CITY OF LOS ANGELES

HARBOR DEPARTMENT



SPECIFICATIONS FOR

HARBOR ADMINISTRATION BUILDING
HVAC REPLACEMENT

SPECIFICATION NO. 2837

APPL. PORT. PERMITS NO. 131218-158

CONTRACT NO.

CONTRACTOR ACCO Engineered Systems, Inc.

AMOUNT $ 12,569,495.00

TIME TO COMMENCE Notice Inviting Bids

TIME TO COMPLETE 480 Calendar Days

BOARD OF HARBOR COMMISSIONERS

THE PORT OF LOS ANGELES
425 S. Palos Verdes Street Post Office Box 151 San Pedro, CA 90733-0151 TEL 310-SEA-PORT portoflosangeles.org

Karen Bass *Mayor, City of Los Angeles*

Board of Harbor Commissioners
Lucille Roybal-Allard *President*
John A. Pérez *Vice President*
Yolanda M. De La Torre *Commissioner*
Edward R. Renwick *Commissioner*
I. Lee Williams *Commissioner*

Eugene D. Seroka *Executive Director*

June 30, 2025

ATTENTION ALL BIDDERS

SUBJECT: ADDENDUM NO. 3
HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT
SPECIFICATION NO. 2837

It is intended that all work affected by the herein contained information shall conform to the requirements of Specification No. 2837, as amended herein, and shall be included in the preparation of bids responsive to the Notice Inviting Bids, dated April 24, 2025.

SPECIFICATION:

Changes to the below listed specification pages are highlighted by shading the additions and revisions, striking out the deletions, and by adding "Addendum No. 3" on the bottom of the page. These pages replace the existing pages. Changes are on the following pages:

TOC – 1 through 3, 5 and 6
00030 – 51 and 52 (pages 53 and 54 are Format Change Only)
00060 – 2 (pages 1 and 3 through 14 are Format Change Only)
00860 – 1 and 2
01000 – 9 (pages 10 through 12 are Format Change Only)
01 11 00 – 2 (page 1 is Format Change Only)

Section 23 09 93 – Sequence of Operations for HVAC Controls has been replaced in its entirety.

DRAWINGS:
Changes on Drawings are shown clouded with Delta “A” on the revised areas and on each sheet of the revised Drawings.

The following sheets were revised for Drawing No. 1-3577:

T-1.0	T-2.0	T-3.0	A-1.0	S-8.1
M-0.3	M-0.4	M-0.6	M-0.7	M-0.10
M-0.11	M-0.12	MD-2.1	MD-2.2	MD-5.1
MD-5.2	M-2.1	M-2.2	M-5.1	M-5.2

BID CLOSING:

The bid closing date remains **Wednesday, July 9, 2025.**

Please check the website at https://www.portoflosangeles.org/business/contracting-opportunities/construction-bids for the latest responses to submitted questions.

For further information, please contact Jill Shimamoto, Senior Construction Manager, at (310) 732-7634.

Sincerely,

Shaun Shahrestani
2025.06.30 11:33:10 -07'00'

SHAUN SHAHRESTANI
Chief Harbor Engineer

JS:msr
30320.doc
File No. Spec No. 2837 – 4.3.1
Form 4/20

Attachments
1. Spec 2837 Addendum Changes

THE PORT OF LOS ANGELES
425 S. Palos Verdes Street Post Office Box 151 San Pedro, CA 90733-0151 TEL 310-SEA-PORT portoflosangeles.org

Karen Bass, *Mayor, City of Los Angeles*

Board of Harbor Commissioners: Lucille Roybal-Allard, *President*; John A. Pérez, *Vice President*; Yolanda M. De La Torre, *Commissioner*; Edward R. Renwick, *Commissioner*; I. Lee Williams, *Commissioner*

Eugene D. Seroka, *Executive Director*

June 12, 2025

ATTENTION ALL BIDDERS

SUBJECT: ADDENDUM NO. 2
HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT
SPECIFICATION NO. 2837

It is intended that all work affected by the herein contained information shall conform to the requirements of Specification No. 2837, as amended herein, and shall be included in the preparation of bids responsive to the Notice Inviting Bids, dated April 24, 2025.

SPECIFICATION:

Changes to the below listed specification page are highlighted by shading the additions and revisions, striking out the deletions, and by adding "Addendum No. 2" on the bottom of the page. This page replaces the existing page. Changes are on the following page:

Section 00012, Notice of Inviting Bids, page 1

BID CLOSING:

The bid closing date has been changed to **Wednesday, July 9, 2025.**

Please check the website at https://www.portoflosangeles.org/business/contracting-opportunities/construction-bids for the latest responses to submitted questions.

For further information, please contact Jill Shimamoto, Senior Construction Manager, at (310) 732-7634.

Sincerely,

Shaun Shahrestani
2025.06.12 08:51:23 -07'00'

SHAUN SHAHRESTANI
Chief Harbor Engineer

MP:msr
30293.doc
File No. Spec No. 2837 – 4.3.1
Form 4/20

Attachments
1. S c 2837 Addendum Changes

THE PORT OF LOS ANGELES
425 S. Palos Verdes Street Post Office Box 151 San Pedro, CA 90733-0151 TEL 310-SEA-PORT portoflosangeles.org

Karen Bass, *Mayor, City of Los Angeles*
Board of Harbor Commissioners: Lucille Roybal-Allard, *President*; John A. Pérez, *Vice President*; Yolanda M. De La Torre, *Commissioner*; Edward R. Renwick, *Commissioner*; I. Lee Williams, *Commissioner*
Eugene D. Seroka, *Executive Director*

May 29, 2025

ATTENTION ALL BIDDERS

SUBJECT: ADDENDUM NO. 1
HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT
SPECIFICATION NO. 2837

It is intended that all work affected by the herein contained information shall conform to the requirements of Specification No. 2837, as amended herein, and shall be included in the preparation of bids responsive to the Notice Inviting Bids, dated April 24, 2025.

SPECIFICATION:

Changes to the below listed specification page are highlighted by shading the additions and revisions, striking out the deletions, and by adding "Addendum No. 1" on the bottom of the page. This page replaces the existing page. Changes are on the following page:

Section 00012, Notice of Inviting Bids, page 1

BID CLOSING:

The bid closing date has been changed to **Wednesday, June 18, 2025.**

Please check the website at https://www.portoflosangeles.org/business/contracting-opportunities/construction-bids for the latest responses to submitted questions.

For further information, please contact Jill Shimamoto, Senior Construction Manager, at (310) 732-7634.

Sincerely,

Shaun Shahrestani
2025.05.29 12:43:39 -07'00'

SHAUN SHAHRESTANI
Chief Harbor Engineer

JS:msr
30260.doc
File No. Spec No. 2837 – 4.3.1
Form 4/20

Attachments
1. Spec 2837 Addendum Changes

TABLE OF CONTENTS
BIDDING REQUIREMENTS

ATTACHMENT NO. 1

SECTION		TITLE	PAGES
00012		NOTICE INVITING BIDS	1-5
00022		INFORMATION FOR BIDDERS	1-9
	.01	General	1
	.02	Form of Proposal	1
	.03	Proposal Irregularities and Alterations	1
	.04	Proposal Signature(s)	1
	.05	Proposal Guaranty	2
	.06	Affidavit of Noncollusion	2
	.07	Federal Excise Tax	3
	.08	Retail Sales or Use Tax	3
	.09	Duties	3
	.10	Withdrawal of Bid	3
	.11	Interpretations and Addenda	3
	.12	Bidders to Investigate	4
	.13	Existing Information	4
	.14	Subcontracts	4
	.15	Mandatory Provisions Pertaining to Non-Discrimination in Employment	5
	.16	Small, Very Small, Minority, Women, Disabled Veteran, and Other Business Enterprise (SBE/VSBE/MBE/WBE/DVBE/OBE)	5-6
	.17	Award of Contract	6-7
	.18	Bond Assistance Program	7
	.19	Release of Public Records	7
	.20	Business Tax	7
	.21	Bidders Check List	8-9
00030		BIDDING DOCUMENTS	1-534
	.01	Bid Bond	1
	.02	Affidavit of Noncollusion	2
	.03	Mandatory Provisions Pertaining to Non-Discrimination in Employment	3-22
	.04	Mandatory Provisions Pertaining to Non-Discrimination in Employment and Affirmative Action in Hiring Employees	23-24
	.05	Equal Benefits Ordinance Compliance Affidavit	25-27
	.06	Small Business Enterprise Program (SBEP)	28-32
	.07	Contract Solicitations Charter Section 470 (c) (12)	33
	.08	Iran Contracting Act of 2010	34
	.09	Iran Contracting Act of 2010 Compliance Affidavit	35
	.10	Local Business Preference Program (LBPP)	36-40
	.11	Contractor Ownership / RAMP Outreach / Local Business Enterprise Affidavit	41-42
	.11A	Monthly Subcontractor/Supplier Monitoring Report	43-44
	.12	Proposal	45-47
	.13	Bid Proposal Line Items	48-534

TABLE OF CONTENTS
BIDDING REQUIREMENTS

SECTION	TITLE	PAGES
00060	CONTRACT	1-134
1.1	Contract Documents	1
1.2	Work to be Done	1
1.3	Contract Time	1 2
1.4	Liquidated Damages	2
2.1	Payments to Contractor	2 3
3.1	Quality of Services	2 3
3.2	Indemnification	2-3-4
3.3	Insurance	4-9-10
3.4	Compliance with Laws	9 10
4.1	Binding Effect	9 10
4.2	Notices	10
4.3	Relationship of Parties	10 11
4.4	Entire Agreement	10 11
4.5	Legal Justification and Recourse	10 11
4.6	Time of Essence	11
4.7	Labor Code Section 1861	11
4.8	Assignment of Certain Causes of Action	11 12
4.9	Termination Due to Non-Appropriation of Funds	11-12
4.10	No Waiver	12 13
4.11	Joint and Several Obligations of Contractor	12 13
5.1	Signatures	13 14
00070	PERFORMANCE BOND	1
00074	PAYMENT BOND	1-2
00078	AFFIDAVITS OF COMPLETION	1-5
00660	SBE/VSBE/MBE/WBE/DVBE/OBE/LBE INFORMATION	1-5
.01	Contractor/Supplier Information Form	1-2
.02	Subcontractor/Supplier Ownership and Local Business Enterprise Affidavit	3-4
.03	Supplier List	5
00860	CONTRACT DOCUMENTS	1-2

TABLE OF CONTENTS
BIDDING REQUIREMENTS

SECTION	TITLE	PAGES
01000	GENERAL CONDITIONS	1-56
.01	Abbreviations and Definitions	1-6
.02	Time for Submittal of Bonds	6
.03	Performance Bond	6
.04	Payment Bond	6
.05	Responsibility for Loss	6-7
.06	Prevailing Wages	7-9
.07	Wage and Earning Assignment Orders/ Notices of Assignments	9
.08	Working Hours	9
.09	Apprentice Utilization on Public Works	10
.10	Non-Discrimination Provisions	10
.11	Board Right to Terminate Contract	10-11
.12	Assignments	11-12
.13	Cancellation for Default	12
.14	Other Contracts	14
.15	Contract Documents Complementary	14
.16	Precedence of Documents	15
.17	Standard Specifications	15
.18	Reference Specifications	15
.19	Electronic Copies of Contract Documents Furnished	15
.20	Responsibility of Costs and Materials	16
.21	Shop Drawings and Materials Samples	16-17
.22	Source Inspections and Samples for Testing	18-19
.23	Defective Materials and Construction	19
.24	Protection of Materials	20
.25	Authority of Engineer	20
.26	Subsurface Data and Physical Conditions	20-21
.27	Protection of Existing Utilities	21
.28	Harbor Datum	21-22
.29	Surveying and Staking	22
.30	Inspection of Work	23
.31	Field Office Trailer and Field Personnel	23
.32	Character of Workers and Discipline Among Employees	24
.33	Changes in Work	24
.34	Cost-Plus Change Order Work (Change Orders)	25-28
.35	Authority for Adjustments	28-30
.36	Force Account Work	30
.37	Request for Additional Compensation	31
.38	Emergency Work	31-32
.39	Temporary Suspension of Work	32
.40	Unauthorized Work	32
.41	Contractor to Abide by Applicable Laws	32-33
.42	Explosives	33
.43	Proprietary Names and Substitutions	33-34

SECTION	TITLE	PAGES
.44	Patent Rights	34
.45	Housekeeping and Maintenance of Surface Areas of Project Site and any Laydown Area(s)	35
.46	Protection of Harbor Waters	35
.47	Project Site and any Laydown Area(s) Security	35
.48	Public Convenience and Protection	36
.49	Temporary Utilities	36
.50	Sanitation	36
.51	Railroad Tracks	37
.52	Construction Schedule	37
.53	Extensions of Time and Compensable Delays	38-39
.54	Liquidated Damages	40
.55	Partial Acceptance and Use	40-41
.56	Partial Payments	41-44
.57	Acceptance and Final Payment	45
.58	Affidavit of Completion	46
.59	Guarantee	46-47
.60	No Personal Liability	47
.61	No Estoppel	47
.62	Potentially Significant Cultural Material	48
.63	State Tidelands Grant	48
.64	Responsibility for Subcontractors	48
.65	Contractor's Liability for Hazardous Wastes or Hazardous Substances	49
.66	Time and Materials Form	50
.67	Daily Field Report	51
.68	Laydown Area(s)	52-56
01000A	SUPPLEMENTARY CONDITIONS	1-5

TABLE OF CONTENTS
BIDDING REQUIREMENTS

SECTION	TITLE	PAGES
	DIVISION 01 - GENERAL REQUIREMENTS	
01 11 00	Summary of Work	1-2
01 14 13	Location and Access	1
01 14 19	Site Conditions	1-3
01 31 13	Coordination	1-3
01 31 25	Internet – Based Project Management	1-2
01 32 16	Construction Schedules	1-18
01 41 00	Regulatory Requirements	1-6
01 74 20	Construction and Demolition Waste Management	1-10
01 78 39	Project Record Documents	1-3
01 89 00	Site Construction Performance Requirements	1-4
01 91 13	Commissioning	1-23
	DIVISION 02 – EXISTING CONDITIONS	
02 00 01	Basic Site Materials and Methods	1-4
02 41 13	Selective Site Demolition	1-3
02 82 13	Asbestos Abatement	1-36
	DIVISIONS 03 THROUGH 04 – NOT USED	
	DIVISION 05 – METALS	
05 05 14	Treating Damaged Galvanizing	1-2
05 50 00	Metal Fabrications	1-20
05 51 00	Metal Stairs	1-4
	DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES – NOT USED	
	DIVISION 07 - THERMAL AND MOISTURE PROTECTION	
07 84 01	Firestopping and Smokestopping	1-6
	DIVISION 08 – OPENINGS – NOT USED	
	DIVISION 09 – FINISHES	
09 90 01	Painting for Exterior Improvements	1-6

TABLE OF CONTENTS
BIDDING REQUIREMENTS

SECTION	TITLE	PAGES

DIVISIONS 10 THROUGH 21 – NOT USED

DIVISION 22 – PLUMBING

22 05 29	Hangers and Supports for Plumbing Piping and Equipment	1-10
22 07 00	Plumbing Insulation	1-6
22 11 00	Facility Water Distribution	1-12
22 13 00	Facility Sanitary Sewerage	1-7
22 16 00	Facility Natural Gas Piping	1-8

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

23 01 45	Mechanical Demolition	1-3
23 05 01	Basic Mechanical Requirements	1-9
23 05 13	Common Motor Requirements for HVAC Equipment	1-5
23 05 17	Sleeves and Sleeve Seals for HVAC Piping	1-6
23 05 23	General Duty Valves for HVAC Piping	1-9
23 05 29	Hangers and Supports for HVAC Piping and Equipment	1-14
23 05 48	Vibration and Seismic Controls for HVAC	1-15
23 05 53	Identification for HVAC Piping and Equipment	1-4
23 05 93	Testing, Adjusting, and Balancing for HVAC	1-31
23 07 13	Duct Insulation	1-13
23 07 16	HVAC Equipment Insulation	1-11
23 07 19	HVAC Piping Insulation	1-17
23 08 00	Commissioning of HVAC	1-12
23 09 00	Instrumentation and Controls for HVAC	1-26
23 09 93	Sequence of Operations for HVAC Controls	1-~~15~~ 25
23 21 13	Hydronic Piping	1-10
23 21 14	Piping Tests	1-7
23 21 23	Hydronic Pumps	1-8
23 21 30	Pipe Cleaning and Water Treatment	1-8
23 23 00	Refrigerant Piping	1-14
23 25 00	HVAC Water Treatment	1-7
23 29 23	Variable Frequency Motor Controllers	1-10
23 31 13	Metal Ducts	1-7
23 33 00	Air Duct Accessories	1-10
23 34 17	Fans	1-8
23 36 00	Air Terminal Units	1-5
23 41 00	Particulate Air Filtration	1-6
23 52 13	Electric Boilers	1-7
23 52 14	Air Source Modular Heat Pump	1-10
23 61 23	Rotary-Screw Refrigerant Compressors	1-7

SECTION	TITLE	PAGES
23 63 33	Evaporative Refrigerant Condensers	1-8
23 64 16	Centrifugal Water Chillers	1-15
23 81 23.15	Computer Room Air Conditioners, Floor Mounted Units	1-7
23 82 16.13	Refrigerant Air Coils	1-3
23 82 19	Fan Coil Units	1-10

DIVISION 25 – INTEGRATED AUTOMATION – NOT USED

DIVISION 26 – ELECTRICAL

26 00 01	Basic Electrical Materials and Methods	1-6
26 05 19	Low Voltage Electrical Power Conductors and Cables	1-4
26 05 26	Grounding and Bonding for Electrical Systems	1-4
26 05 29	Hangers and Supports for Electrical Systems	1-5
26 05 33	Raceways and Boxes for Electrical Systems	1-12
26 05 34	Outlet, Junction, and Pull Boxes	1-2
26 24 16	Panelboards	1-3

DIVISIONS 27 THROUGH 30 – NOT USED

DIVISION 31 – EARTHWORK

31 23 33	Trenching and Backfilling	1-3

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 13 14	Concrete for Exterior Improvements	1-5

DIVISIONS 33 THROUGH 48 – NOT USED

SECTION TITLE PAGES

Appendix “A”

Project Labor Agreement (PLA) and POLA Construction Careers Policy

Appendix “B”

Waste Management Plan (WMP) and Solid Waste Diversion and Disposal (SWDD) Report Forms

Appendix “C”

Environmental Compliance Tracking (ECT) Form

Appendix “D”

HVAC Control Points List

Appendix "E”

Electrical Safety Policy – Implementation Plan

01 The HARBOR DEPARTMENT of the CITY OF LOS ANGELES, California, invites electronic bids in accordance with Specification No. 2837 for HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT.

02 Project consists of removing and replacing existing heating, ventilating and air conditioning (HVAC) systems, including but not limited to variable air volume (VAV) boxes and associated pneumatic controls; cooling plant including compressors, evaporative condenser, cooling coils; direct digital control (DDC) system serving cooling plant and built-up air handler; filters and filter rack in built-up air handler; refrigerant piping and associated appurtenances; and providing temporary HVAC unit until the new HVAC system is commissioned, tested, adjusted, balanced, and accepted.

03 Contract Documents are available in Department's Web-based Bid Management System called "Construction Division Business Opportunity Network (CDBON)" utilizing an online bid management system at https://www.portoflosangeles.org/business/contracting-opportunities/construction-bids. Bidders shall be required to register to download Drawings, Specifications, Addenda, and other important documents. A plan holders list can be accessed without registering. For information concerning bids, call Department at (310) 732-3522.

04 A virtual pre-bid conference shall be held on May 7, 2025 at 9 a.m. via Microsoft Teams. Please RSVP to Jill Shimamoto if you plan to attend. The agenda and related materials shall be posted to CDBON and shall be discussed in detail at the meeting.

05 Bids must be submitted online via Port of Los Angeles CDBON system on or before 2:45:00 p.m. (PST/PDT) on July 9th, ~~June 18,~~ 2025 at which time, bid results shall be available for viewing.

06 Each bid must be accompanied by a scanned copy of the following: a check certified by a responsible financial institution, or a cashier's check issued by a responsible financial institution, or by a satisfactory bid bond, payable to the order of City of Los Angeles Harbor Department, for an amount not less than 10 percent of the aggregate sum of the bid, as a guarantee that Bidder shall enter into Contract if awarded, and furnish the required bonds. Bid bond shall be placed with insurance carriers which are rated VII, A- or better in Best's Insurance Guide. If a Best's Insurance Guide rating is not available, then the proposed carrier must meet comparable standards in another rating service satisfactory to City.

07 The provisions of Sections 10.8 through 10.11 and 10.13 of Los Angeles Administrative Code pertaining to nondiscrimination and affirmative action shall be a part of said Contract. Portions of these provisions are summarized in Subsections 00030.03 and 00030.04 of BIDDING DOCUMENTS Section which set forth requirements Bidder must acknowledge.

08 City of Los Angeles Harbor Department is committed to creating an environment that provides all individuals and businesses open access to the business opportunities available at Port of Los Angeles in a manner that reflects the diversity of City of Los Angeles. Port of Los Angeles Small Business Enterprise Program (SBEP or "Program") as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section was created to provide additional opportunities for small businesses to participate in any and all contracts. It has been determined that based on Work to be performed in Contract, Small Business Enterprise participation shall be a minimum of 5%, of which 1% shall be Very Small Business Enterprise participation.

09 The first 3 apparent low Bidders shall submit the following documents with original signatures within 4 Business Days after bids are closed. Information from other Bidders shall be requested only if they are being considered for an Award of Contract. Other Bidders shall submit this information within 4 Business Days of receiving a written request from Engineer.

a Original of a check certified by a responsible financial institution, or a cashier's check, or bid bond in conformance with Subsection 06 above.

b Affidavit of Noncollusion.

c Contractor/Supplier Information Form, refer to Subsection 00660.01.

d Subcontractor/Supplier Ownership and Local Business Enterprise Affidavit for each subcontractor and supplier, refer to Subsection 00660.02.

e Electrical Safety Policy form.

f CEC Form 50, prime contractor's certification.

g CEC Form 55 with subcontractor's and principals of subcontractor's information (if subcontractor and principal of subcontractor information were not submitted at time of bid). Failure to submit the information within 4 Business Days after bids are closed or within 4 Business Days after receiving written request from Engineer shall be cause to deem bid nonresponsive. Refer to BIDDING DOCUMENTS Section, Subsection 00030.07, Contract Solicitations Charter Section 470 (c) (12) Subsection, Paragraph C.

10 At time of bid, Bidders must be registered on City's Contracts Management and Opportunities Database, Regional Alliance Marketplace for Procurement (RAMP) – a free service provided by the Mayor's Office of Economic Development and the Minority Business Opportunity Committee.

Bidders, subcontractors, and suppliers identified in the bid submittal as SBE or VSBE must be certified at time of bid, as applicable. Bidders, subcontractors, and suppliers must submit a copy of SBE certificate or VSBE certificate from the agency utilized to obtain certification as SBE or as VSBE to Engineer within 4 Business Days of close of bids in order to be acknowledged within the bid as SBE or VSBE. Refer to https://kentico.portoflosangeles.org/getmedia/aea536e1-5d48-440a-8857-c55907e3dc74/contracting-proprietary-sbe-cert-application for certification instructions.

Within 30 Calendar Days after close of bids, subcontractors and suppliers must be registered on RAMP. In addition, within 30 Calendar Days after close of bids, Bidders, subcontractors, and suppliers identified in the bid submittals as SBE or VSBE must be verified on RAMP as SBE (Proprietary) or VSBE (Harbor), as applicable.

RAMP is accessible at https://www.rampla.org/s/. Bidders, subcontractors, and suppliers are advised that there is an application process required to become certified as SBE (Proprietary) and as VSBE (Harbor), and that time is of the essence.

11 Contract may be awarded at any time during a period of 90 Calendar Days after date of close of bids. The right is reserved to reject any and all bids.

12 The successful Bidder shall possess an active Class A, B, or C20 California Contractor's License at the time of Award.

13 The successful Bidder shall, within 14 Calendar Days after Notice of Award, provide acceptable bonds and insurance on the forms provided as required in CONTRACT Section and GENERAL CONDITIONS Section.

14 The successful Bidder shall, within 30 Calendar Days after Notice of Award, enter into the written Contract.

15 A performance bond in the amount of the full Contract price shall be provided. A payment bond in the amount of 100 percent of Contract price shall also be provided in case of an award in excess of $25,000. Performance bond and payment bond shall be placed with insurance carriers which are rated VII, A- or better in Best's Insurance Guide. If a Best's Insurance Guide rating is not available, then the proposed carrier must meet comparable standards in another rating service satisfactory to City. Bidders may be eligible for participation in City's Bond Assistance Program referenced in Subsection 00022.18.

16 The prevailing rate of per diem wages and rates for legal holidays and overtime work for each craft, classification or type of workers needed in the execution of any contract to let under Specifications has been determined by the Director of the Department of Industrial Relations of the State of California pursuant to the provisions of the Labor Code of the State of California. Copies of the applicable Determinations by the said Director are on file in Construction Division and are hereby incorporated and made a part hereof as though the same were fully set forth in this Section. The State of California has approved City's Labor Compliance Program of enforcement of State prevailing wage laws and shall allow City to retain all penalty assessments for violation of these laws.

17 Pursuant to notice requirements effective January 1, 2015, all contractors and subcontractors must register with and meet requirements of the State of California Department of Industrial Relations using the online application before bidding on public works contracts in California. For the online application, visit http://www.dir.ca.gov/Public-Works/PublicWorks.html.

a No contractor or subcontractor may be listed on a bid proposal for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 (with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1[a]).

b No contractor or subcontractor may be awarded a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

c Project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

18 In accordance with Board of Harbor Commissioners' Resolution No. 6315, Electrical Safety Policy, adopted October 27, 2004, the successful Bidder shall comply with the required qualifications for jobsite workers, as specified in BASIC ELECTRICAL MATERIALS AND METHODS Section (PART 1, Quality Assurance Article, Paragraph B, Jobsite Workers and subparagraphs).

19 Board of Harbor Commissioners of City of Los Angeles adopted Resolution No. 6328 on January 12, 2005, agreeing to adopt the provisions of Los Angeles City Ordinance 172,908, as amended, relating to Equal Benefits (Section 10.8.2.1. et seq. of Los Angeles Administrative Code) as a policy of Harbor Department. Contractor shall comply with the policy detailed in Subsection 00030.05 Equal Benefits Ordinance Compliance Affidavit of BIDDING DOCUMENTS Section.

20 In accordance with Board of Harbor Commissioners' Resolution No. 17-8164, Approval of Port-Wide Project Labor Agreement (PLA), adopted September 7, 2017, and in accordance with Board of Harbor Commissioners' Resolution Nos. 18-8319 and 18-8320, approval of Construction Careers Policy, adopted July 17, 2018, included as Appendix "A" of Specifications, Contractor and all subcontractors, prior to start of Work, shall sign a Letter of Assent (Attachment A of Appendix "A") agreeing to the terms of PLA. Contractor shall further comply with the terms of Attachment "B" (Drug and Alcohol Testing Policy) and fill out Attachment "C" (Request/Verification for Craft Employees) during the course of Project.

21 Harbor Department strives to work cooperatively with Contractor through partnering. Refer to SUPPLEMENTARY CONDITIONS Section for partnering language and requirements.

22 Iran Contracting Act of 2010: Harbor Department shall enforce Iran Contracting Act of 2010 requirement provisions included as Subsection 00030.08 of BIDDING DOCUMENTS Section of Specifications. Bidder shall fill out and submit at time of bid Iran Contracting Act of 2010 Compliance Affidavit included as Subsection 00030.09 of BIDDING DOCUMENTS Section of Specifications.

23 Local Business Preference Program (LBPP) shall apply to Project. Refer to Subsection 00030.10 of BIDDING DOCUMENTS Section.

24 Submit questions to https://www.portoflosangeles.org/business/contracting-opportunities/construction-bids. Questions submitted less than 2 Business Days before close of bids may or may not be answered as time permits. Responses to questions shall be posted on Construction Division Business Opportunity Network (CDBON) at https://www.portoflosangeles.org/business/contracting-opportunities/construction-bids. The responses to questions may be updated at any time prior to the day bids are due. This shall be the only means used to communicate with Bidders other than by addendum. Department assumes no liability for Bidder's failure to attend the pre-bid conference or to review Construction Division Business Opportunity Network to obtain responses to Bidder's questions.

EUGENE D. SEROKA
Executive Director

Dated April 21, 2025

01 GENERAL

a Information in this Section supplements or further explains information in NOTICE INVITING BIDS Section.

02 FORM OF PROPOSAL

a Bids shall be tendered online via CDBON, in conformance with Subsection 00012.03, of NOTICE INVITING BIDS Section.

b All required fields in Bid Proposal Line Items shall be filled in on the forms provided online.

c All documents listed in Subsection 00022.21, “Bidder’s Check List”, shall be submitted in conformance with the instructions provided in Subsection 00022.21.

03 PROPOSAL IRREGULARITIES AND ALTERATIONS

a Bidders are prohibited from altering BIDDING DOCUMENTS Section. Any alterations or changes made to BIDDING DOCUMENTS Section shall render the bid informal and subject to rejection.

04 PROPOSAL SIGNATURE(S)

a If the bid is made by an individual, the signature must be the full name of Bidder, whose address must be given.

b If the bid is made by a partnership, it must be signed by each partner or accompanied by proof that the persons signing the bid are authorized to bind the partnership. The name and address of the partnership and the address of the persons signing must be provided.

c If the bid is made by a corporation, it must be signed by a person authorized to do so by bylaw or resolution of that corporation.

d A corporation submitting a bid may be required, before Contract is finally awarded, to furnish a certificate as to its corporate existence, and satisfactory evidence as to the officers or officer authorized to execute the bid on behalf of the corporation.

05 PROPOSAL GUARANTY

a The bid shall be accompanied by a scanned copy of the following documents: A certified check or a cashier's check issued by a responsible financial institution, payable to the order of City of Los Angeles Harbor Department, or by a satisfactory bond, for an amount equal to at least 10 percent of the total amount of the bid, as a guaranty that the Bidder shall, within thirty (30) Calendar Days after Notice of Award, enter into Contract with City and furnish all required bonds for Work contemplated. The originals shall be submitted with the documents listed in Subsection 00012.09 of NOTICE INVITING BIDS Section.

b If a certified or cashier's check is tendered as a proposal guaranty, Bid Bond form may be disregarded. In all other instances, the bond form provided with BIDDING DOCUMENTS Section shall be signed by the Bidder and its surety(ies).

c Upon execution of Contract and provision of the necessary bond(s) and insurance by the successful Bidder, the check or the amounts thereof and the bonds of the unsuccessful Bidders shall be returned or released.

06 AFFIDAVIT OF NONCOLLUSION

a Affidavit of Noncollusion form provided with BIDDING DOCUMENTS Section, properly executed, a scanned copy must be submitted with the bid. The signature on the affidavit must be subscribed and sworn to before a notary public.

b Any bid made without such affidavit, shall not be considered. Any Bidder making a false affidavit may be excluded from future bidding on contracts with City.

c If at any time it is found that the person, firm, or corporation, to whom Award of Contract has been made, did, in submitting the bid, collude with any other party or parties, then Contract shall be voided. Work shall be re-advertised. Contractor and Contractor's bondspersons shall be held liable to City for all loss or damage which it may suffer thereby.

d The original shall be submitted with the documents listed in Specifications as Subsection 00012.09 of NOTICE INVITING BIDS Section.

07 FEDERAL EXCISE TAX

a Prices quoted by Bidder shall be exclusive of federal excise taxes pursuant to exemption of political subdivisions of a State under federal law.

b City, when requested, shall furnish Contractor a Certificate of Exemption from federal excise tax covering materials and equipment to be furnished pursuant to Specifications.

08 RETAIL SALES OR USE TAX

a Purchases under Specifications are subject to the full application of California State and Los Angeles City and County sales or use tax.

b Prices quoted in BIDDING DOCUMENTS Section shall be construed as including all applicable taxes regardless of whether or not sales or use tax is stated separately by Bidder.

09 DUTIES

a Prices quoted by Bidder shall include all applicable duties, including import duties.

10 WITHDRAWAL OF BID

a A Bidder may withdraw a bid, without prejudice, at any time prior to bid closing. The Withdraw button on CDBON online system shall become available from the time a bid is submitted to any time prior to the close of bids.

11 INTERPRETATIONS AND ADDENDA

a Should a prospective Bidder find discrepancies in or omissions from Specifications or other Contract Documents, or should there be doubt as to their intended meaning, Bidder may submit to Engineer a written request for an interpretation and clarification. Bidder submitting the request is responsible for the prompt delivery and timeliness of any such request.

b Any interpretation of or change in Contract Documents shall be made only by addendum issued to each person or entity to whom Specifications have been issued, and shall become a part of any contract awarded. City shall not be responsible for any oral or other explanations or interpretations. Receipt of any such addenda by Bidder must be acknowledged on Proposal form in the space provided.

12 BIDDERS TO INVESTIGATE

a Bidder's submittal of a bid constitutes its acknowledgement that Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality and quantities of Work to be performed and materials to be furnished, and as to the requirements of Specifications. The submission of the bid shall constitute prima facie evidence that Bidder has made such examination.

13 EXISTING INFORMATION

a Engineer shall make available to all prospective Bidders, prior to the receipt of bids, all information in possession of Department as to subsoil conditions in the vicinity of Work, topographical maps, or other information that might assist Bidder in properly evaluating the amount and character of Work that may be required. Any additional subsurface exploration shall be done at Bidder's sole cost and expense.

14 SUBCONTRACTS

a Section 10.14 (as amended) of Los Angeles Administrative Code requires each Bidder to submit with the bid the names and addresses of subcontractors whose Work shall be in excess of one-half of 1 percent of Bidder's total bid or $10,000, whichever is greater, and shall indicate that portion of Work which shall be done by each subcontractor so listed. The successful Bidder shall make no substitutions of subcontractors so listed except as provided for in said ordinance. For the purpose of Article 15, the terms and definitions of Section 10.14 (as amended) of Los Angeles Administrative Code shall apply.

b Not more than 50 percent of the monetary value of Work shall be subcontracted. The listing of more than 50 percent may result in the rejection of the bid.

c Bidder shall be fully responsible to City for its acts and/or omissions and for the acts and/or omissions of persons directly employed by Bidder. Additionally, Bidder shall be fully responsible to City for the acts and/or omissions of subcontractors and of persons or entities either directly or indirectly employed by subcontractors. Nothing contained in Contract Documents shall create or be construed as creating a contractual relationship between any subcontractor of Bidder and City.

d Each Bidder must complete, sign, notarize, and submit as part of the bid Contractor Ownership / RAMP Outreach / Local Business Enterprise Affidavit included in Specifications as Subsection 00030.11 of BIDDING DOCUMENTS Section. Each Bidder shall also submit with the bid the subcontractor list entered online as provided on CDBON.

15 MANDATORY PROVISIONS PERTAINING TO NON-DISCRIMINATION IN EMPLOYMENT

Unless otherwise exempt, this Contract is subject to the applicable non-discrimination, equal benefits, equal employment practices, and affirmative action program provisions in Los Angeles Administrative Code (LACC) Section 10.8 et seq., as amended from time to time.

a Contractor shall comply with the applicable non-discrimination and affirmative action provisions of the laws of the United States of America, the State of California, and City. In performing this Contract, Contractor shall not discriminate in any of its hiring or employment practices against any employee or applicant for employment because of such person's race, color, religion, national origin, ancestry, sex, sexual orientation, gender, gender identity, age, disability, domestic partner status, marital status or medical condition.

b The requirements of Section 10.8.2.1 of LAAC, Equal Benefits Ordinance, and the provisions of Section 10.8.2.1(f) are incorporated and made a part of this Contract by reference.

c The provisions of Section 10.8.3 of LAAC are incorporated and made a part of this Contract by reference and shall be known as the "Equal Employment Practices" provisions of this Contract.

d The provisions of Section 10.8.4 of LAAC are incorporated and made a part of this Contract by reference and shall be known as the "Affirmative Action Program" provisions of this Contract.

16 SMALL, VERY SMALL, MINORITY, WOMEN, DISABLED VETERAN, AND OTHER BUSINESS ENTERPRISE (SBE/VSBE/MBE/WBE/DVBE/OBE)

a It is the policy of City of Los Angeles to provide Small Business Enterprises (SBE) and Very Small Business Enterprises (VSBE), including Minority Business Enterprises (MBEs), Women Business Enterprises (WBEs), Disabled Veteran Business Enterprise (DVBE), and Other Business Enterprises (OBEs) an equal opportunity to participate in the provision of goods and services under Contract. Department strongly encourages Contractor to include MBE, WBE, and DVBE participation to the fullest extent possible.

b To be eligible for an award of contract, each Bidder shall complete, sign, notarize, and submit as part of the bid Contractor Ownership / RAMP Outreach / Local Business Enterprise Affidavit included in Specifications as Subsection 00030.11 of BIDDING DOCUMENTS Section.

00022.16 Cont'd.

c As part of the bid, each Bidder shall complete and submit subcontractor list in CDBON. As part of the bid, each Bidder shall complete and upload into CDBON the Supplier List in Subsection 00660.03 of SBE/VSBE/MBE/WBE/DVBE/OBE/LBE INFORMATION Section listing suppliers necessary to meet SBE/VSBE participation requirements in conformance with Subsection 00030.06 of BIDDING DOCUMENTS Section.

d Within 4 Business Days after bids are closed, each Bidder shall submit Contractor/Supplier Information Form included in Specifications as Subsection 00660.01 of SBE/VSBE/MBE/WBE/DVBE/OBE/LBE INFORMATION Section.

e Contractor Ownership / RAMP Outreach / Local Business Enterprise Affidavit and Contractor/Supplier Information Form when signed, shall signify Bidder's intent to comply with Small Business Enterprise Program described in Specifications.

f In accordance with Section 4104 of the Public Contracting Code of the State of California, as amended, information is required to be entered in CDBON for each subcontractor who shall perform Work (including Contingency and Allowance Item Work) amounting to more than one half of one percent (0.5%) of the Total Base Bid or $10,000 (whichever is greater).

17 AWARD OF CONTRACT

a Award of Contract shall be in accordance with the provisions of this Subsection.

1 Award of Contract, if award is to be made, shall be to the lowest and best regular, responsible Bidder furnishing satisfactory security for its performance and complying with Small Business Requirement taking into account Local Business Preference, if applicable.

2 The right is reserved to reject any and all bids, or to reject any item or items therein and to waive any informality in the bid.

b Bidder to be awarded Contract must be capable of performing the various items of Work bid upon. Bidders may be required to submit, before Award of Contract, satisfactory evidence covering experience on similar Work, a list of machinery, plant and other equipment available for the proposed Work, and such statements of their financial resources as may be deemed necessary. If the available evidence of competency of any Bidder is not satisfactory, the bid of such Bidder shall be rejected.

00022.17 Cont'd.

c City may reject bids which have prices shown on Bid Proposal Line Items that are obviously unbalanced.

d The bid of any party who has been delinquent or unfaithful in the performance of any former contract with City may be rejected.

18 BOND ASSISTANCE PROGRAM

a Bond Assistance Program (BAP) is designed to assist small, local, minority, women, and disadvantaged businesses in removing potential barriers of surety bonding by providing technical, administrative assistance, and other resources to these companies. For information on BAP, please contact Tricia Carey at (310) 732-7656 or email tcarey@portla.org.

19 RELEASE OF PUBLIC RECORDS

a City seeks to conduct its business publicly. The law generally provides that information given to City is a public record. In limited circumstances, information such as trade secrets and certain financial data may be treated confidentially. Bidder should be aware that the information provided to City may be available for public review. Therefore, information which Bidder desires to retain as confidential should not be produced unless expressly requested by City. If City receives a request to produce such information, it shall notify Bidder of such request. If Bidder instructs that the information not be released, City shall withhold the information provided Bidder expeditiously seeks and successfully obtains a court protective order to prevent such a release.

20 BUSINESS TAX

a In accordance with City of Los Angeles Municipal Code, a Business Tax Registration Certificate (BTRC) must be obtained and a business tax must be paid by every person engaged in business as a contractor in City of Los Angeles. Contractor shall obtain a BTRC number and pay tax due to City of Los Angeles Office of Finance, (844) 663-4411. BTRC number must be clearly shown on all invoices submitted for payment.

21 BIDDERS CHECK LIST

a Bidders may use the following checklist to verify BIDDING DOCUMENTS Section has been completed.

b Please check under the appropriate column:
*Upload: Complete included document, attach supporting documents as indicated, scan, and upload to CDBON online system. Hard copies are to be submitted within 4 Business Days of bid closing.
**Online: Enter information directly into online form in CDBON online system.

		Upload*	Online**
1	PROPOSAL GUARANTY*		
(a)	Is the amount at least 10% of the total bid?	_____	
(b)	If surety bond, is it properly filled in and signed by surety?	_____	
(c)	If certified or cashier's check, is it enclosed with bid?	_____	
2	AFFIDAVIT OF NONCOLLUSION*		
(a)	Is affidavit properly filled in and signed?	_____	
(b)	Is affidavit notarized?	_____	
3	EQUAL BENEFITS ORDINANCE COMPLIANCE AFFIDAVIT*		
(a)	Is the affidavit completed and signed?	_____	
(b)	Are the forms enclosed with the bid?	_____	
4	CONTRACT SOLICITATIONS CHARTER SECTION 470 (c) (12)*		
(a)	Are City Ethics Commission (CEC) Forms 50 and 55 completed and signed? (If CEC Form 55 is submitted without subcontractor information, Bidder shall submit updated CEC Form 55 as stated in NOTICE INVITING BIDS Section.)	_____	
(b)	Are the forms enclosed with the bid?	_____	
5	IRAN CONTRACTING ACT OF 2010 COMPLIANCE AFFIDAVIT*		
(a)	Is the affidavit completed and signed?	_____	
(b)	Is the affidavit enclosed with the bid?	_____	

000022.21 Cont'd.

		Upload*	Online**
6	CONTRACTOR OWNERSHIP / RAMP OUTREACH/ LOCAL BUSINESS ENTERPRISE AFFIDAVIT*		
	(a) Is affidavit properly filled in and signed?	_____	
	(b) Is affidavit notarized?	_____	
7	SUBCONTRACTOR/SUPPLIER INFORMATION*/**		
	(a) Has Bidder listed the name and business address of each applicable subcontractor?		_____
	(b) Has Bidder included the dollar amount in the appropriate column for each subcontractor?		_____
	(c) Has Bidder accurately described Work to be done by said subcontractor(s)?		_____
	(d) Has Bidder completed Supplier List in Subsection 00660.03?	_____	
8	PROPOSAL**/*		
	(a) Has Bidder acknowledged receipt of addendum/addenda?		_____
	(b) Is Bidder's contractor's license number and expiration date provided?	_____	
	(c) Is proposal properly signed and dated?	_____	
	(d) Has Bidder inserted its Tax Identification Number?	_____	
	(e) Has Bidder identified the type of business and named the Partners or Corporate Officers?	_____	
	(f) Has Bidder completed and signed the Headquarters Location Form?	_____	
9	BID PROPOSAL LINE ITEMS**		
	(a) Has Bidder filled in a price for each bid item?		_____

END OF SECTION

01 BID BOND

*Bond portion of form need not be executed when bid is accompanied by a certified check or a cashier's check issued by a responsible financial institution.

WE, the undersigned principal and surety Fidelity and Deposit Company of Maryland acknowledge ourselves jointly and severally bound to City of Los Angeles, in the sum of Ten Percent of Amount Bid dollars ($ 10% of Amount Bid) to be paid to said City if the foregoing bid shall be accepted and the proposed contract awarded to said Bidder, and said Bidder shall fail to execute Contract and furnish and execute such bond(s) as are specified in the foregoing NOTICE INVITING BIDS Section; otherwise, this obligation be void.

Dated: May 30, 20 25.

Bidder's Name ACCO Engineered Systems, Inc.

By _____
Chuck Darway, Vice President

_____

_____

(Surety) Fidelity and Deposit Company of Maryland

(Surety) _____
Simone Gerhard, Attorney-In-Fact

NOTE: Surety must be in the form of a certified check, cashier's check, or a corporate surety bond. A personal surety bond is not acceptable. Annual bidder's bonds are acceptable. Cash is acceptable although not recommended.

If a check is submitted, state number _____

and amount $_____.

If an annual bid bond is used, state name of company_____

bond number _____

and unencumbered amount _____.

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT **CIVIL CODE § 1189**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)

County of Los Angeles)

On MAY 30 2025 before me, Ethan Spector, Notary Public

Date *Here Insert Name and Title of the Officer*

Personally appeared Simone Gerhard

Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____

Signature of Notary Public

ETHAN SPECTOR
Notary Public - California
Los Angeles County
Commission # 2466163
My Comm. Expires Oct 11, 2027

Place Notary Seal Above

---------- ***OPTIONAL*** ----------

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document _____ Document Date _____

Number of Pages _____ Signer(s) Other Than Named Above _____

Capacity(ies) Claimed by Signer(s)

Signer's Name _____	Signer's Name _____
☐ Corporate Officer—Title(s) _____	☐ Corporate Officer—Title(s) _____
☐ Partner ☐ Limited ☐ General	☐ Partner ☐ Limited ☐ General
☐ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other _____	☐ Other _____
Signer Is Representing _____	Signer Is Representing _____

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by Robert D. Murray, Vice President, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint Paul RODRIGUEZ, Emily NEWELL, D. GARCIA, KD WAPATO, Marina TAPIA, Edward C. SPECTOR, Sarah CAMPBELL, Rachel A. MULLEN, B ALEMAN, Ethan SPECTOR, Timothy NOONAN, Janina MONROE, Sandra CORONA, Jennifer OCHS, Aidan SMOCK, Lisa CRAIL, Simone GERHARD, Erin BROWN **of Los Angeles, California,** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings,** and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

,

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 14th day of March, A.D. 2024.



ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 14th day of March, A.D. 2024, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Genevieve M. Maison

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790

GENEVIEVE M. MAISON
NOTARY PUBLIC
BALTIMORE COUNTY, MD
My Commission Expires JANUARY 27, 2025

GENEVIEVE M. MAISON NOTARY PUBLIC EXP. 01/27/2025 BALTIMORE COUNTY, MD

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Vice President of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this _____ day of MAY 30 2025.

Colonial American Casualty and Surety Company CORPORATE SEAL

ZURICH AMERICAN INSURANCE COMPANY CORPORATE SEAL 1977 NEW YORK

Fidelity and Deposit Company of Maryland CORPORATE SEAL 1890

Thomas O. McClellan
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Authenticity of this bond can be confirmed at bondvalidator.zurichna.com or 410-559-8790

02 AFFIDAVIT OF NONCOLLUSION

STATE OF California
COUNTY OF Los Angeles

_____, being first duly sworn, composes and says that Bidder is Chuck Darway, Vice President

_____

(insert "sole owner", "partner", "president", "secretary", or other proper title) of _____

_____

ACCO Engineered Systems, Inc.
(Insert name of Bidder)

who submits herewith to City of Los Angeles the attached bid:

(1) That Bidder is the person whose name is signed to the hereto attached Proposal form; that said bid is genuine; that the same is not sham or collusive; that all statements of fact therein are true; that such proposal was not made in the interest of or behalf of any person, partnership, company, association, organization or corporation not therein named or disclosed.

(2) That Bidder has not directly or indirectly by agreement, communication, or conference with anyone attempted to induce action prejudicial to the interests of the public body which is to award Contract or any other bidder, or anyone else interested in the proposed Contract; that Bidder has not in any manner sought by collusion to secure an advantage over any other bidder.

(3) That prior to the date and time of deadline for bid submittal the said Bidder:

(a) did not, directly or indirectly, induce or solicit anyone else to submit a false or sham bid;

(b) did not, directly or indirectly, collude, conspire, connive or agree with anyone else that said Bidder or anyone else would submit a false or sham bid, or that anyone should refrain from bidding or withdraw bid;

(c) did not, directly or indirectly, submit the bid price entered on the attached Bid Proposal Line Items form or any breakdown thereof, or the contents thereof, or divulge information or data relative thereto, to any corporations, partnership, company, association, organization, bid depository, or to any member or agent thereof, or to any individual or group of individuals, except to the awarding authority or to any person or persons who have a partnership or other financial interest in the business of said Bidder.

Signed: _____

(Title)

Subscribed and sworn to before me

this 2 day of June, 2025

(Seal of Notary)

See Below

_____

Signature of Notary

SUSANA FREGOSO ROSAS
Notary Public - California
Los Angeles County
Commission # 2507389
My Comm. Expires Dec 20, 2028

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA COUNTY OF Los Angeles

Subscribed and sworn to (or affirmed) before me on this 2 day of June, 2025 by Chuck Darway Vice President proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

Susana Fregoso Rosas

(Signature of Notary)

03 MANDATORY PROVISIONS PERTAINING TO NON-DISCRIMINATION IN EMPLOYMENT

Pursuant to Los Angeles Charter and Administrative Code, Division 10 Chapter 1, Article 1, Section 10.8 et seq. it is the policy of City of Los Angeles to require each person or entity contracting for goods or services to comply with the Non-discrimination, Equal Employment practices, and Affirmative Action Program provisions of City of Los Angeles.

Sec. 10.8 Mandatory Provisions Pertaining to Non-discrimination in Employment in the Performance of City Contracts.

The City of Los Angeles, in letting and awarding contracts for the provision to it or on its behalf of goods or services of any kind or nature, intends to contract only with those contractors that comply with the non-discrimination and affirmative action provisions of the laws of the United States of America, the State of California and the City of Los Angeles. The City and each of its awarding authorities shall therefore require that any person, firm, corporation, partnership or combination thereof that contracts with the City for services, materials or supplies, shall not discriminate in any of its hiring or employment practices, shall comply with all provisions pertaining to non-discrimination in hiring and employment, and shall require Affirmative Action Programs in contracts in accordance with the provisions of this Code. The awarding authority and/or Office of Contract Compliance of the Department of Public Works shall monitor and inspect the activities of each contractor to determine that they are in compliance with the provisions of this chapter.

Although in accordance with Section 22.359 of this Code, the Board of Public Works, Office of Contract Compliance, is responsible for the administration of the City's Contract Compliance Program, accomplishing the intent of the City in contract compliance and achieving non-discrimination in contractor employment shall be the continuing responsibility of each awarding authority. Each awarding authority shall use only the rules, regulations, and forms provided by the Office of Contract Compliance to monitor, inspect, or investigate contractor compliance with the provisions of this chapter.

00030.03 Cont'd.

Each awarding authority shall provide immediate notification upon award of each contract by that awarding authority to the Office of Contract Compliance. Each awarding authority shall call upon the Office of Contract Compliance to review, evaluate, and recommend on any contractual dispute or issue of noncompliance under the provisions of this chapter. The Office of Contract Compliance shall be notified by each awarding authority of any imminent announcement to bid, to allow the Office of Contract Compliance the opportunity to participate with the awarding authority in the monitoring, review, evaluation, investigation, audit and enforcement of the provisions of this chapter in accordance with the rules, regulations and forms promulgated to implement the City's Contract Compliance, Equal Employment Practices Program.

Sec. 10.8.1. Definitions.

Except for Section 10.8.2.1, the following definitions shall apply to the following terms used in this article:

"Awarding Authority" means any Board or Commission of the City of Los Angeles, or any authorized employee or officer of the City of Los Angeles, including the Purchasing Agent of the City of Los Angeles, who makes or enters into any contract or agreement for the provision of any goods or services of any kind or nature whatsoever for, or on behalf of, the City of Los Angeles.

"Contract" means any agreement, franchise, lease or concession, including agreements for any occasional professional or technical personal services, for the performance of any work or service, the provision of any materials or supplies, or the rendition of any service to the City of Los Angeles or to the public, which is let, awarded or entered into with, or on behalf of, the City of Los Angeles or any Awarding Authority thereof. Contracts where the provisions of this article would conflict with federal or state grant funded contracts, or conflict with the terms of the grant or subvention, as determined by the DAA, are exempt.

"Contractor" means any person, firm, corporation, partnership, or any combination thereof, who enters into a contract with any Awarding Authority of the City of Los Angeles.

"Designated Administrative Agency (DAA)" means the Department of Public Works, Office of Contract Compliance created by Article X of Chapter 13 of Division 22 of the Los Angeles Administrative Code. That office is also known as the Department of Public Works, Bureau of Contract Administration.

00030.03 Cont'd.

"Domestic Partners" means, for purposes of this article, any two adults, of the same or different sex, who have registered with a governmental entity pursuant to state or local law authorizing this registration or with an internal registry maintained by an employer of at least one of the domestic partners.

"Employment Practices" means any solicitation of, or advertisement for, employees, employment, change in grade or work assignment, assignment or change in place or location of work, layoff, suspension or termination of employees, rate of pay or other form of compensation including vacation, sick and compensatory time, selection for training, including apprenticeship programs, any and all employee benefits and activities, promotion and upgrading, and any and all actions taken to discipline employees for infractions of work rules or employer requirements.

"Minority" is defined to mean "minority person" as the phrase is defined in Subsection (f) of Section 2000 of the California Public Contract Code, as amended from time to time.

"Subcontractor" means any person, firm or corporation or partnership, or any combination thereof, who enters into a contract with a Contractor to perform or provide a portion or part of any Contract with the City.

Sec. 10.8.1.1. Summary of Thresholds.

The following thresholds will be used to determine the non-discrimination and affirmative action requirements set forth in this chapter for each type of contract.

Non-discrimination Practices as outlined in Section 10.8.2 of this Code apply to all contracts.

Equal Employment Practices as outlined in Section 10.8.3 of this Code apply to all construction contracts of $1,000 or more and all non-construction contracts of $1,000 or more.

Affirmative Action Program as outlined in Sections 10.8.4 and 10.13 of this Code applies to all Construction Contracts of $25,000 or more and all non-Construction Contracts of $25,000 or more.

00030.03 Cont'd.

Sec. 10.8.2. All Contracts: Non-discrimination Clause.

Notwithstanding any other provision of any ordinance of the City of Los Angeles to the contrary, every Contract which is let, awarded or entered into with or on behalf of the City of Los Angeles, shall contain by insertion therein a provision obligating the Contractor in the performance of such Contract not to discriminate in his or her Employment Practices against any employee or applicant for employment because of the applicant's race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status, domestic partner status or medical condition. All Contractors who enter into such Contracts with the City shall include a like provision in all subcontracts awarded for work to be performed under the Contract with the City. Failure of the Contractor to comply with this requirement or to obtain the compliance of its Subcontractors with such obligations shall subject the Contractor to the imposition of any and all sanctions allowed by law, including, but not limited to, termination of the Contractor's Contract with the City. Nothing contained in this Contract shall be construed in any manner so as to require or permit any act which is prohibited by law.

Sec. 10.8.2.1. Equal Benefits Ordinance.

(a) Legislative Findings. The City awards many contracts to private firms to provide services to the public and to City government. Many City contractors and subcontractors perform services that affect the proprietary interests of City government in that their performance impacts the success of City operations. The City holds a proprietary interest in the work performed by many employees employed by City contractors and subcontractors. In a very real sense, the success or failure of City operations may turn on the success or failure of these enterprises, for the City has a genuine stake in how the public perceives the services rendered for them by these businesses.

Discrimination in the provision of employee benefits between employees with domestic partners and employees with spouses results in unequal pay for equal work. Los Angeles law prohibits entities doing business with the City from discriminating in employment practices based on marital status and/or sexual orientation. The City's departments and contracting agents are required to place in all City contracts a provision that the company choosing to do business with the City agrees to comply with the City's nondiscrimination laws.

00030.03 Cont'd.

It is the City's intent, through the contracting practices outlined in this Ordinance, to assure that those companies wanting to do business with the City will equalize the total compensation between similarly situated employees with spouses and with domestic partners. The provisions of this Ordinance are designed to ensure that the City's contractors will maintain a competitive advantage in recruiting and retaining capable employees, thereby improving the quality of the goods and services the City and its people receive, and ensuring protection of the City's property.

(b) Definitions. For purposes of the Equal Benefits Ordinance only, the following shall apply.

(1) Awarding Authority means any Board or Commission of the City, or any employee or officer of the City, that is authorized to award or enter into any Contract, as defined in this ordinance, on behalf of the City, and shall include departments having control of their own funds and which adopt policies consonant with the provisions of the Equal Benefits Ordinance.

(2) Benefits means any plan, program, or policy provided or offered by a Contractor to its employees as part of the employer's total compensation package. This includes but is not limited to the following types of benefits: bereavement leave, family medical leave, health benefits, membership or membership discounts, moving expenses, pension and retirement benefits, and travel benefits.

(3) Cash Equivalent means the amount of money paid to an employee with a Domestic Partner (or spouse, if applicable) in lieu of providing Benefits to the employee's Domestic Partner (or spouse, if applicable). The Cash Equivalent is equal to the direct expense to the employer of providing Benefits to an employee for his or her Domestic Partner (or spouse, if applicable) or the direct expense to the employer of providing Benefits for the dependents and family members of an employee with a Domestic Partner (or spouse, if applicable).

(4) City means the City of Los Angeles.

(5) Contract means an agreement the value of which exceeds $25,000. It includes agreements for work or services to or for the City; for public works or improvements to be performed; agreements for the purchase of goods, equipment, materials, or supplies; or grants to be provided, at the expense of the City or to be paid out of monies under the control of the City. The term also includes a Lease or License, as defined in the Equal Benefits Ordinance.

00030.03 Cont'd.

(6) Contractor means any person or persons, firm, partnership, corporation, joint venture, or any combination of these, or any governmental entity acting in its proprietary capacity that enters into a Contract with any Awarding Authority of the City. The term does not include Subcontractors.

(7) Designated Administrative Agency (DAA) means the Department of Public Works, Bureau of Contract Administration.

(8) Domestic Partner means any two adults, of the same or different sex, who have registered as domestic partners with a governmental entity pursuant to state or local law authorizing this registration or with an internal registry maintained by the employer of at least one of the domestic partners.

(9) Equal Benefits Ordinance means Los Angeles Administrative Code Section 10.8.2.1, *et seq.*, as amended from time to time.

(10) Equal Benefits means the equality of benefits between employees with spouses and employees with Domestic Partners, between spouses of employees and Domestic Partners of employees, and between dependents and family members of spouses and dependents and family members of Domestic Partners.

(11) Lease or License means any agreement allowing others to use property owned or controlled by the City, any agreement allowing others the use of City property in order to provide services to or for the City, such as for concession agreements, and any agreement allowing the City to use property owned or controlled by others.

(12) Subcontractor means any person or persons, firm, partnership, corporation, joint venture, or any combination of these, and any governmental entity, that assists the Contractor in performing or fulfilling the terms of the Contract. Subcontractors are not subject to the requirements of the Equal Benefits Ordinance unless they otherwise have a Contract directly with the City.

(c) Equal Benefits Requirements.

(1) No Awarding Authority of the City shall execute or amend any Contract with any Contractor that discriminates in the provision of Benefits between employees with spouses and employees with Domestic Partners, between spouses of employees and Domestic Partners of employees, and between dependents and family members of spouses and dependents and family members of Domestic Partners.

00030.03 Cont'd.

(2) A Contractor must permit access to, and upon request, must provide certified copies of all of its records pertaining to its Benefits policies and its employment policies and practices to the DAA, for the purpose of investigation or to ascertain compliance with the Equal Benefits Ordinance.

(3) A Contractor must post a copy of the following statement in conspicuous places at its place of business available to employees and applicants for employment: "During the performance of a Contract with the City of Los Angeles, the Contractor will provide equal benefits to its employees with spouses and its employees with domestic partners." The posted statement must also include a City contact telephone number which will be provided each Contractor when the Contract is executed.

(4) A Contractor must not set up or use its contracting entity for the purpose of evading the requirements imposed by the Equal Benefits Ordinance.

(d) Other Options for Compliance. Provided that the Contractor does not discriminate in the provision of Benefits, a Contractor may also comply with the Equal Benefits Ordinance in the following ways:

(1) A Contractor may provide an employee with the Cash Equivalent only if the DAA determines that either:

a. The Contractor has made a reasonable, yet unsuccessful effort to provide Equal Benefits; or

b. Under the circumstances, it would be unreasonable to require the Contractor to provide Benefits to the Domestic Partner (or spouse, if applicable).

(2) Allow each employee to designate a legally domiciled member of the employee's household as being eligible for spousal equivalent Benefits.

(3) Provide Benefits neither to employees' spouses nor to employees' Domestic Partners.

(e) Applicability.

(1) Unless otherwise exempt, a Contractor is subject to and shall comply with all applicable provisions of the Equal Benefits Ordinance.

00030.03 Cont'd.

(2) The requirements of the Equal Benefits Ordinance shall apply to a Contractor's operations as follows:

a. A Contractor's operations located within the City limits, regardless of whether there are employees at those locations performing work on the Contract.

b. A Contractor's operations on real property located outside of the City limits if the property is owned by the City or the City has a right to occupy the property, and if the Contractor's presence at or on that property is connected to a Contract with the City.

c. The Contractor's employees located elsewhere in the United States but outside of the City limits if those employees are performing work on the City Contract.

(3) The requirements of the Equal Benefits Ordinance do not apply to collective bargaining agreements ("CBA") in effect prior to January 1, 2000. The Contractor must agree to propose to its union that the requirements of the Equal Benefits Ordinance be incorporated into its CBA upon amendment, extension, or other modification of a CBA occurring after January 1, 2000.

(f) Mandatory Contract Provisions Pertaining to Equal Benefits. Unless otherwise exempted, every Contract shall contain language that obligates the Contractor to comply with the applicable provisions of the Equal Benefits Ordinance. The language shall include provisions for the following:

(1) During the performance of the Contract, the Contractor certifies and represents that the Contractor will comply with the Equal Benefits Ordinance.

(2) The failure of the Contractor to comply with the Equal Benefits Ordinance will be deemed to be a material breach of the Contract by the Awarding Authority.

(3) If the Contractor fails to comply with the Equal Benefits Ordinance the Awarding Authority may cancel, terminate or suspend the Contract, in whole or in part, and all monies due or to become due under the Contract may be retained by the City. The City may also pursue any and all other remedies at law or in equity for any breach.

00030.03 Cont'd.

(4) Failure to comply with the Equal Benefits Ordinance may be used as evidence against the Contractor in actions taken pursuant to the provisions of Los Angeles Administrative Code Section 10.40, *et seq.*, Contractor Responsibility Ordinance.

(5) If the DAA determines that a Contractor has set up or used its Contracting entity for the purpose of evading the intent of the Equal Benefits Ordinance, the Awarding Authority may terminate the Contract on behalf of the City. Violation of this provision may be used as evidence against the Contractor in actions taken pursuant to the provisions of Los Angeles Administrative Code Section 10.40, *et seq.*, Contractor Responsibility Ordinance.

(g) Administration.

(1) The DAA is responsible for the enforcement of the Equal Benefits Ordinance for all City Contracts. Each Awarding Authority shall cooperate to the fullest extent with the DAA in its enforcement activities.

(2) In enforcing the requirements of the Equal Benefits Ordinance, the DAA may monitor, inspect, and investigate to ensure that the Contractor is acting in compliance with the Equal Benefits Ordinance. Contractor's failure to cooperate with the DAA may result in a determination by the DAA that the Contractor is not in compliance with the Equal Benefits Ordinance, which may subject the Contractor to enforcement measures set forth in Section 10.8.2.1(h).

(3) The DAA shall promulgate rules and regulations and forms for the implementation of the Equal Benefits Ordinance. No other rules, regulations, or forms may be used by an Awarding Authority of the City to accomplish this contract compliance program.

(h) Enforcement.

(1) If the Contractor fails to comply with the Equal Benefits Ordinance:

a. The failure to comply may be deemed to be a material breach of the Contract by the Awarding Authority; or

b. The Awarding Authority may cancel, terminate or suspend, in whole or in part, the contract; or

c. Monies due or to become due under the Contract may be retained by the City until compliance is achieved;

00030.03 Cont'd.

d. The City may also pursue any and all other remedies at law or in equity for any breach.

e. The City may use failure to comply with the Equal Benefits Ordinance as evidence against the Contractor in actions taken pursuant to the provisions of Los Angeles Administrative Code Section 10.40, et seq., Contractor Responsibility Ordinance.

(i) Non-applicability, Exceptions, and Waivers.

(1) Upon request of the Awarding Authority, the DAA may waive compliance with the Equal Benefits Ordinance under the following circumstances:

a. The Contract is for the use of City property, and there is only one prospective Contractor willing to enter into the Contract; or

b. The Contract is for needed goods, services, construction of a public work or improvement, or interest in or right to use real property that is available only from a single prospective Contractor, and that prospective Contractor is otherwise qualified and acceptable to the City; or

c. The Contract is necessary to respond to an emergency that endangers the public health or safety, and no entity which complies with the requirements of the Equal Benefits Ordinance capable of responding to the emergency is immediately available; or

d. The City Attorney certifies in writing that the Contract involves specialized litigation requirements such that it would be in the best interests of the City to waive the requirements of the Equal Benefits Ordinance; or

e. The Contract is (i) with a public entity; (ii) for goods, services, construction of a public work or improvement, or interest in or right to use real property; and (iii) that is either not available from another source, or is necessary to serve a substantial public interest. A Contract for interest in or the right to use real property shall not be considered as not being available from another source unless there is no other site of comparable quality or accessibility available from another source; or

00030.03 Cont'd.

f. The requirements of the Equal Benefits Ordinance will violate or are inconsistent with the terms or conditions of a grant, subvention or agreement with a public agency or the instructions of an authorized representative of the agency with respect to the grant, subvention or agreement, provided that the Awarding Authority has made a good faith attempt to change the terms or conditions of the grant, subvention or agreement to authorize application of the Equal Benefits Ordinance; or

g. The Contract is for goods, a service or a project that is essential to the City or City residents and there are no qualified responsive bidders or prospective Contractors who could be certified as being in compliance with the requirements of the Equal Benefits Ordinance; or

h. The Contract involves bulk purchasing arrangements through City, federal, state or regional entities that actually reduce the City's purchasing costs and would be in the best interests of the City.

(2) The Equal Benefits Ordinance does not apply to contracts which involve:

a. The investment of trust monies, bond proceeds or agreements relating to the management of these funds, indentures, security enhancement agreements (including, but not limited to, liquidity agreements, letters of credit, bond insurance) for City tax-exempt and taxable financings, deposits of City's surplus funds in financial institutions, the investment of City monies in competitively bid investment agreements, the investment of City monies in securities permitted under the California State Government Code and/or the City's investment policy, investment agreements, repurchase agreements, City monies invested in U.S. government securities or pre-existing investment agreements;

b. Contracts involving City monies in which the Treasurer or the City Administrative Officer finds that either:

(i) No person, entity or financial institution doing business in the City, which is in compliance with the Equal Benefits Ordinance, is capable of performing the desired transaction(s); or
(ii) The City will incur a financial loss or forego a financial benefit which in the opinion of the Treasurer or City Administrative Officer would violate his or her fiduciary duties.

00030.03 Cont'd.

(3) The Equal Benefits Ordinance does not apply to contracts for gifts to the City.

(4) Nothing in this Subsection shall limit the right of the City to waive the provisions of the Equal Benefits Ordinance.

(5) The provisions of this Subsection shall apply to the Equal Benefits Ordinance only. The Equal Benefits Ordinance is not subject to the exemptions provided in Section 10.9 of this Code.

(j) Consistency with Federal or State Law. The provisions of the Equal Benefits Ordinance do not apply where the application of these provisions would violate or be inconsistent with the laws, rules or regulations federal or state law, or where the application would violate or be inconsistent with the terms or conditions of a grant or contract with the United States of America, the State of California, or the instruction of an authorized representative of any of these agencies with respect to any grant or contract.

(k) Severability. If any provision of the Equal Benefits Ordinance is declared legally invalid by any court of competent jurisdiction, the remaining provisions shall remain in full force and effect.

(l) Timing of Application.

(1) The requirements of the Equal Benefits Ordinance shall not apply to Contracts executed or amended prior to January 1, 2000, or to bid packages advertised and made available to the public, or any bids received by the City, prior to January 1, 2000, unless and until those Contracts are amended after January 1, 2000 and would otherwise be subject to the Equal Benefits Ordinance.

(2) The requirements of the Equal Benefits Ordinance shall apply to competitively bid Contracts that are amended after April 1, 2003, and to competitively bid Contracts that result from bid packages advertised and made available to the public after May 1, 2003.

(3) Unless otherwise exempt, the Equal Benefits Ordinance applies to any agreement executed or amended after January 1, 2000, that meets the definition of a Contract as defined within Subsection 10.8.2.1(b).

00030.03 Cont'd.

Sec. 10.8.3. Equal Employment Practices Provisions.

Every non-construction and construction Contract with, or on behalf of, the City of Los Angeles for which the consideration is $1,000 or more shall contain the following provisions, which shall be designated as the Equal Employment Practices provision of such contract:

A. During the performance of this Contract, the Contractor agrees and represents that it will provide Equal Employment Practices and the Contractor and each Subcontractor hereunder will ensure that in his or her Employment Practices persons are employed and employees are treated equally and without regard to, or because of, race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status or medical condition.

1. This provision applies to work or service performed or materials manufactured or assembled in the United States.

2. Nothing in this section shall require or prohibit the establishment of new classifications of employees in any given craft, work or service category.

3. The Contractor agrees to post a copy of Paragraph A., hereof, in conspicuous places at its place of business available to employees and applicants for employment.

B. The Contractor will, in all solicitations or advertisements for employees placed by, or on behalf of, the Contractor, state that all qualified applicants will receive consideration for employment without regard to their race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status or medical condition.

C. At the request of the Awarding Authority or the DAA, the Contractor shall certify in the specified format that he or she has not discriminated in the performance of City Contracts against any employee or applicant for employment on the basis or because of race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status, or medical condition.

D. The Contractor shall permit access to, and may be required to provide certified copies of, all of his or her records pertaining to employment and to employment practices by the awarding authority or the DAA for the purpose of investigation to ascertain compliance with the Equal Employment Practices provisions of City Contracts. Upon request, the Contractor shall provide evidence that he or she has or will comply therewith.

00030.03 Cont'd.

E. The failure of any Contractor to comply with the Equal Employment Practices provisions of this contract may be deemed to be a material breach of City Contracts. The failure shall only be established upon a finding to that effect by the Awarding Authority, on the basis of its own investigation or that of the DAA. No such finding shall be made or penalties assessed except upon a full and fair hearing after notice and an opportunity to be heard has been given to the Contractor.

F. Upon a finding duly made that the Contractor has failed to comply with the Equal Employment Practices provisions of a City Contract, the Contract may be forthwith cancelled, terminated or suspended, in whole or in part, by the Awarding Authority, and all monies due or to become due hereunder may be forwarded to, and retained by, the City of Los Angeles. In addition thereto, the failure to comply may be the basis for a determination by the Awarding Authority or the DAA that the said Contractor is a non-responsible bidder or proposer pursuant to the provisions of Section 10.40 of this Code. In the event of such a determination, the Contractor shall be disqualified from being awarded a Contract with the City of Los Angeles for a period of two years, or until the Contractor shall establish and carry out a program in conformance with the provisions hereof.

G. Notwithstanding any other provision of this contract, the City of Los Angeles shall have any and all other remedies at law or in equity for any breach hereof.

H. The Board of Public Works shall promulgate rules and regulations through the DAA, and provide necessary forms and required language to the Awarding Authorities to be included in City Request for Bids or Request for Proposal packages or in supplier registration requirements for the implementation of the Equal Employment Practices provisions of this Contract, and such rules and regulations and forms shall, so far as practicable, be similar to those adopted in applicable Federal Executive orders. No other rules, regulations, or forms may be used by an Awarding Authority of the City to accomplish the contract compliance program.

I. Nothing contained in this Contract shall be construed in any manner so as to require or permit any act which is prohibited by law.

J. By affixing its signature on a Contract that is subject to this article, the Contractor shall agree to adhere to the Equal Employment Practices specified herein during the performance or conduct of City Contracts.

00030.03 Cont'd.

K. Equal Employment Practices shall, without limitation as to the subject or nature of employment activity, be concerned with employment practices, including, but not limited to:

1. hiring practices;

2. apprenticeships where approved programs are functioning and other on-the-job training for non-apprenticeable occupations;

3. training and promotional opportunities; and

4. reasonable accommodations for persons with disabilities.

L. All Contractors subject to the provisions of this section shall include a similar provision in all subcontracts awarded for work to be performed under the Contract with the City, and shall impose the same obligations including, but not limited to, filing and reporting obligations, on the Subcontractors as are applicable to the Contractor. Subcontracts shall follow the same thresholds specified in Section 10.8.1.1. Failure of the Contractor to comply with this requirement or to obtain the compliance of its Subcontractors with all such obligations shall subject the Contractor to the imposition of any and all sanctions allowed by law, including, but not limited to, termination of the Contractor's Contract with the City.

Sec. 10.8.4. Affirmative Action Program Provisions.

Every non-construction and construction Contract with, or on behalf of, the City of Los Angeles for which the consideration is $25,000 or more shall contain the following provisions which shall be designated as the Affirmative Action Program provisions of such Contract:

A. During the performance of a City Contract, the Contractor certifies and represents that the Contractor and each Subcontractor hereunder will adhere to an Affirmative Action Program to ensure that in its employment practices, persons are employed and employees are treated equally and without regard to or because of race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status, domestic partner status or medical condition.

1. This section applies to work or services performed or materials manufactured or assembled in the United States.

2. Nothing in this section shall require or prohibit the establishment of new classifications of employees in any given craft, work or service category.

00030.03 Cont'd.

3. The Contractor shall post a copy of Paragraph A., hereof, in conspicuous places at its place of business available to employees and applicants for employment.

B. The Contractor shall, in all solicitations or advertisements for employees placed, by or on behalf of, the Contractor, state that all qualified applicants will receive consideration for employment without regard to their race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status, domestic partner status or medical condition.

C. At the request of the Awarding Authority or the DAA, the Contractor shall certify on an electronic or hard copy form to be supplied, that the Contractor has not discriminated in the performance of City Contracts against any employee or applicant for employment on the basis or because of race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status, domestic partner status or medical condition.

D. The Contractor shall permit access to, and may be required to provide certified copies of, all of its records pertaining to employment and to its employment practices by the Awarding Authority or the DAA for the purpose of investigation to ascertain compliance with the Affirmative Action Program provisions of City Contracts and, upon request, to provide evidence that it has or will comply therewith.

E. The failure of any Contractor to comply with the Affirmative Action Program provisions of City Contracts may be deemed to be a material breach of a City Contract. The failure shall only be established upon a finding to that effect by the Awarding Authority, on the basis of its own investigation or that of the DAA. No finding shall be made except upon a full and fair hearing after notice and an opportunity to be heard has been given to the Contractor.

F. Upon a finding duly made that the Contractor has breached the Affirmative Action Program provisions of a City Contract, the Contract may be forthwith cancelled, terminated or suspended, in whole or in part, by the Awarding Authority, and all monies due or to become due hereunder may be forwarded to and retained by the City of Los Angeles. In addition thereto, the breach may be the basis for a determination by the Awarding Authority or the Board of Public Works that the Contractor is a non-responsible bidder or proposer pursuant to the provisions of Section 10.40 of this Code. In the event of such determination, the Contractor shall be disqualified from being awarded a contract with the City of Los Angeles for a period of two years, or until he or she shall establish and carry out a program in conformance with the provisions hereof.

00030.03 Cont'd.

G. In the event of a finding by the Fair Employment and Housing Commission of the State of California, or the Board of Public Works of the City of Los Angeles, or any court of competent jurisdiction, that the Contractor has been guilty of a willful violation of the California Fair Employment and Housing Act, or the Affirmative Action Program provisions of a City Contract, there may be deducted from the amount payable to the Contractor by the City of Los Angeles under the contract, a penalty of ten dollars for each person for each calendar day on which the person was discriminated against in violation of the provisions of a City Contract.

H. Notwithstanding any other provisions of a City Contract, the City of Los Angeles shall have any and all other remedies at law or in equity for any breach hereof.

I. The Public Works Board of Commissioners shall promulgate rules and regulations through the DAA and provide to the Awarding Authorities electronic and hard copy forms for the implementation of the Affirmative Action Program provisions of City contracts, and rules and regulations and forms shall, so far as practicable, be similar to those adopted in applicable Federal Executive Orders. No other rules, regulations or forms may be used by an Awarding Authority of the City to accomplish this contract compliance program.

J. Nothing contained in City Contracts shall be construed in any manner so as to require or permit any act which is prohibited by law.

K. By affixing its signature to a Contract that is subject to this article, the Contractor shall agree to adhere to the provisions in this article for the duration of the Contract. The Awarding Authority may also require Contractors and suppliers to take part in a pre-registration, pre-bid, pre-proposal, or pre-award conference in order to develop, improve or implement a qualifying Affirmative Action Program.

1. The Contractor certifies and agrees to immediately implement good faith effort measures to recruit and employ minority, women, and other potential employees in a non-discriminatory manner including, but not limited to, the following actions as appropriate and available to the Contractor's field of work. The Contractor shall:

(a) Recruit and make efforts to obtain employees through:

(i) Advertising employment opportunities in minority and other community news media or other publications.

00030.03 Cont'd.

(ii) Notifying minority, women, and other community organizations of employment opportunities.

(iii) Maintaining contact with schools with diverse populations of students to notify them of employment opportunities.

(iv) Encouraging existing employees, including minorities and women, to refer their friends and relatives.

(v) Promoting after school and vacation employment opportunities for minority, women, and other youth.

(vi) Validating all job specifications, selection requirements, tests, etc.

(vii) Maintaining a file of the names and addresses of each worker referred to the Contractor and what action was taken concerning the worker.

(viii) Notifying the appropriate Awarding Authority and the DAA in writing when a union, with whom the Contractor has a collective bargaining agreement, has failed to refer a minority, woman, or other worker.

(b) Continually evaluate personnel practices to assure that hiring, upgrading, promotions, transfers, demotions and layoffs are made in a non-discriminatory manner so as to achieve and maintain a diverse work force.

(c) Utilize training programs and assist minority, women, and other employees in locating, qualifying for and engaging in the training programs to enhance their skills and advancement.

(d) Secure cooperation or compliance from the labor referral agency to the Contractor's contractual Affirmative Action Program obligations.

(e) Establish a person at the management level of the Contractor to be the Equal Employment Practices officer. Such individual shall have the authority to disseminate and enforce the Contractor's Equal Employment and Affirmative Action Program policies.

(f) Maintain records as are necessary to determine compliance with Equal Employment Practices and Affirmative Action Program obligations and make the records available to City, State and Federal authorities upon request.

00030.03 Cont'd.

(g) Establish written company policies, rules, and procedures which shall be encompassed in a company-wide Affirmative Action Program for all its operations and Contracts. The policies shall be provided to all employees, Subcontractors, vendors, unions and all others with whom the Contractor may become involved in fulfilling any of its Contracts.

(h) Document its good faith efforts to correct any deficiencies when problems are experienced by the Contractor in complying with its obligations pursuant to this article. The Contractor shall state:

(i) What steps were taken, how and on what date.

(ii) To whom those efforts were directed.

(iii) The responses received, from whom and when.

(iv) What other steps were taken or will be taken to comply and when.

(v) Why the Contractor has been or will be unable to comply.

2. Every contract of $25,000 or more which may provide construction, demolition, renovation, conservation, or major maintenance of any kind shall also comply with the requirements of Section 10.13 of the Los Angeles Administrative Code.

L. The Affirmative Action Program required to be submitted hereunder and the pre-registration, pre-bid, pre-proposal or pre-award conference which may be required by the Awarding Authority shall, without limitation as to the subject or nature of employment activity, be concerned with such employment practices as:

1. Apprenticeship where approved programs are functioning, and other on-the-job training for non-apprenticeable occupations;

2. Classroom preparation for the job when not apprenticeable;

3. Pre-apprenticeship education and preparation;

4. Upgrading training and opportunities;

00030.03 Cont'd.

5. Encouraging the use of Contractors, Subcontractors and suppliers of all racial and ethnic groups; provided, however, that any contract subject to this ordinance shall require the Contractor, Subcontractor or supplier to provide not less than the prevailing wage, working conditions and practices generally observed in private industries in the Contractor's, Subcontractor's or supplier's geographical area for such work;

6. The entry of qualified women, minority and all other journeymen into the industry; and

7. The provision of needed supplies or job conditions to permit persons with disabilities to be employed, and minimize the impact of any disability.

M. Any adjustments which may be made in the Contractor's work force to achieve the requirements of the City's Affirmative Action Program in purchasing and construction shall be accomplished by either an increase in the size of the work force or replacement of those employees who leave the work force by reason of resignation, retirement or death and not by termination, layoff, demotion or change in grade.

N. This ordinance shall not confer upon the City of Los Angeles or any Agency, Board or Commission thereof any power not otherwise provided by law to determine the legality of any existing collective bargaining agreement and shall have application only to discriminatory employment practices by Contractors engaged in the performance of City Contracts.

O. All Contractors subject to the provisions of this article shall include a similar provision in all subcontracts awarded for work to be performed under the Contract with the City and shall impose the same obligations including, but not limited to, filing and reporting obligations, on the Subcontractors as are applicable to the Contractor. Failure of the Contractor to comply with this requirement or to obtain the compliance of its Subcontractors with all such obligations shall subject the Contractor to the imposition of any and all sanctions allowed by law, including, but not limited to, termination of the Contractor's Contract with the City.

04 MANDATORY PROVISIONS PERTAINING TO NON-DISCRIMINATION IN EMPLOYMENT AND AFFIRMATIVE ACTION IN HIRING EMPLOYEES

Sec. 10.13. Mandatory Provisions Pertaining to Non-discrimination in Employment and Affirmative Action in Hiring Employees in the Performance of Work on Certain City Construction Contracts.

A. Notwithstanding any other provision of this division to the contrary, every construction Contract involving an expenditure of $25,000 or more of City funds, except in cases of urgent necessity, as provided in Section 371 of the Charter of the City of Los Angeles and except as provided in Section 10.9 of this Code, shall contain these provisions as part of the Contract. By affixing its signature on a Contract, the Contractor shall agree to adhere to these provisions for the duration of the Contract.

B. Anticipated Utilization. At the request of the Awarding Authority or DAA, the Contractor must set forth anticipated minority, women, and all other staffing utilization by the Contractor and all Subcontractors on each project constructed by the City using those trades within the area of jurisdiction of the Los Angeles Building and Construction Trades Council within the City of Los Angeles in each work class and at all levels in terms of staff hours. The anticipated levels of minority, women and other staffing utilization shall be the levels at which each of those groups are represented in the relevant work force in the Greater Los Angeles Area as determined by the U.S. Bureau of the Census and made available by the DAA. Attainment of the anticipated levels of utilization may only be used as an indicia of whether the Contractor has complied with the requirements of this section and has applied its Affirmative Action Program in good faith and in a non-discriminatory manner. Failure to attain the anticipated levels of utilization shall not, by itself, disqualify the Contractor for award of a Contract or subject the Contractor to any sanctions or penalties.

In no event may a Contractor utilize the requirements of this section in such a manner as to cause or result in discrimination against any person on account of race, color, religion, national origin, ancestry, sex, sexual orientation, age, disability, marital status, domestic partner status or medical condition.

C. The Contractor shall make a good faith effort with respect to apprenticeship and training programs to:

1. Recruit and refer minority, women and other employees to such programs;

2. Establish training programs within the company and/or its affiliates that will prepare minority, women and other employees for advancement opportunities; and

00030.04 Cont'd.

3. Abide by the requirements of the Labor Code of the State of California with respect to the provision of apprenticeship job opportunities.

D. No contract shall be executed until the appropriate Awarding Authority of the City of Los Angeles, and the Federal funding agency (if Federal funds are involved), has determined in writing that the Contractor has executed and filed with the Awarding Authority and the DAA any federal or state requirements.

E. It shall be no excuse that the union with which the Contractor has a collective bargaining agreement providing for referral, exclusive or otherwise, failed to refer minority, women, or other employees.

F. Subject to this subsection, the Contractor shall execute further forms and documentation at times and as may be required by the appropriate Awarding Authority.

G. Where the Contractor has failed to comply with the requirements contained in this section, any and all sanctions allowed by law may be imposed upon the Contractor.

H. The DAA shall be responsible for administering the City's Contract Compliance Program in the manner described in Sections 22.359 through 22.359.2 of this Code.

I. All Contractors subject to the provisions of this section shall include a similar provision in all subcontracts awarded for work to be performed under the Contract with the City and shall impose the same obligations, including, but not limited to, filing and reporting obligations, on the Subcontractors as are applicable to the Contractor. Failure of the Contractor to comply with this requirement or to obtain the compliance of its Subcontractors with all such obligations shall subject the Contractor to the imposition of any and all sanctions allowed by law including, but not limited to, termination of the Contractor's Contract with the City.

05 EQUAL BENEFITS ORDINANCE COMPLIANCE AFFIDAVIT

A Administered by City of Los Angeles Department of Public Works, Bureau of Contract Administration, Office of Contract Compliance, located at 1149 S. Broadway, Suite 300, Los Angeles, CA 90015, Phone; (213) 847-2625, email address: bca.eeoe@lacity.org.

B Contractor must be certified as complying with Los Angeles Code Section 10.8.2.1, Equal Benefits Ordinance, prior to the execution of a City agreement. This form must be returned to City department awarding the agreement.

00030.05 Cont'd.

EBO COMPLIANCE

City of Los Angeles
Department of Public Works Bureau of
Contract Administration Office of Contract
Compliance
1149 S. Broadway, Suite 300, Los Angeles, CA 90015
Phone: (213) 847-2625 E-mail: bca.eeoe@lacity.org

EQUAL BENEFITS ORDINANCE COMPLIANCE AFFIDAVIT

Prime contractors must certify compliance with Los Angeles Administrative Code (LAAC) Section 10.8.2.1 et seq. prior to the execution of a City agreement subject to the Equal Benefits Ordinance (EBO).

SECTION 1. CONTACT INFORMATION

Company Name: ACCO Engineered Systems, Inc. RAMP Company ID 4569

Company Address: 888 E. Walnut St.

City: Pasadena State: CA Zip: 91101

Contact Person: Patrick Shade Phone: (818) 482-4656 E-mail: pshade@accoes.com

Approximate Number of Employees in the United States: 5,383

Approximate Number of Employees in the City of Los Angeles: 138

SECTION 2. EBO REQUIREMENTS

The EBO requires City Contractors who provide benefits to employees with spouses to provide the same benefits to employees with domestic partners. Domestic Partner means any two adults, of the same or different sex, who have registered as domestic partners with a governmental entity pursuant to state or local law authorizing this registration, or with an internal registry maintained by the employer of at least one of the domestic partners.

Unless otherwise exempt, the contractor is subject to and shall comply with the EBO as follows:

A. Contractor's operations located within City limits, regardless of whether there are employees at those locations performing Work on City Contract; and
B. Contractor's operations located outside of City limits if the property is owned by City or City has a right to occupy the property, and if Contractor's presence at or on the property is connected to a Contract with City; and
C. Contractor's employees located elsewhere in the United States, but outside of City Limits, if those employees are performing Work on City Contract.

Contractor must post a copy of the following statement in conspicuous places at its place of business available to employees and applicants for employment:

"During the performance of a Contract with City of Los Angeles, Contractor shall provide equal benefits to its employees with spouses and its employees with domestic partners."

00030.05 Cont'd.

SECTION 3. COMPLIANCE OPTIONS

I have read and understand the provisions of Equal Benefits Ordinance and have determined that this company shall comply as indicated below:

☐..... I have no employees.

☐..... I provide no benefits.

☐..... I provide benefits to employees only. Employees are prohibited from enrolling their spouse or domestic partner.

☒..... I provide equal benefits as required by City of Los Angeles EBO.

☐..... I provide employees with a "Cash Equivalent." Note: The "Cash Equivalent" is the amount of money equivalent to what your company pays for spousal benefits that are unavailable for domestic partners, or vice versa.

☐..... All or some employees are covered by a collective bargaining agreement (CBA) or union trust fund. Consequently, I shall provide Equal Benefits to all non-union represented employees, subject to the EBO, and shall propose to the affected unions that they incorporate the requirements of the EBO into their CBA upon amendment, extension, or other modification of the CBA.

☐..... Health benefits currently provided do not comply with the EBO. However, I shall make the necessary changes to provide Equal Benefits upon my next Open Enrollment period which begins on (Date) _____.

☐..... Our current company policies, i.e., family leave, bereavement leave, etc., do not comply with the provisions of the EBO. However, I shall make the necessary modifications within three (3) months from the date of this affidavit.

SECTION 4. DECLARATION UNDER PENALTY OF PERJURY

I understand that I am required to permit City of Los Angeles access to and upon request, must provide certified copies of all company records pertaining to benefits, policies and practices for the purpose of investigation or to ascertain compliance with Equal Benefits Ordinance. Furthermore, I understand that failure to comply with LAAC Section 10.8.2.1 et seq., Equal Benefits Ordinance may be deemed a material breach of any City contract by Awarding Authority. Awarding Authority may cancel, terminate or suspend in whole or in part, the contract; monies due or to become due under a contract may be retained by City until compliance is achieved. City may also pursue any and all other remedies at law or in equity for any breach. City may use the failure to comply with Equal Benefits Ordinance as evidence against Contractor in actions taken pursuant to the provisions of the LAAC Section 10.40, et seq., Contractor Responsibility Ordinance.

ACCO Engineered Systems, Inc. shall comply with Equal Benefits Ordinance requirements
Company Name
as indicated above prior to executing a contract with City of Los Angeles and shall comply for the entire duration of the contract(s).

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, and that I am authorized to bind this entity contractually.

Executed this 27th day of MAY, in the year 2025, at PASADENA (City), CA (State)

Signature

Chuck Darway, Vice President
Name of Signatory (please print)

Title

888 E. Walnut Street
Mailing Address

Pasadena, CA 91101
City, State, Zip Code

95-1625123
EIN/TIN

Form OCC/EBO-Affidavit (Rev 6/21/12)

06 SMALL BUSINESS ENTERPRISE PROGRAM (SBEP)

A POLICY STATEMENT

City of Los Angeles Harbor Department is committed to creating an environment that provides all individuals and businesses open access to the business opportunities available at Port of Los Angeles in a manner that reflects the diversity of City of Los Angeles. Port of Los Angeles Small Business Enterprise Program (SBEP or the "Program") was created to provide additional opportunities for small businesses to participate in any and all contracts.

It is the policy of Harbor Department to solicit participation in the performance of all service contracts by all individuals and businesses, including but not limited to, small business enterprises (SBEs), very small business enterprises (VSBEs), women-owned businesses (WBEs), minority-owned businesses (MBEs), and disabled veterans business enterprises (DVBE). Program shall allow Department to target more effectively small and very small business participation (including MBEs, WBEs, and DVBEs). It is also the intent of Department to make it easier for small and very small businesses to participate in Department contracts by providing education and assistance on how to do business with City, including, but not limited to, ensuring that payments to small and very small businesses are processed in a timely manner.

City's Contracts Management and Opportunities Database, Regional Alliance Marketplace for Procurement (RAMP) is a free service provided by the Mayor's Office of Economic Development and the Minority Business Opportunity Committee. In order to ensure the highest participation of SBE/VSBE/MBE/WBE/DVBEs, all Bidders shall utilize RAMP, at https://www.rampla.org/s/, to outreach to potential subcontractors and suppliers. Bidders shall go on RAMP and notify subcontractors and suppliers that they shall be bidding and are looking for subcontractors and suppliers.

Bidders must be registered on RAMP at time of bid. Subcontractors and suppliers must be registered on RAMP within 30 Calendar Days after bids are closed.

00030.06 Cont'd.

Bidders, subcontractors, and suppliers identified in the bid submittal as SBE or VSBE must be certified at time of bid, as applicable. Bidders, subcontractors, and suppliers must submit a copy of SBE certificate or VSBE certificate from the agency utilized to obtain certification as SBE or VSBE to Engineer within 4 Business Days of close of bids in order to be acknowledged within the bid as SBE or VSBE. Refer to https://kentico.portoflosangeles.org/getmedia/aea536e1-5d48-440a-8857-c55907e3dc74/contracting-proprietary-sbe-cert-application for certification instructions.

Within 30 Calendar Days after close of bids, Bidders, subcontractors, and suppliers identified in the bid submittal as SBE or VSBE must be verified on RAMP as SBE (Proprietary) or VSBE (Harbor), as applicable.

B SMALL BUSINESS REQUIREMENT

SBEP, which has a very small business enterprise component, is a results-oriented program, requiring contractors who receive contracts from Department to perform outreach and utilize certified small and very small businesses.

Any bid submitted which fails to meet the small and very small business requirement as shown in NOTICE INVITING BIDS Section shall result in rejection of the bid. If no bids are submitted that meet the small and very small business participation identified above, all bids shall be rejected by Department.

For purposes of calculating small and very small business participation in order to meet the requirement, the following shall apply:

1 At the time of bid, SBE and VSBE participation levels shall be based on the percentage of total Contract amount (including Allowance Items) to be paid to SBE and VSBE subcontractors and suppliers.

2 If the prime contractor is an SBE, or VSBE, small or very small business participation is shown as 100%.

3 100% of payments to SBE or VSBE truckers and suppliers.

4 Final SBE and VSBE participation levels shall be based on the percentage of final Contract amount, including the utilized Allowance Item amounts.

00030.06 Cont'd.

Definitions:

Small Business Enterprise (SBE): Harbor Department, and other City of Los Angeles Proprietary Departments, defines an SBE as an independently owned and operated business that is not dominant in its field and meets criteria set forth by the Small Business Administration in Title 13, Code of Federal Regulations, Part 121, generally meeting SBA established size standards for most industries in the economy. Size standards can be accessed on the SBA Website at www.sba.gov/ca/la.

Very Small Business Enterprise (VSBE): Harbor Department, and other City of Los Angeles Proprietary Departments, defines a VSBE based on the State of California's micro-business definition which is (1) a small business that has average annual gross receipts of $5,000,000 or less within the previous 3 years, or (2) a small business manufacturer with 25 or fewer employees.

A Minority Business Enterprise (MBE) is defined as a business in which a minority owns and controls at least 51% of the business. A Woman Business Enterprise (WBE) is defined as a business in which a woman owns and controls at least 51% of the business. For the purpose of this Project, a minority includes:

(1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, The Indian Subcontinent, or the Pacific Islands); and

(4) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

A Disabled Veteran Business Enterprise (DVBE) is defined as a business in which a disabled veteran owns at least 51 percent of the business, and the daily business operations are managed and controlled by one or more disabled veterans.

00030.06 Cont'd.

An OBE (Other Business Enterprise) is any enterprise that is not a SBE, VSBE, DVBE, MBE, or WBE.

Bidder shall be responsible for determining SBE and VSBE status of its subcontractors and suppliers for purposes of meeting the small and very small business requirements. Bidders, subcontractors, and suppliers identified in the bid submittal as SBE or VSBE must be certified at time of bid, as applicable Bidders, subcontractors, and suppliers must submit a copy of SBE certificate or VSBE certificate from the agency utilized to obtain certification as SBE or VSBE to Engineer within 4 Business Days of close of bids in order to be acknowledged within the bid as SBE or VSBE. All business participation shall be determined by the percentage paid to SBEs and VSBEs of the total amount of compensation under Agreement.

Contract Requirements:

Bidder shall complete, sign, notarize, and submit as part of the bid Contractor Ownership/RAMP Outreach/Local Business Enterprise Affidavit form included in Specifications as Subsection 00030.11 with a complete description of Work or supplies to be provided by each and the dollar amount of each such transaction entered in the online subcontractor list provided on CDBON and on the Supplier List in Subsection 00660.03 of SBE/VSBE/MBE/WBE/DVBE/OBE/LBE INFORMATION Section. Subcontractors and suppliers shall complete, sign, notarize, and submit Subcontractor/Supplier Ownership and Local Business Enterprise Affidavit and Contractor/Supplier Information Form included in Subsection 00660.01 of SBE/VSBE/MBE/WBE/DVBE/OBE/LBE INFORMATION Section for each subcontractor and supplier by the time required in Subsection 00012.10 of NOTICE INVITING BIDS Section with a complete description of Work or supplies to be provided by each and the dollar amount of each such transaction. Contractor/Supplier Information Form, when signed, shall signify Contractor's intent to comply with SBE requirement. Within 30 Calendar Days after bids are closed, Harbor Department shall verify SBE and VSBE status of Bidders, subcontractors, and suppliers.

Contractor shall not substitute an SBE or VSBE firm without obtaining prior approval of City and amending its Contract. A request for substitution must be based upon demonstrated good cause. If substitution is permitted, Contractor shall endeavor to make an in-kind substitution for the substituted SBE or VSBE.

00030.06 Cont'd.

During the performance of Contract, Contractor shall complete and submit to Engineer, a Monthly Subcontractor/Supplier Monitoring Report included in Specifications as Subsection 00030.11A. Engineer shall make the report available to Contractor in electronic/digital format. The completed report shall be submitted to Engineer on the form provided in Subsection 00030.11A of this Section. Among other information, the completed form shall reflect payments made to all (SBE/VSBE/MBE/WBE/DVBE/OBE) subcontractors and suppliers to date. The subcontractors or suppliers listed in Monthly Subcontractor/Supplier Monitoring Report shall be the same as those entered in the online subcontractor list provided on CDBON and submitted as part of the bid. All subcontractors/ suppliers shall be listed on the report, regardless of level of activity to date (even if payment to date is zero). The correctly completed report shall be submitted by Contractor at the beginning of each month.

In the event of Contractor's noncompliance during the performance of Contract, Contractor shall be considered in material breach of Contract. In addition to any other remedy available to City under Contract or by operation of law, City may:

1 Withhold invoice payments to Contractor until noncompliance is corrected, and assess the costs of City's audit of books and records of Contractor and its subcontractors and suppliers.

2 Disqualify Contractor from participation in City contracts for a period of up to five (5) years in the event Contractor falsifies or misrepresents information contained in any form or other willful noncompliance as determined by City.

07 CONTRACT SOLICITATIONS CHARTER SECTION 470 (c) (12)

A Persons who submit a bid for this solicitation (Bidders) are subject to Charter Section 470 (c) (12) and related ordinances. As a result, Bidders may not make campaign contributions to and or engage in fundraising for certain elected City officials or candidates for elected City office from the time they submit the bid until either the contract is signed by City of Los Angeles, or the bid is withdrawn by Bidder, or City rejects all bids, whichever is earlier. The prohibitions continue for 12 months after Contract is signed by City for successful Bidder, and principals, subcontractors of at least $100,000, and principals of such subcontractors.

B Bidders must submit signed CEC Form 50 through CDBON at the time of bid. Bids submitted without signed CEC Form 50 shall be deemed nonresponsive. The original signature copy shall be submitted with the 4-day documents in conformance with NOTICE INVITING BIDS Section, Subsection 09.

C Bidders must submit signed CEC Form 55 (which requires bidders to identify their principals) through CDBON at the time of bid. The original signature copy shall be submitted with the 4-day documents in conformance with NOTICE INVITING BIDS Section, Subsection 09. Bidders shall notify their principals and subcontractors in writing of the restrictions and include the notice in contracts with subcontractors. Bidders shall also identify their subcontractors performing $100,000 or more in Work on Contract, and the principals of these subcontractors. Bidders are only required to identify vendors or suppliers who provide additional services and $100,000 or more in materials or equipment. Bidders are not required to identify vendors or suppliers if no services are provided. Bids submitted without signed CEC Form 55 that, at a minimum, contains required information for Bidder and its principals shall be deemed nonresponsive. If required information for any subcontractors and principals of subcontractors is not included on CEC Form 55 at the time of bid, updated CEC Form 55 containing all required information shall be submitted by apparent low Bidder, or other Bidders when requested by Engineer, within 4 Business Days of the date and time of deadline for bid submittal or the bid shall be deemed nonresponsive.

D Bidders who fail to comply with City law may be subject to penalties, termination of Contract, and debarment. Additional information regarding these restrictions and requirements may be obtained from City Ethics Commission at (213) 978-1960 or https://ethics.lacity.org/.

E CEC Forms 50 and 55 may be obtained from City Ethics Commission at https://ethics.lacity.org/contracts/bidders/.

08 IRAN CONTRACTING ACT OF 2010

A California Legislature adopted the Iran Contracting Act of 2010 to respond to policies of Iran in a uniform fashion (PCC § 2201(q)). Iran Contracting Act prohibits Bidders engaged in investment activities in Iran from submitting bids for, or entering into or renewing contracts with public entities for goods and services of one million dollars ($1,000,000) or more (PCC § 2203(a)). In accordance with California Public Contract Code Sections 2200-2208, Bidders submitting bids for, entering into, or renewing contracts with Harbor Department for goods and services estimated at $1,000,000 or more are required to complete, sign, and submit Iran Contracting Act of 2010 Compliance Affidavit included as Subsection 00030.09 of this Section.

09 IRAN CONTRACTING ACT OF 2010 COMPLIANCE AFFIDAVIT (California Public Contract Code Sections 2200-2208)

California Legislature adopted Iran Contracting Act of 2010 to respond to policies of Iran in a uniform fashion (PCC § 2201(q)). Iran Contracting Act prohibits Bidders engaged in investment activities in Iran from submitting bids for, or entering into or renewing contracts with public entities for goods and services of one million dollars ($1,000,000) or more (PCC § 2203(a)). A Bidder who "engages in investment activities in Iran" is defined as either:

- A Bidder providing goods or services of twenty million dollars ($20,000,000) or more in the energy sector of Iran, including provision of oil or liquefied natural gas tankers, or products used to construct or maintain pipelines used to transport oil or liquefied natural gas, for the energy sector of Iran; or
- A Bidder that is a financial institution (as that term is defined in 50 U.S.C. § 1701) that extends twenty million dollars ($20,000,000) or more in credit to another person, for 45 days or more, if that person shall use the credit to provide goods or services in the energy sector in Iran and is identified on a list created by the California Department of General Services (DGS) pursuant to PCC § 2203(b) as a person engaging in the investment activities in Iran.

Bidder shall certify that at the time of submitting a bid for a new contract or for the renewal of an existing contract, he or she is not identified on the DGS list of ineligible businesses or persons and that Bidder is not engaged in investment activities in Iran in violation of Iran Contracting Act of 2010.

> California law establishes penalties for providing false certifications, including civil penalties equal to the greater of $250,000 or twice the amount of the contract for which the false certification was made; contract termination; and three-year ineligibility to bid on contracts (PCC § 2205).

To comply with Iran Contracting Act of 2010, Bidder shall complete and sign ONE of the options shown below and submit with the bid.

OPTION #1: CERTIFICATION

I, the official named below, certify that I am duly authorized to execute this certification on behalf of Bidder or financial institution identified below, and that Bidder or financial institution identified below is not on the current DGS list of persons engaged in investment activities in Iran and is not a financial institution extending twenty million dollars ($20,000,000) or more in credit to another person or vendor, for 45 days or more, if that other person or vendor shall use the credit to provide goods or services in the energy sector in Iran and is identified on the current DGS list of persons engaged in investment activities in Iran.

Name of Bidder/Financial Institution (Printed):
ACCO Engineered Systems, Inc.
Signed by: _____
(Authorized Signature)
Chuck Darway, Vice President
(Printed Name)
_____
(Title of Person Signing)

OPTION #2: EXEMPTION

Pursuant to PCC § 2203(c) and (d), a public entity may permit a Bidder or financial institution engaged in investment activities in Iran, on a case-by-case basis, to be eligible for, or to submit a bid for, or enter into, or renew, a contract for services. If Bidder or financial institution identified below has obtained an exemption from the certification requirement under Iran Contracting Act of 2010, Bidder or financial institution shall complete and sign below and attach documentation demonstrating the exemption approval.

Name of Bidder/Financial Institution (Printed): _____
Signed by: _____ (Authorized Signature)
_____ (Printed Name)
_____ (Title of Person Signing)

10 LOCAL BUSINESS PREFERENCE PROGRAM (LBPP)

A LBPP is based on findings that significant benefits are associated with local business preference programs. These benefits include an increase in local jobs and expenditures in the local private sector. Recognizing that (1) Harbor Department operations impact the five regional counties, especially the movement of goods throughout the southland; (2) Harbor Department conducts business with companies in all 5 counties; (3) having these businesses in close proximity to Port of Los Angeles, makes port operations more efficient; (4) these counties are currently experiencing high commercial real estate vacancy rates and high unemployment rates, LBPP aims to encourage businesses to compete for City contracting opportunities, to locate operations in the area, to encourage existing Local Business Enterprises (LBEs) to refrain from relocating to less expensive areas, and to increase local jobs and expenditures.

B Exemption:

1 Any contracts that involve an expenditure of state or federal grant funds, or contracts with any funds not entirely within the control of Harbor Department are exempt from LBPP, as well as any other contract when it is in the best interest of Harbor Department to exempt such contract prior to the date and time of deadline for bid submittal. Refer to NOTICE INVITING BIDS Section for information on whether LBPP applies to Project.

C Local Business Preference Program (LBPP): The following sets forth the specific requirements of LBPP:

1 Los Angeles Harbor Department defines an LBE as:

a A business headquartered within Los Angeles, Orange, Riverside, San Bernardino, or Ventura Counties. “Headquartered” shall mean that the business physically conducts and manages all of its operations from a location in the above-named counties; or

b A business that has at least 50 full-time employees, or 25 full-time employees for specialty marine contracting firms, working within the boundaries of Los Angeles, Orange, Riverside, San Bernardino, or Ventura Counties. A specialty marine contracting firm is a firm whose work is marine improvements, which is defined as work over, under or adjacent to water, such as dredging, installing wharves, piles, electrical above water, water systems above water, and the like.

00030.10 Cont'd.

2 Local Business Preference:

a LBPP allows LBE bidders to receive an 8 percent preference for any contract opportunity that is competitively awarded. The local preference is applicable to all construction contracts greater than $150,000. When applying the preference to construction contracts awarded based on low bid, the total price bid by an LBE shall be reduced by 8 percent. The reduced bid amount shall be deemed the amount bid by that bidder; however, the resulting contract price shall be the amount bid by the successful bidder prior to allocating the local preference percentage. The maximum preference shall not exceed $1,000,000.

b Below is an example of how the local preference is applied to contracts awarded on a low-bid basis:

	Non-local Firm	Local Firm A	Local Firm B	
Original Bid	$10,500,000	$11,000,000	$12,750,000	
8% Preference	N/A	($880,000)	($1,000,000)	*
Final Bid	$10,500,000	$10,120,000	$11,750,000	

*Maximum Preference

In the example above, Local Firm A was the lowest bidder after applying the local preference. Although the final bid amount is $10,120,000, Harbor Department would award a contract based on the original bid in the amount of $11,000,000. Harbor Department would have expended $500,000 more on the project as a result of the local preference, when compared to the bid submitted by the non-local firm.

3 Local Subcontractor/ Supplier Preference:

a LBPP allows non-local bidders to receive up to a maximum 5 percent preference if the bidder identifies local subcontractors or suppliers that shall perform Work under Contract. LBPP allows for 1 percent preference, up to a maximum of 5 percent, for every 10 percent of Work that is subcontracted to or supplied by LBEs. The maximum preference shall not exceed $1,000,000.

00030.10 Cont'd.

b LBPP applies only to first tier local subcontractors. LBPP applies also to local suppliers if they are first tier.

c The following is an example of non-local bidders with LBE subcontractors as applied to contracts awarded on a low bid basis.

00030.10 Cont'd.

	Non-Local Firm A	Non-Local Firm B	Non-Local Firm C	Local Firm D
Original Bid	$13,900,000	$13,600,000	$14,200,000	$14,500,000
Preference %	3%	0%	5%*	8%
Preference	($417,000)	$0	($710,000)	($1,000,000)*
Final Bid	$13,483,000	$13,600,000	$13,490,000	$13,500,000

*Maximum preference

		Sub-bid	Percent of bid	Percent Preference
Firm A's Subs	LBE Sub A1	$1,500,000	10.79%	
	LBE Sub A2	$2,000,000	14.39%	
	LBE Sub A3	$1,600,000	11.51%	
	Subtotal	$5,100,000	36.69%	3%
	Non LBE Sub A4	$1,150,000	8.27%	
	Non LBE Sub A5	$700,000	5.04%	
	Subtotal	$1,850,000	13.31%	
portion by prime		$6,950,000	50.00%	
	TOTAL	$13,900,000	100.00%	
	Adjusted Bid	$13,483,000		

		Sub-bid	Percent of bid	Percent Preference
Firm B's Subs	Non LBE Sub B1	$1,020,000	7.50%	
	Non LBE Sub B2	$1,110,000	8.16%	
	Non LBE Sub B3	$990,000	7.28%	
	Non LBE Sub B4	$3,680,000	27.06%	
	Subtotal	$6,800,000	50.00%	0%
portion by prime		$6,800,000	50.00%	
	TOTAL	$13,600,000	100.00%	
	Adjusted Bid	$13,600,000		

		Sub-bid	Percent of bid	Percent Preference
Firm C's Subs	LBE Sub C1	$900,000	6.34%	
	LBE Sub C2	$1,000,000	7.04%	
	LBE Sub C3	$2,390,000	16.83%	
	LBE Sub C4	$4,230,000	29.79%	
	Subtotal	$8,520,000	60.00%	5%
portion by prime		$5,680,000	40.00%	
	TOTAL	$14,200,000	100.00%	
	Adjusted Bid	$13,490,000		

00030.10 Cont'd.

d In the previous example, Non-Local Firm A was the lowest bidder after applying the preference for local subcontractors. Although the final bid amount is $13,483,000, Harbor Department would award a contract based on the original bid in the amount of $13,900,000. Harbor Department would have expended $300,000 more on the project as a result of the local preference, when compared to Non-Local Firm B. Note that fractions of a percent are rounded down when calculating percent preference.

D In order for Harbor Department staff to determine the appropriate LBE preference, Bidders shall complete, sign, notarize and submit Contractor Ownership/RAMP Outreach/Local Business Enterprise Affidavit in Subsection 00030.11 of BIDDING DOCUMENTS Section, fill out subcontractor list online provided on CDBON, fill out Contractor/Supplier Information Form in Subsection 00660.01 and complete, sign, notarize and submit Subcontractor/Supplier Ownership and Local Business Enterprise Affidavit in Subsection 00660.02.

In the event Contractor claims a Local Business or local subcontractor/supplier preference in its bid and is awarded Contract, if at any time during the term of Contract, Contractor fails to remain in compliance with the requirements of the claimed preference, Contractor shall be considered in material breach of Contract. In addition to any other remedy available to Department under Contract or by operation of law, Department may withhold payments to Contractor or recover previous payments in the amount of the preference claimed in Contractor's bid and assess the costs of Department's audit of books and records of Contractor and its subcontractors/suppliers. In the event Contractor falsifies or misrepresents information contained in any form or other willful noncompliance as determined by Department, Department may disqualify Contractor from participation in Department contracts for a period of up to five years.

11 CONTRACTOR OWNERSHIP / RAMP OUTREACH / LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following is true and correct and include all material information necessary to identify and explain the operations of

ACCO Engineered Systems, Inc.

Name of Firm

as well as the ownership thereof. Further, the undersigned agrees to provide Harbor Department, upon request, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Furthermore, the undersigned certifies that it has utilized RAMP to outreach to potential SBE/VSBE/MBE/WBE/DVBEs for potential subcontracting opportunities associated with this bid.

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

| Small Business Enterprise (SBE) | Yes/(No) | (Circle One)

| Very Small Business Enterprise (VSBE) | Yes/(No) | (Circle One)

Is Your Firm an MBE Yes/(No) WBE Yes/(No) DVBE Yes/(No) OBE Yes/(No) (Circle as appropriate)

Local Business Preference Program: Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

(LBE) (Circle One)
Non-LBE (Circle One)

If you are a non-LBE, please indicate below whether you are claiming a Local Subcontractor Preference (as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section) and, if so, the preference percentage claimed (maximum preference of 5 percent).

Local Subcontractor Preference: _____ percent preference (enter percent claimed)

_____ Not claiming Local Subcontractor Preference (check if not claiming preference)

Signature _____ Title _____

Chuck Darway, Vice President

Printed Name _____ Date Signed _____

NOTARY

(State of California)

County of _____)

00030.11 Cont'd.

On _____ before me, _____
Date Here insert Name and Title of the Officer

personally appeared _____
Name(s) of Signer(s)

_____

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature_____
Signature of Notary Public

CALIFORNIA ACKNOWLEDGMENT CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles

On May 29, 2025 *Date* before me, Hanh Nguyen, Notary Public *Here Insert Name and Title of the Officer*,

personally appeared Chuck Darway *Name(s) of Signer(s)*,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

HANH NGUYEN
Notary Public - California
Los Angeles County
Commission # 2510633
My Comm. Expires Feb 18, 2029

Place Notary Seal and/or Stamp Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____	Signer's Name: _____
☐ Corporate Officer – Title(s): _____	☐ Corporate Officer – Title(s): _____
☐ Partner – ☐ Limited ☐ General	☐ Partner – ☐ Limited ☐ General
☐ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer is Representing: _____	Signer is Representing: _____

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11A MONTHLY SUBCONTRACTOR / SUPPLIER MONITORING REPORT

SAMPLE MONTHLY SUBCONTRACTOR/SUPPLIER MONITORING REPORT

Instructions: Please indicate the SBE/VSBE/MBE/WBE/OBE/DVBE participation levels achieved for the month of _____covered by the referenced contract number.

Contract No. | Spec. No. | Division | Contract Administrator

Contractor | Group* | Contract Title/Project

Original Contract Amount $10,000,000.00 | Contract Start Date | Contract End Date

Total Earned Value to Date $ 6,000,000.00

Original Proposed Subcontractor Percentages SBE 22.00% VSBE 7.00% MBE 20.00% WBE 20.00% OBE 60.00% DVBE 0.00%

Contract-required minimum percentages (in parentheses) (21%) (6%)

The VSBE and Total SBE min-required percentages above, are not additive. The Total SBE percentage includes VSBE participation.

					PROPOSED		ACTUALS		
	Name of Subcontractor	Type of Work Performed	SBE/VSBE	MBE/WBE/OBE/DVBE	Original Proposed Amount	Original Proposed Percentage	Earned Value to Date	Earned Value to Date Percentage	Total Earned Value Percentage
1	Construction Firm A	Asphalt Paving	VSBE, SBE	MBE, WBE	$300,000.00	3.00%	$150,000.00	50.00%	2.50%
2	Construction Firm B	Demolition	VSBE, SBE	OBE	$200,000.00	2.00%	$25,000.00	12.50%	0.42%
3	Supplier No. 1	Concrete Piles	VSBE, SBE	OBE	$200,000.00	2.00%	$75,000.00	37.50%	1.25%
			VSBE Subtotal:		$700,000.00	7.00%	$250,000.00	35.71%	4.17%
1	Construction Firm C	Low Voltage Electrical	SBE	WBE, DVBE	$500,000.00	5.00%	$100,000.00	20.00%	1.67%
2	Supplier No. 2	Precast Concrete Pipe	SBE	MBE	$1,000,000.00	10.00%	$250,000.00	25.00%	4.17%
3			SBE			0.00%		#DIV/0!	0.00%
			SBE Subtotal (Exclusive of VSBE):		$1,500,000.00	15.00%	$350,000.00	23.33%	5.83%
			Total SBE (Inclusive of VSBE):		$2,200,000.00	22.00%	$600,000.00	27.27%	10.00%
1	Construction Firm D	Concrete Pumping	No	OBE	$500,000.00	5.00%	$400,000.00	80.00%	6.67%
2	Construction Firm F	Concrete Sawing	No	MBE	$500,000.00	5.00%	$500,000.00	100.00%	8.33%
3			No			0.00%		#DIV/0!	0.00%
4			No			0.00%		#DIV/0!	0.00%
5			No			0.00%		#DIV/0!	0.00%
			Non-SBE Total:		$1,000,000.00	10.00%	$900,000.00	90.00%	15.00%

Directions:

Original Proposed Percentage = Original Proposed Amount / Original Contract Amount

Earned Value to Date Percentage = Earned Value to Date / Original Proposed Amount

Total Earned Value Percentage = Earned Value to Date / Total Earned Value to Date

*Group = SBE / VSBE / MBE / WBE / OBE / DVBE

Rev 3 / 1 / 11

00030.11A Cont'd.

MONTHLY SUBCONTRACTOR/SUPPLIER MONITORING REPORT

Instructions: Please indicate the SBE/VSBE/MBE/WBE/OBE/DVBE participation levels achieved for the month of _____covered by the referenced contract number.

Contract No. Spec. No. Division Contract Administrator

Contractor Group* Contract Title/Project

Original Contract Amount Contract Start Date Contract End Date

Total Earned Value to Date

Original Proposed Subcontractor Percentages SBE 0.00% VSBE 0.00% MBE 0.00% WBE 0.00% OBE 0.00% DVBE 0.00%

Contract-required minimum percentages (in parentheses) (0%) (0%)

The VSBE and Total SBE min-required percentages above, are not additive. The Total SBE percentage includes VSBE participation.

					PROPOSED		ACTUALS		
	Name of Subcontractor	Type of Work Performed	SBE/VSBE	MBE/WBE/OBE /DVBE	Original Proposed Amount	Original Proposed Percentage	Earned Value to Date	Earned Value to Date Percentage	Total Earned Value Percentage
1			VSBE, SBE						
2			VSBE, SBE						
3			VSBE, SBE						
			VSBE Subtotal:						
1			SBE						
2			SBE						
3			SBE						
			SBE Subtotal (Exclusive of VSBE):						
			Total SBE (Inclusive of VSBE):						
1			No						
2			No						
3			No						
4			No						
5			No						
			Non-SBE Total:						

Directions:

Original Proposed Percentage = Original Proposed Amount / Original Contract Amount

Earned Value to Date Percentage = Earned Value to Date / Original Proposed Amount

Total Earned Value Percentage = Earned Value to Date / Total Earned Value to Date

*Group = SBE / VSBE / MBE / WBE / OBE / DVBE

Rev 3 / 1 / 11

12 PROPOSAL

Los Angeles, California

To Board of Harbor Commissioners:

The undersigned, having carefully examined Contract Documents for Specification No. 2837 at Port of Los Angeles, and having personally visited the site of Work and having become familiar with the conditions based upon the site visit and review of the reference materials, hereby proposes to furnish all materials and perform all Work required to complete Project in accordance with Contract Documents, within the time set forth in Contract for the Grand Total stated in CDBON's bid item online form.

The undersigned represents all Work indicated in Contract Documents is included within the scope of Work of Contract, is included in the Grand Total for the item(s) stated in the online form, and shall not be construed to be extra Work for which extra compensation can be claimed.

The undersigned has carefully checked all figures inserted in the online form and understands that Board shall not be responsible for any errors or omissions on the part of the undersigned in making the bid.

The undersigned agrees upon acceptance of the bid for all Work indicated on Contract Documents, to enter into and execute an agreement, of which the documents listed in the table of contents of said Specification No. 2837 shall be made a part, at the Grand Total stated in the online form, and to furnish and execute such bonds and insurance as required.

The undersigned furthermore agrees that in case of default in execution of such agreement, or in furnishing the required bonds, the security accompanying this Proposal and the money payable thereon shall be forfeited and remain the property of Department. Such forfeiture shall not preclude recovery of any sum over and above the amount posted or guaranteed to which Department sustains damage by reason of such default or failure to contract.

The undersigned agrees that Board reserves the right, in its sole discretion, to accept or reject the bid, without price escalation, at any time within ninety (90) days after date and time of deadline to submit bids.

00030.12 Cont'd.

The undersigned acknowledges receipt of all addenda and accepts all conditions contained therein.

Contractor's License No. 120696 Expiration Date 12/31/2025

By _____
Signature
Chuck Darway, Vice President

_____
Signature

Address 888 E. Walnut St. Pasadena, CA 91101

Contractor declares that its authorized Taxpayer Identification Number (TIN) is 95-1625123. The above signed understands no payments shall be made under Contract without a valid TIN number.

Bidder Is* Corporation

If a partnership, state names of partners. If a corporation, state names of president and secretary.
Jeffrey R Marrs, President and CEO

Robert M Osier, Corporate Secretary

The representations made herein are made under penalty of perjury.

*Corporation, Partnership, Limited Partnership, Individual

*If Bidder is a corporation, bid must be signed by a person authorized to do so by bylaw or resolution of that corporation.

*If Bidder is a partnership, bid must be signed by all partners unless bid is accompanied by proof that signing partner(s) is (are) authorized to bind partnership.

00030.12 Cont'd.

LOS ANGELES HARBOR DEPARTMENT
HEADQUARTERS LOCATION FORM

AT THE REQUEST OF A LOS ANGELES CITY COUNCIL MOTION, ALL BIDDERS SHALL SUBMIT THE FOLLOWING INFORMATION AT THE TIME OF BID OR PROPOSAL SUBMITTAL. THIS IS FOR INFORMATION ONLY AND SHALL IN NO WAY AFFECT CONTRACT SELECTION PROCESS.

DATE: May 24th, 2025 SPECIFICATION NO. 2837

PROJECT TITLE: HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT.

COMPANY NAME: ACCO Engineered Systems, Inc.

CONTACT PERSON: Patrick Shade

COMPANY HEADQUARTERS ADDRESS: 888 E. Walnut St.

CITY: Pasadena STATE: CA ZIP CODE: 91101

COMPANY LOCATION ADDRESS 888 E. Walnut St.

CITY: Pasadena STATE: CA ZIP CODE: 91101

PHONE NUMBER: (818) 482-4656 NUMBER OF EMPLOYEES: 5,383

PERCENTAGE OF EMPLOYEES WHO RESIDE IN THE CITY OF LOS ANGELES __%

Patrick Shade/ Project Manager
NAME/TITLE

Docusign Envelope ID: A7990A91-8230-4AD7-87E9-3AA5CE5009CA

acco engineered systems

CERTIFICATE OF CORPORATE RESOLUTION

I, Robert M. Osier, Secretary of ACCO Engineered Systems, Inc., a California Corporation ("the Corporation") DO CERTIFY that the following is a true and complete copy of a resolution adopted by the Board of Directors of the Corporation on January 30, 2025, and that said resolution has not been rescinded, removed, amended, or modified in any respect and remains in full force and effect as of the date hereof.

CONTRACT, BOND, AND OTHER AGREEMENTS SIGNING AUTHORITY RESOLUTION

RESOLVED, that ACCO Engineered Systems, Inc. (the "Corporation") does hereby authorize Charles Darway, Ronald Falasca, Kevin FitzGerald, Bradley Graham, Gregory Holbrook, and Jeffrey Marrs in the ordinary course of business to sign contracts, bonds, and other agreements (except commercial real estate leases) on behalf of the Corporation. Additionally, these individuals have the authority to authorize in writing, on a case-by-case basis, any of the individuals listed below to execute contracts, bonds, and other agreements in a higher amount than authorized below.

RESOLVED, that this Corporation does hereby authorize Jeffrey Marrs in the ordinary course of business to sign commercial real estate leases on behalf of the Corporation. Additionally, Mr. Marrs may authorize in writing, on a case-by-case basis, others listed above to execute commercial real estate leases on behalf of the Corporation.

RESOLVED, that this Corporation does hereby authorize Jonathan Bell, Robert Felix, Charles Oberosler, Michael Potts, and Carlton Seyforth, in the ordinary course of business to sign contracts, bonds, and other agreements of $5,000,000 on behalf of the Corporation.

RESOLVED, that this Corporation does hereby authorize Erik Dibble, Richard Ferreira, Jeanette James, Larry Jimenez, Brian Jones, Kenneth Lindsey, Robert McKenzie, Robert Osier, and Hugh Palmer in the ordinary course of business to sign contracts, bonds, and other agreements of $2,000,000 or less on behalf of the Corporation.

RESOLVED, that this Corporation does hereby authorize Rick Adams, Michael Avakian, Jeremiah Cremins, Scott Ellis, Pamela Leonard, Neb Milesic, Ryan Novacek, David Osburn, and Christopher Way in the ordinary course of business to sign contracts and bonds of $1,000,000 or less on behalf of the Corporation.

RESOLVED, that this Corporation does hereby authorize Sean Bennett, Brandon Ellis, Daniel Grumbles, Gregory Guizado, Ryan Leahy, Adrian Menendez, Epifanio Ramirez, Jose Rivera, and Wildivina Rosario in the ordinary course of business to sign contracts of $250,000 or less on behalf of the Corporation.

WITNESS THEREOF, the undersigned has set his hand and affixed the seal of this Corporation on this 18th day of February 2025.

DocuSigned by:
Robert M. Osier
43D58EB3CC9A4D6...

Robert M. Osier, Corporate Secretary

ACCO ENGINEERED SYSTEMS, INCORPORATED
JUNE 15, 1950
CALIFORNIA, INC.

2025 OFFICERS

JEFFREY R. MARRS
President and Chief Executive Officer

BRADLEY G. GRAHAM
Chief Financial Officer and Treasurer

ROBERT M. OSIER
Corporate Secretary and General Counsel

ADDITIONAL OFFICERS

CHARLES J. DARWAY, Executive Vice President, Construction
MICHAEL J. POTTS, Executive Vice President, Facility Service
LEON ID KOFMAN, Chief Information Officer
CURTIS J. CADY, Senior Vice President, Technology, Responsible Managing Officer- Contractor's License
RONALD A. FALASCA, Senior Vice President, Construction
RICHARD J. FERREIRA, Senior Vice President, Facility Service
KEVIN P. FITZGERALD, Senior Vice President, Construction
BRYAN P. GRAHAM , Senior Vice President, Operations & Compliance, Responsible Managing Officer-Contractor's License
GREGORY M. HOLBROOK, Senior Vice President, Construction
JUSTIN B. KIRCHART, Senior Vice President, Administration, Senior Vice President, Facility Service
RICK R. RILEY, Senior Vice President, Construction Operations
NATALIE ABDOU, Vice President, Executive Office
JONATHAN B. BELL, Vice President, Construction
ROBERT A. FELIX, Vice President, Construction, Responsible Managing Officer Contractor's License
MICHAEL V. HEATH, Vice President, Engineering
JEANETTE D. JAMES, Vice President, Construction
LARRY K. JIMENEZ, Vice President, Construction
KENNETH M. LINDSEY, Vice President, Construction
ANDREW LORANCE, Vice President, Business Operations & Technology
ROBERT F. MCKENZIE, Vice President, Construction
DARLENE J. MITCHELL, Vice President, Information Technology
CHARLES J. OBEROSLER, Vice President, Construction
CHRISTOPHER F. WAY, Vice President, Procurement
ANTHONY A. RUBALCAVA, Responsible Managing Officer, Civil-Structural Engineering Business Registration
ERIK A. DIBBLE, Assistant Secretary
MICHAEL V. AVAKIAN, Assistant Secretary
JOHN C. EBERSBERGER, Assistant Secretary
SCOTT B. ELLIS, Assistant Secretary
ADAM S. FOGEL, Assistant Secretary
JODI L. DREWERY, Assistant Secretary
JOSE A. LEMUS, Assistant Secretary, ACCO Engineered Systems, Inc. DBA Geo. H. Wilson Mechanical Contractors
HELEN E. LEONARD, Assistant Secretary
ADRIAN S. MENENDEZ, Assistant Secretary
RYAN NOVACEK, Assistant Secretary
DAVID B. OSBURN, Assistant Secretary
HUGH D. PALMER, Assistant Secretary
CARLTON A. SEYFORTH, Assistant Secretary

13 BID PROPOSAL LINE ITEMS

The bid proposal line items are located on Construction Division Business Opportunities Network (CDBON) online system. Enter bidder's unit prices in the online form. The extended prices for each bid item are automatically calculated by CDBON's online system based on unit prices entered. The Grand Total is automatically summed from the extended prices. A printed version of the bid proposal line items is included at the end of this Subsection of BIDDING DOCUMENTS Section of Specifications for information only.

CONTINGENCY ITEM(S)

Work described in the contingency item(s) in the online form may or may not be necessary depending on conditions discovered in the field after Contract award. If Engineer determines that field conditions justify Work listed in the contingency items, the prices for the contingency items shall be used to adjust Contract amount for Work ordered by Engineer.

ALLOWANCE ITEM(S)

Work described in the allowance item(s) in the online form may or may not be necessary depending on conditions discovered in the field after Contract Award. If field conditions justify Work listed in the allowance items, Engineer shall issue a written authorization to proceed with Work item(s) described in the online form. Work under allowance items is exclusive of Work required elsewhere in Contract Documents unless specifically referenced. All Work performed under these allowance items shall be performed either on a negotiated cost basis prior to performing Work in accordance with the provisions of Subsection 01000.35 "Authority for Adjustments", or on a Time and Material basis in accordance with the provisions of Subsection 01000.34 "Cost-Plus Change Order Work (Change Orders)" of GENERAL CONDITIONS Section. Upon completion of Contract, any unused allowance remaining under each allowance bid item shall be credited back to Department.

Award: Award, if made, shall be made to a single Contractor. The lowest bidder shall be based on the sum of all the items for which a bid is requested, including all contingency items regardless of whether all of those items are actually awarded, and Local Business Preference indicated below. The awarded Contractor's bid results provided in CDBON online system shall be inserted at the end of Subsection 00030.13 and shall become part of any Contract awarded.

00030.13 Cont'd.

LOCAL BUSINESS PREFERENCE (Not to Exceed $1,000,000. Reduction amount shall be applied, if necessary, by Harbor Department)

Prime is Local Business (8 percent preference)

OR

Prime is not a Local Business but subcontractor(s) or supplier(s) is(are) Local Business(es) (up to 5 percent preference. Not to Exceed $1,000,000)

The subcontractor percent preference shall be applied by Department as described in Subsection 00030.10.

REDUCED BID AMOUNT (The reduced bid amount shall be used for Award purposes)

Section	ItemCode	ItemDesc	UnitOfMeasure	Quantity	UnitPrice
Main Bid	1	Lump Sum Construction: For furnishing transportation, labor, materials, equipment, mobilization, demobilization, and incidentals necessary to complete Work, exclusive of Work covered by Items 2 through the last item of Bid Proposal Line Items	Lump Sum	1	
Main Bid	2	Air Cooled Chiller: For furnishing transportation, labor, materials, and equipmnet to furnish and install air cooled chiller including but not limited to neoprene pads, epoxy anchors, and anchor installations, including additions to or deductions from the approximate quantity stipulated	Units	2	
Main Bid	3	Cold Water Pump: For furnishing transportation, labor, materials, and equipment to furnish and install cold water pump including but not limited to neoprene pads, epoxy anchors, and anchor installations, including additions to or deductions from the approximate quantity stipulated	Units	1	
Main Bid	4	Refrigerant Compressors: Fur furnishing transportation, laobr, materials, and equipment to furnish and install refrigerant compressors and associated refrigerant plant control system including but not limited to epoxy anchors and anchor installations, including additions to or deductions from the approximate quantity stipulated	Units	3	
Main Bid	5	Evaporative Condenser: For furnishing transportation, labor, materials, and equipment to furnish and install evaporative condenser including but not limited to epoxy anchors and anchor installations, including additions to or deductions from the approximate quantity stipulated	Units	1	

SUBMIT BIDS ONLINE

Main Bid	6	Fan Walls: For furnishing transportation, labor, materials, and equipment to furnish and install supply and return fan walls including but not limited to concrete pads, post-installed anchors, epoxy anchors, and anchor installations, including additions to or deductions from the approximate quantity stipulated	Units	2	
Main Bid	7	Dx Cooling Coils: For furnishing transportation, labor, materials, and equipment to furnish and install Dx cooling coils, including additions or deductions from the approximate quantity stipulated	Units	6	
Main Bid	8	Air Handler Dampers, Filters, and Filter Rack: For furnishing transportation, labor, materials, and equipment to furnish and install exhaust, return, and outside air dampers, filters, and filter rack at built-up air handler, including additions to or deductions from the approximate quantity stipulated	Lump Sum ~~Units~~	1 ~~3~~	
Main Bid	9	Exhaust Fan: For furnishing transportation, labor, materials, and equipment to furnish and install building exhaust fan, including additions to or deductions from the approximate quantity stipulated	Units	1	
Main Bid	10	Electric Water Boiler and Modular Heat Pump: For furnishing transportation, labor, materials, and equipment to furnish and install heating hot water boiler and modular heat pump including but not limited to concrete pads, post-installed anchors, epoxy anchors, and anchor installations, and hydronic balances, including additions to or deductions from the approximate quantity stipulated	Units	2	
Main Bid	11	~~Modular Heat~~ Heating Hot Water Pumps: For furnishing transportation, labor, materials, and equipment to furnish and install heating water pumps, including additions to or deductions from the approximate quantity stipulated	Units	2	

SUBMIT BIDS ONLINE

Main Bid	12	Cold Water Piping: For furnishing transportation, labor, materials, and equipment to furnish and install cold water piping including but not limited to pipe supports and support installations, including additions to or deductions from the approximate quantity stipulated	Lump Sum ~~Linear Feet~~	1 ~~2300~~	
Main Bid	13	Hot Water Piping: For furnishing transportation, labor, materials, and equipment to furnish and install heating hot water piping, including additions to or deductions from the approximate quantity stipulated	Lump Sum ~~Linear Feet~~	1 ~~1200~~	
Main Bid	14	Refrigerant Piping: For furnishing transportation, labor, materials, and equipment to furnish and install refrigerant piping, including additions to or deductions from the approximate quantity stipulated	Lump Sum ~~Linear Feet~~	1 ~~1000~~	
Main Bid	15	Fan Coil Unit: For furnishing transportation, labor, materials, and equipment to furnish and install fan coil units including but not limited to condensate drain piping, including additions to or deductions from the approximate quantity stipulated	Units	34	
Main Bid	16	Data Center Unit: For furnishing transportation, labor, materials, and equipment for furnish and install data center unit including but not limited to condensate drain piping, including additions to or deductions from the approximate quantity stipulated	Units	1	
Main Bid	17	VAV Boxes: For furnishing transportation, labor, materials, and equipment to furnish and install VAV boxes including but not limited to VAV box supports, including additions to or deductions from the approximate quantity stipulated	Units	150	
Main Bid	18	Ductwork and Air Distribution: For furnishing transportation, labor, materials, and equipment to furnish and install ductwork, air distribution associated with fan coil, and VAV box installation, including additions to or deductions from the approximate quantity stipulated	Lump Sum ~~Linear Feet~~	1 ~~3000~~	

SUBMITBIDS ONLINE

Main Bid	19	Building Automation System: For furnishing transportation, labor, materials, and equipment to furnish and install building automation system	Lump Sum	1	
Main Bid	20	Electrical System: For furnishing transportation, labor, materials, and equipment to furnish and install electrical system including but not limited to conduit, boxes, wiring, disconnects, and fuses	Lump Sum	1	
Allowance Item	21	Perform Unforeseen Utility, Structures, and Substructures Modifications, Additions, Removals, and Abandonment: Bidder shall include in the bid the listed allowance to perform unforeseen utility, structure, and substructure modifications, removals, and additions as directed by Engineer	Lump Sum	1	500000
Allowance Item	22	Work Associated with Regulatory Agency Changes and Additional Requirements: Bidder shall include in the bid the listed allowance to perform Work as required by agencies due to regulatory changes and additional requirements as directed by Engineer	Lump Sum	1	200000
Allowance Item	23	Owner Requested Changes: Bidder shall include in the bid the listed allowance to perform owner requested changes, as approved by Engineer	Lump Sum	1	300000
Allowance Item	24	Premium Time for Schedule Acceleration/Overtime: Bidder shall include in the bid the listed allowance to account for labor premium time pay differential for schedule acceleration as approved by Engineer. This allowance bid item shall be used strictly at the discretion of Engineer and is not part of Bid Proposal Line Items	Lump Sum	1	350000
Allowance Item	25	Partnering Facility: Bidder shall include in the bid the listed allowance to provide partnering facility as directed by Engineer	Lump Sum	1	50000
Allowance Item	26	Unforeseen Asbestos Abatement Remediation: Bidder shall include in the bid the listed allowance to perform removal of unforeseen asbestos containing material as directed by Engineer	Lump Sum	1	10000

SUBMIT BIDS ONLINE

Allowance Item	27	Internet-Based Project Management: Bidder shall include in the bid the listed allowance to provide internet-based project management as directed by Engineer	Lump Sum	1	50000

END OF SECTION

SUBMIT BIDS ONLINE

THIS CONTRACT (hereinafter referred to as "Contract") is made and entered into by and between City of Los Angeles, a Municipal Corporation (herein called "City"), acting by and through its Board of Harbor Commissioners (hereinafter called "Board"), and ACCO Engineered Systems, Inc. (hereinafter referred to as "Contractor"). The effective date of this Contract (hereinafter referred to as "Effective Date") is the date of execution by Executive Director upon authorization of Board, subject to the provisions of Charter Section 245 of City of Los Angeles. Unless terminated as herein provided, the term of this Contract shall not exceed three (3) years commencing on Effective Date.

WITNESSETH

In consideration of the covenants and conditions hereinafter contained, IT IS MUTUALLY AGREED BETWEEN CONTRACTOR AND CITY AS FOLLOWS:

ARTICLE 1. CONTRACTOR'S OBLIGATIONS

Section 1.1 CONTRACT DOCUMENTS

A This written agreement executed by Contractor and City together with the documents listed in Section 1.1B are Contract. Contractor has read and understands each and every provision of Contract Documents and its assent to and signature of this written agreement shall be deemed to constitute assent to and signature of all Contract Documents.

B Specification No. 2837, together with documents listed in Table of Contents and defined in GENERAL CONDITIONS Section of said Specifications shall constitute Contract Documents.

C Contract Documents are complementary and require complete and finished Work. Anything shown or required of Contractor, in any one or more of said documents, shall be as binding as if contained in all said documents.

Section 1.2 WORK TO BE DONE

Contractor, with full knowledge of the kind, quantity and quality of Work, materials, and services required, at Contractor's sole cost and expense, except as may be herein otherwise expressly specified, and in strict conformity with Specification No. 2837, for HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT shall carry out Contract as awarded. Contractor shall complete Work in accordance with Section 1.3 Contract Time of this Section.

Section 1.3 CONTRACT TIME

A Contract shall be effective from Notice to Proceed (NTP) date. Contract Time for performance of Work under Contract shall be 540 ~~480~~ Calendar Days commencing on the date stated in Notice to Proceed. Work shall be completed in conformance with the following milestones:

1. Contract Time for completing Milestone 1 shall be 90 Calendar Days commencing on effective date of NTP 1.

2. Contract Time for completing Milestone 2 shall be 360 Calendar Days commencing on effective date of NTP 2.

3. Contract Time for completing Milestone 3 shall be 90 Calendar Days commencing after completion of Milestone 2.

   a. Milestone 1 shall include securing necessary permits, coordinating with other project schedules, approval of submittals necessary for ordering and procuring long lead materials with a delivery lead time of 4 weeks or more. No on-site work shall be allowed except for site investigation (verify clear paths for utility and equipment installation and the like) and mobilization of contractor trailer.

   b. Milestone 2 shall include, but not limited to, Contractor's on-site mobilization of crews, equipment, and materials for performance of Work. For construction sequence refer to mechanical drawing sheets.

   c. Milestone 3 shall include, but not limited to, commissioning and testing, performing TAB tests, submission of operations and maintenance manuals, warranties and guarantees, as-built drawings, and collection of spare parts and extra stock items.

Section 1.4 LIQUIDATED DAMAGES

A. Contractor and City agree that, in the event that Work contemplated hereunder is not completed within the time required, it shall be impracticable and extremely difficult to determine or fix City's actual damage and therefore City shall be entitled to liquidated damages in the amount stipulated below ~~of~~ $2,600 for each and every Calendar Day the execution of said Work exceeds the time allowed for that purpose. Contractor agrees to all of the other terms of the liquidated damages provision set forth in GENERAL CONDITIONS Section of Specifications.

1. Completion of Work specified in Section 1.3, Paragraph A1: $0
2. Completion of Work specified in Section 1.3, Paragraph A2: $2,600
3. Completion of Work specified in Section 1.3, Paragraph A3: $2,600

ARTICLE 2. COMPENSATION

Section 2.1 PAYMENTS TO CONTRACTOR

In consideration for all labor, materials, and equipment furnished hereunder, and subject to Contractor's full compliance with the terms and conditions of Contract Documents, City shall pay Contractor the amount set forth in the "Bid Proposal Line Items," which is attached hereto and by this reference incorporated herein. Payments shall be made as set forth in GENERAL CONDITIONS Section.

ARTICLE 3. OPERATIONS

Section 3.1 QUALITY OF SERVICES

Work performed by Contractor shall be strictly in accordance with Drawings and Specifications, copies of which are on file in the office of Engineer. Said Work shall be performed in a manner which is consistent with Applicable Laws as defined in GENERAL CONDITIONS Section of Specifications in the construction industry.

Section 3.2 INDEMNIFICATION

A Except as may arise from the sole or active negligence or willful misconduct of City, Contractor shall at all times relieve, indemnify, defend, protect, and save harmless City and any and all of its boards, officers, agents, and employees from any and all claims and demands, actions, proceedings, losses, liens, costs and judgments of any kind and nature whatsoever, including cost of litigation (including all actual litigation costs incurred by City, including but not limited to costs of experts and consultants), for death of or injury to persons or damage to property including property owned by or under the care and custody of City, and for civil fines and penalties, that may arise from or be caused directly or indirectly by:

1 Any dangerous, hazardous, unsafe or defective condition of, in or on Project Site and any Laydown Area(s), of any nature whatsoever, which may exist by reason of any act, omission, neglect, or any use or occupation of such premises by Contractor, its officers, agents, employees, subcontractors, or invitees;

2 Any undertaking of Work, or operation conducted upon or any use or occupation of Project Site and any Laydown Area(s) by Contractor, its officers, agents, employees, subcontractors, or invitees under or pursuant to the provisions of Contract or otherwise;

3 Any act, error, omission, willful misconduct, or negligence of Contractor, its officers, agents, employees, subcontractors, or invitees, arising from the use, operation, or occupancy of Project Site and any Laydown Area(s).

4 Any failure of Contractor, its officers, agents, employees, subcontractors, or invitees to comply with any of the terms or conditions of this Contract or any Applicable Laws; or

5 The conditions, operations, uses, occupations, acts, omissions or negligence referred to in Subdivisions (1), (2), (3), and (4) above, existing or conducted upon or arising from the undertaking of Work or use or occupation of Project Site and any Laydown Area(s) by Contractor on any other area within the Harbor District, as defined in Charter of City, including the approaches, channels, turning basins, and other waters.

B Contractor also agrees to indemnify City and pay for all damage or loss suffered by City and Department, including but not limited to damage to or loss of property, to the extent not insured by City, and loss of City revenue from any source, caused by or arising out of the conditions, operations, uses, occupations, acts, omissions or negligence referred to in Section 3.2 of this Section. The term “persons” as used in this Section shall include, but not be limited to, officers and employees of Contractor.

C Contractor shall also indemnify, defend, and hold City harmless from any and all claims, judgments, damages, penalties, fines, costs, liabilities, or losses which arise during or after the term of this Contract as a result of Contamination for which Contractor is otherwise responsible for under the terms of this Contract. This indemnification of City by Contractor includes, without limitation, costs incurred in connection with any investigation of site conditions or any clean up, remedial, removal, or restoration work required by any federal, state, or local governmental agency because of Contamination present in the soil or groundwater on or under Project Site and any Laydown Area(s).

D The indemnity obligations under Section 3.2 shall survive the expiration date of this Contract.

E Notwithstanding the provisions of Section 3.2, nothing contained herein shall be interpreted or enforced in violation of California Civil Code Section 2782.

Section 3.3 INSURANCE

A In addition to, and not as a substitute for, or limitation of, any of the indemnity obligations imposed by Section 3.2 of this Section, Contractor shall procure and maintain at its sole cost and expense and keep in force at all times during the term of this Contract the following insurance requirements of this Section.

B Commercial general liability or marine general liability insurance, including contractual liability and property damage insurance, written by an insurance company authorized to do business in the State of California, or approved by the California Department of Insurance as a surplus lines insurer eligible to do business in California, rated VII, A- or better in Best's Insurance Guide (or an alternate guide acceptable to City if a Best's Rating is not available) with Contractor's normal limits of liability but not less than Five Million Dollars ($5,000,000) for injury or death to one or more persons out of each accident or occurrence and Five Million Dollars ($5,000,000) for bodily injury and property damage for each occurrence / Five Million Dollars ($5,000,000) general aggregate. Additionally, each policy shall include an additional insured endorsement (CG 2010) naming City of Los Angeles Harbor Department, its officers, agents, and employees as Primary additional insureds. Contractor shall further procure and maintain, either by an endorsement thereto or by a separate policy, fire legal liability insurance with a minimum limit of Five Hundred Thousand Dollars ($500,000) covering legal liability of Contractor for damage or destruction to the works, buildings, and improvements owned by City provided that said minimum limits of liability shall be subject to adjustments by Executive Director to conform with the deductible amount of the fire insurance policy maintained by Board, with waiver of subrogation in favor of Contractor so long as permitted by Board's fire insurance policy, upon thirty (30) days' prior written notice thereof to Contractor at any time during the term of this Contract. Contractor shall delete railroad exclusion when Work is within 50 feet of railroad tracks.

C Contractor shall procure and maintain fire and extended coverage insurance covering One Hundred percent (100%) of the replacement value of the works, buildings, and improvements erected or owned by Contractor on Project Site and any Laydown Area(s), with such provision in the policies issued to cover the same, or in riders attached thereto, as shall provide for all losses to be payable to Board to be held in trust for reconstruction. In the event of loss or damage by fire to any of such works, buildings, or improvements, Contractor shall undertake replacement or reconditioning of such items within ninety (90) days following any such loss. As Contractor undertakes such replacement or reconditioning, such proceeds shall be released by Board to Contractor as payments are required for said purpose. Upon the completion of such replacement or reconditioning to the reasonable satisfaction of Executive Director, any balance thereof remaining shall be paid to said Contractor forthwith.

D Where Contractor utilizes any vehicles, Contractor shall procure and maintain at its sole cost and expense, and keep in force at all times during the term of this Contract, automobile insurance with limits of liability not less than One Million Dollars ($1,000,000) covering injuries or death resulting from each accident or claim arising out of any one claim or accident. This insurance shall cover all owned, non- owned, and/or hired automobiles. Additionally, each policy shall include an additional insured endorsement (CG 2010) naming City of Los Angeles Harbor Department, its officers, agents, and employees as Primary additional insureds.

E Where Contractor operates watercraft, Contractor shall procure and maintain protection and indemnity coverage with limits of One Million Dollars ($1,000,000) per occurrence for bodily injury, illness, death, loss of or damage to the property of another including masters and members of the vessel crew, and Jones Act risks or equivalent thereto internationally. City shall be named as an additional insured. Additionally, each policy shall include an additional insured endorsement (CG 2010) naming City of Los Angeles Harbor Department, its officers, agents, and employees as Primary additional insureds.

F Where Contractor's operations involve the storage or use of any type of hazardous materials or pollutants, Contractor shall procure and maintain environmental impairment liability insurance which shall include coverage for bodily injury, property damage, including third-party claims for on-site and off-site bodily injury and property damage, clean-up, and defense of suits, with a limit of at least Two Million Dollars ($2,000,000) per occurrence, which is to remain in effect at least five (5) years after Termination Date. Additionally, each policy shall include an additional insured endorsement (CG 2010) naming City of Los Angeles Harbor Department, its officers, agents, and employees as Primary additional insureds.

G Contractor shall secure the payment of compensation to any employees injured while performing work or labor necessary for and incidental to performance under this Contract in conformance with Section 3700 of the California Labor Code. Contractor shall file with City one of the following:

1 A certificate of consent to self-insure issued by the Director of Industrial Relations, State of California;

2 A certificate of Workers' Compensation insurance issued by an admitted carrier; or

3 An exact copy or duplicate thereof of the policy certified by the Director of Industrial Relations or the insurer.

4 Such documents shall be filed prior to Contractor's occupancy of Project Site and any Laydown Area(s). Where Contractor has employees who are covered by the United States Longshore and Harbor Workers' Compensation Act ("USLHWC Act"), Contractor shall furnish proof of such coverage to City. It is suggested that Contractor consult with its insurance professional of its choosing to determine whether its proposed operation methods shall render its employees subject to coverage under the USLHWC Act. All Workers' Compensation insurance submitted to City shall include an endorsement providing that any carrier paying benefits agrees to waive any right of subrogation it may have against City.

H Except as provided in Paragraph 1 below, Contractor shall, at Contractor's sole cost and expense, provide all risk builder's risk insurance covering loss, damage or destruction of property, including material in transit and stored on and off Project Site and any Laydown Area(s), satisfactory to City, in an amount at least equal to the value of the construction and materials on hand. Contractor's insurance broker or agent shall submit for approval said insurance to City's online insurance compliance system KwikComply™ https://kwikcomply.org/. Acceptable evidence of coverage shall name City as an additional named insured and as loss payee as its interest may appear.

1 Contractor need not provide all risk builder's risk insurance for fills; excavations; rock work; concrete or masonry walls and bulkheads retaining earth; foundations entirely below ground or in earth fill; pipe, sewer systems, conduit, and electric light and power systems entirely below ground or submerged; ballast and grading for railroad tracks on or in earth; pavements, sidewalks and pits on solid earth or in fill outside of buildings; incombustible poles, area lighting and metal fencing not attached to exterior or interior of buildings. Contractor is not relieved of the obligation to rebuild these improvements when damaged.

2 An installation risk or "floater" policy, written to cover only specific types of equipment during construction, may be provided to cover damage to work or high valued equipment or materials.

I Limits for coverage required under Section 3.3 of this Section shall provide first dollar coverage except that Executive Director may permit a self-insured retention or self-insurance in those cases where, in his or her sole judgment, such retention or self-insurance is justified by the net worth of Contractor. The self-insured retention or self-insurance shall provide that any other insurance maintained by City's Harbor Department shall be excess of Contractor's insurance and shall not contribute to it. In all cases, regardless of any deductible, retention, or self-insurance, Contractor shall have all the obligations of an "insurer" under the California Insurance Code and said insurance shall be deemed to include a defense of suits provision and a severability of interest clause.

J If Contractor maintains higher limits than the minimums shown above, City requires and shall be entitled to coverage for the higher limits maintained by Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to City.

K Policies submitted pursuant to Section 3.3 of this Section shall, in addition, provide the following coverage either in the original policy or by endorsement substantially as follows:

1 "Notwithstanding any inconsistent statement in the policy to which this endorsement is attached, or any endorsement or certificate now or hereafter attached hereto, it is agreed that City of Los Angeles, acting by and through its Harbor Department, Board of Harbor Commissioners, and its officers, agents, and employees, are additional insureds hereunder, except to the extent prohibited by Applicable Laws, and that coverage is provided for contractual obligations, operations, uses, occupations, acts, and activities of all the insureds under this Specification, and under any amendments, modifications, extensions, or renewals of said Contract regardless of whether such contractual obligations, operations, uses, occupations, acts, and activities occur on Project Site and any Laydown Area(s) or elsewhere."

2 "The coverage provided by the policy to which this endorsement is attached is primary coverage and any other insurance carried by City is excess coverage."

3 "In the event of one of the named insureds incurring liability to any other of the named insureds, this policy shall provide protection for each named insured against whom claim is or may be made, including claims by other named insureds, in the same manner as if separate policies had been issued to each named insured. Nothing contained herein shall operate to increase the insurance company's limit of liability."

L All insurance procured by Contractor shall comply with the following:

1 For each insurance policy, Contractor shall give to Board of Harbor Commissioners a 10-days prior notice of cancellation or reduction in coverage for nonpayment of premium, and a 30-days prior notice of cancellation or reduction in coverage for any other reason, by written notice via registered mail and addressed to City of Los Angeles Harbor Department, Attn: Risk Manager and City Attorney's Office, 425 S. Palos Verdes Street, San Pedro, California 90731.

2 Electronic submission is the required method of submitting Contractor's insurance documents. KwikComply is City's online insurance compliance system which is designed to be used by insurance brokers and agents to submit client insurance certificates directly to City. Contractor's insurance broker or agent shall obtain access to KwikComply at http://kwikcomply.org and follow the instructions to register and submit the appropriate proof of insurance on Contractor's behalf.

3 Prior to the expiration of each policy, Contractor shall show through submitting to KwikComply that the policy has been renewed or extended or, if new insurance has been obtained, submit the appropriate proof of insurance to KwikComply. If Contractor neglects or fails to secure or maintain the required insurance, or if Contractor fails to submit proof of insurance as required above, City's Harbor Department may, at its option and at the sole cost and expense of Contractor, obtain such insurance for Contractor.

4 Executive Director, at his or her discretion, based upon recommendation of Risk Manager of City's Harbor Department, may request that Contractor increase or decrease amounts and types of insurance coverage required hereunder at any time during the term hereof by giving written notice to Contractor; provided that Contractor shall be entitled to an equitable adjustment under Contract to reimburse Contractor for any increase in the cost of such insurance to Contractor resulting from the requested changes.

5 Upon request by City, Contractor must furnish a copy of the binder of insurance and/or full certified copies of any or all polices of insurance required herein. Contractor's obligation to provide such copies shall survive the expiration of this Contract regardless of whether City's request is made prior to or after the expiration of this Contract.

6 The approval of insurance by Risk Manager shall be a condition precedent to the right of Contractor to demand or receive payment for Work under Contract requiring such insurance. No request for payment shall be processed until the required insurance has been approved by Risk Manager, and no Project Site and any Laydown Area(s) access shall be permitted until such approval has been given.

7 All insurance policies and surety bonds which Contractor is required to provide pursuant to Specifications, including, but not limited to, workers' compensation, liability, protection and indemnity, and builder's risk policies shall be placed with insurance carriers which are rated VII, A-, or better in Best's Insurance Guide. If a Best's Insurance Guide rating is not available, then the proposed carrier must meet comparable standards in another rating services satisfactory to City.

M Contractor shall report to Engineer immediately and in writing to Executive Director within fifteen (15) days after it, its officers, or its managing agents have knowledge of any accident or occurrence involving death of or injury to any person or persons, or damage in excess of Ten Thousand Dollars ($10,000) to property, occurring upon Project Site and any Laydown Area(s), or elsewhere within the Harbor District, if Contractor's officers, agents, or employees are involved in such an accident or occurrence. Such report shall contain to the extent available: (1) the name and address of the persons involved; (2) a general statement as to the nature and extent of injury or damage; (3) the date and hour of occurrence; (4) the names and addresses of known witnesses; and (5) such other relevant information as may be known to Contractor, its officers, or its managing agents.

Section 3.4 COMPLIANCE WITH LAWS

During the performance of Contract, Contractor shall comply with all Applicable Laws as defined in GENERAL CONDITIONS Section of Specifications. Contractor shall also comply with the provisions of all permits.

ARTICLE 4. MISCELLANEOUS

Section 4.1 BINDING EFFECT

Contract is to be binding on the heirs, successors and assigns of the parties hereto and is not to be assigned by either party without first obtaining the written consent of the other.

Section 4.2 NOTICES

Any notice, request, demand or other communication required or permitted hereunder shall be deemed to be properly given when deposited in the United States mail, postage prepaid, addressed as follows:

To City:	To Contractor:
Executive Director	_____
Port of Los Angeles	_____
425 South Palos Verdes Street	_____
San Pedro, California 90731	_____

Nothing contained herein shall preclude the giving of notice in any other manner allowed by law.

Section 4.3 RELATIONSHIP OF PARTIES

Nothing contained in Contract shall be construed as creating the relationship of employer and employee, master and servant, or principal and agent between the parties hereto. Contractor is an independent contractor and shall have no right or authority to assume or create any obligation, expressed or implied, on behalf of City.

Section 4.4 ENTIRE AGREEMENT

Contract, together with all other Contract Documents, constitutes the entire agreement between the parties hereto, and all other representations or statements heretofore made, verbal or written, are merged herein, and Contract may be amended only in writing and executed by duly authorized representatives of the parties hereto.

Section 4.5 LEGAL JUSTIFICATION AND RECOURSE

Contract shall be deemed entered into in Los Angeles, California, and shall be governed and construed in accordance with the laws of the State of California. In the event any provision hereof is held to violate any applicable law by a court of competent jurisdiction, such provision shall be deemed null and void to the extent thereof, without affecting the balance of Contract. If either party brings any action or proceeding to enforce, protect, or establish any right or remedy arising out of or based upon Contract, including but not limited to the recovery of damages for its breach, or based upon the claim that extra Work was performed, whether mandated by Contract or not, neither party in said action or proceeding shall be entitled to recover any attorney's fees. Each party hereby expressly waives the benefit of any California statute which would permit the award of any attorney's fees to a prevailing party in an action.

Section 4.6 TIME OF ESSENCE

Time is of the essence in Contract.

Section 4.7 LABOR CODE SECTION 1861

Contractor hereby certifies it is aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that Code, and that Contractor shall comply with such provisions before commencing the performance of Work of Contract.

Section 4.8 ASSIGNMENT OF CERTAIN CAUSES OF ACTION

In entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, Contractor or subcontractor/supplier offers and agrees to assign to the awarding body all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), arising from purchases of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to Contractor, without further acknowledgment by the parties.

Section 4.9 TERMINATION DUE TO NON-APPROPRIATION OF FUNDS

Contract is subject to the provisions of Los Angeles City Charter which, among other things, precludes City from making any expenditure of funds or incurring any liability, including contractual commitments, in excess of the amount appropriated therefor.

Board, in awarding Contract, is expected to appropriate sufficient funds to meet the estimated expenditures through June 30 of the current fiscal year and to make further appropriations in each succeeding fiscal year during the life of Contract. However, they are under no legal obligation to do so.

City of Los Angeles, its boards, officers, and employees are not bound by the terms of this Contract or obligated to make any payment thereunder in any fiscal year in which Board does not appropriate funds therefor. Contractor is not entitled to any compensation in any fiscal year in which funds have not been appropriated in Contract by Board.

Although Contractor is not obligated to perform any Work under Contract in any fiscal year in which no appropriation for Contract has been made, Contractor agrees to resume performance of Work required by Contract on the same terms and conditions for a period of 60 days after the end of the fiscal year if an appropriation therefor is approved within that 60-day period. Contractor is responsible for maintaining all insurance and bonds during this 60 days period. The time for performance shall be extended during this period until the appropriation is made; however, such extension of time is not compensable.

If in any subsequent fiscal year funds are not appropriated for Work required by Contract, Contract shall be terminated. However, such termination shall not relieve the parties of liability for any obligation previously incurred.

Section 4.10 NO WAIVER

No waiver by either party at any time of any terms or conditions of this Contract shall be a waiver at any subsequent time of the same or any other term or condition. No breach of a covenant, term, or condition of this Contract shall be deemed to have waived by City unless the waiver is in writing and executed by City.

Section 4.11 JOINT AND SEVERAL OBLIGATIONS OF CONTRACTOR

If more than one individual or entity comprises Contractor, the obligations imposed on each individual or entity that comprises Contractor under this Contract shall be joint and several.

Section 5.1 SIGNATURES

IN WITNESS WHEREOF, the parties hereto have executed Contract on the day and year hereinbefore written.

(SEAL)

THE CITY OF LOS ANGELES,

by its Board of Harbor Commissioners

By _____
Executive Director

Date _____

Contracting Corp.

Brad Graham
CFO

ATTEST:

_____, Secy.

_____

ACCO Engineered Systems, Inc. , Contractor

By _____

Place of Business _____

888 E Walnut St, Pasadena CA 91101

Contractor's License No. 120696

Exp. Date 12/31/2025

Los Angeles, California

Contract and bonds approved as to form.

HYDEE FELDSTEIN SOTO
City Attorney

By _____
Assistant/Deputy

Los Angeles, California

*Contract approved by Board of Harbor Commissioners at its meeting of _____, 20__.

_____
Secretary, Board of Harbor Commissioners

*Approval of contract by Board of Harbor Commissioners required for all contracts where the sum involved exceeds $150,000.

Format Change Only

CALIFORNIA ACKNOWLEDGMENT CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles

On August 7, 2025 (*Date*) before me, Hanh Nguyen, Notary Public (*Here Insert Name and Title of the Officer*),

personally appeared Brad Graham (*Name(s) of Signer(s)*),

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

HANH NGUYEN
Notary Public - California
Los Angeles County
Commission # 2510633
My Comm. Expires Feb 18, 2029

Place Notary Seal and/or Stamp Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____	Signer's Name: _____
☐ Corporate Officer – Title(s): _____	☐ Corporate Officer – Title(s): _____
☐ Partner – ☐ Limited ☐ General	☐ Partner – ☐ Limited ☐ General
☐ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer is Representing: _____	Signer is Representing: _____

©2019 National Notary Association

Date: August 13, 2025
Contractor/Vendor Name: ACCO Engineered Systems, Inc.

Account#	161305	Project#	2509600
Division#	00000	Task#	2450100

Budget FY:	Amount:
2025-26	$8,000,000.00
2026-27	$4,826,445.00
2027-28	$1,000,000.00
TOTAL:	$13,826,445.00

For Acct/Budget Div. Use Only

Verified By: Digitally signed by Joanna Leack Date: 2025.08.14 07:40:54 -07'00'

Verified Funds Available: Digitally signed by Frank Liu Date: 2025.08.14 08:40:32 -07'00'

Date Approved: 8/14/25

KNOW ALL PERSONS BY THESE PRESENTS:

That we, ACCO Engineered Systems, Inc.

as principal _____, and Fidelity and Deposit Company of Maryland as surety(ies) are held and firmly bound unto THE CITY OF LOS ANGELES, CALIFORNIA, a municipal corporation, in the penal sum of Twelve Million, Five Hundred Sixty-Nine Thousand, Four Hundred Ninety-Five and 00/100---------- dollars ($12,569,495.00) lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH: that whereas the principal entered into a certain contract, hereto attached, with City, for HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT

NOW THEREFORE, if said principal(s) shall fail to faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by City, with or without notice to the surety(ies), and during the life of any guaranty required under Contract, or shall fail to faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the surety(ies) being hereby waived, said surety(ies) shall fully and faithfully carry out and perform all of the terms, covenants and conditions of said Contract upon its part to be performed and if surety(ies) does so, then this obligation to be null and void, otherwise to remain in full force and effect, and in addition thereto, in case suit is brought upon this bond, the judgment rendered against the principal or surety(ies), or both, a reasonable attorney's fee, to be fixed by the court, taxed as costs and included in the judgment rendered therein, otherwise this obligation to be void.

It is further agreed that this bond guarantees compliance with all applicable provisions of Section 17.00 et seq. and Section 62.105 through 62.118 of the Municipal Code of CITY OF LOS ANGELES.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several hands and seals this ____day of _____, 20__.

(Principal) _____

_____

ATTEST (Surety) _____

_____ _____

(Surety) _____

_____

(Corporate Seal)

KNOW ALL PERSONS BY THESE PRESENTS:

That we, ACCO Engineered Systems, Inc.

as principal (s) and Fidelity and Deposit Company of Maryland as surety(ies) are held and firmly bound unto THE CITY OF LOS ANGELES, a municipal corporation, acting by and through its Board of Harbor Commissioners, and any person or party named below in the penal sum equal to: Twelve Million, Five Hundred Sixty-Nine Thousand, Four Hundred Ninety-Five and 00/100---------- dollars ($ 12,569,495.00) in lawful money of the United States, and the payment of which shall and truly be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH,

THAT WHEREAS, the principal (s) entered into a certain contract attached hereto with City for HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT

NOW, THEREFORE, if said principal (s) as Contractor (s) or subcontractor (s) fail (s) to pay for any services provided by mechanics, material suppliers, contractors, subcontractors, lessors of equipment, artisans, architects, registered engineers, licensed land surveyors, machinists, builders, teamsters or dray, or fail (s) to pay all persons and laborers of every class performing labor upon or bestowing skill or other necessary service on, or furnishing materials or leasing equipment to be used or consumed in or furnishing materials or leasing equipment to be used or consumed in or furnishing appliances, teams or power contributing to a work or improvement or fail (s) to pay for the value of such labor done or materials furnished and for the value and use of such appliances, equipment, teams or power, whether done or furnished at the instance of City or of any person acting by its authority or under it as contractor or otherwise, or fail (s) to pay for amounts due under the Unemployment Insurance Code of the State of California with respect to work, or labor performed by any such claimant during the original term of said Contract and any extension thereof that may be granted by City with or without notice to the surety(ies) or during the life of any guarantee required under Contract, or fail (s) to pay for any amounts required to be deducted, withheld and paid over to the Franchise Tax Board from the wages of Contractor and subcontractors/suppliers pursuant to that portion of the Revenue and Taxation Code, imposing liability for failure to deduct, withhold, and pay employee taxes, with respect to such work and labor, then in such event said surety(ies) shall pay the same in an amount not exceeding the sum of Twelve Million, Five Hundred Sixty-Nine Thousand, Four Hundred Ninety-Five and 00/100---------- dollars ($12,569,495.00) and, in addition thereto, in case suit is brought upon this bond and judgment rendered against the principal (s) or surety(ies), or both, a reasonable attorney's fee to be fixed by the court, taxed as costs and included in the judgment rendered therein; otherwise this obligation to be void.

It is understood and agreed by principal (s) and surety(ies) herein that by its terms, this payment bond shall insure to the benefit of any person named in Section 9100 of the California Civil Code so as to give a right of action such persons or their assigns in any suit brought upon this payment bond.

IN WITNESS WHEREOF, the above-bounded parties have executed this instrument under their several hands and seals this ____ day of _____, 20__.

ATTEST

_____

(Principal)_____

_____

(Surety) _____

_____

(Surety) _____

_____

(Corporate Seal)

INDIVIDUAL FORM

AFFIDAVIT OF COMPLETION OF WORK
UNDER SPECIFICATION NO. 2837
CONTRACT NO. _____

(STATE OF CALIFORNIA)
(COUNTY OF LOS ANGELES)

_____, being first duly sworn, deposes
(Affiant)
and says:

Affiant is Contractor under Contract No. _____, and makes the following statements:

That, in accordance with the provisions under Subsection 01000.58 of GENERAL CONDITIONS Section of Specification No. 2837 which Specifications is a part of Contract No. _____, by and between City of Los Angeles and Affiant, to the best of my knowledge and belief, Work specified in said Specifications and said Contract has been completed in strict accordance with Drawings and Specifications therefor, that no lawful debts for labor or material are outstanding, and that no federal excise tax has been included in Contract price;

That all request for funds under Items of Contract, including Changes in Work, and under all billings of whatsoever nature are accurate, complete and final and that no additional compensation over and above the final payment now pending shall be requested or is due under Contract or under any adjustment issued thereunder;

That, in accordance with said Subsection 01000.58, upon receipt of said final payment now pending, Affiant acknowledges that City, Board thereof, Executive Director, Engineer and any and all authorized employees of City shall thereby be released from any and all claims or liability on account of Work performed under Contract or any additions thereof.

_____
(Affiant)

Subscribed and sworn to before me
this _____ day of _____, 20__.

Notary Public in and for said County of
Los Angeles, State of California
Form 298-E
11-12-73

CO-PARTNERSHIP FORM

AFFIDAVIT OF COMPLETION OF WORK
UNDER SPECIFICATION NO. 2837
CONTRACT NO. _____

(STATE OF CALIFORNIA)
(COUNTY OF LOS ANGELES)

_____, a co-partner in the firm of
(Affiant)
_____, a co-partnership, being first
(Contractor)
duly sworn, deposes and says:

Affiant is one of the co-partners of _____ and makes
(Contractor)
the following statements and has the authority to do so for and on behalf of _____
_____
(Contractor)
a co-partnership, and Affiant personally;

That in accordance with the provisions under Subsection 01000.58 of GENERAL CONDITIONS Section of Specification No. 2837, which Specifications is a part of Contract No. _____, by and between City of Los Angeles and _____
_____
(Contractor)
to the best of my knowledge and belief, Work specified in said Specifications and said Contract has been completed in strict accordance with Drawings and Specifications therefor, that no lawful debts for labor or materials are outstanding, and that no federal excise tax has been included in Contract price;

That all requests for funds under Items of Contract, including Changes in Work, and under all billings of whatsoever nature are accurate, complete and final and that no additional compensation over and above the final payment now pending shall be requested or is due under Contract or under any adjustment issued thereunder;

That, in accordance with said Subsection 01000.58, upon receipt of said final payment now pending, Affiant acknowledges for himself/herself and for the _____,
(Contractor)
that City, Board thereof, Executive Director, Engineer, and any and all authorized employees of City shall thereby be released from any and all claims or liability on account of Work performed under Contract or any additions thereof.

_____
(Affiant)

Subscribed and sworn to before me
this _____ day of _____, 20__.

Notary Public in and for said County of
Los Angeles, State of California
Form 297-E
11-12-73

CORPORATE FORM

AFFIDAVIT OF COMPLETION OF WORK
UNDER SPECIFICATION NO. 2837
CONTRACT NO. _____

(STATE OF CALIFORNIA)
(COUNTY OF LOS ANGELES)

_____, the _____ of _____,
(Affiant) (Title) (Contractor)
a corporation, being first duly sworn, deposes and says:

Affiant is the _____ of _____
(Title) (Contractor)
and makes the following statements for and on behalf of _____,
(Contractor)
a corporation.

That, in accordance with the provisions under Subsection 01000.58 of GENERAL CONDITIONS Section of Specification No. 2837, which Specifications is a part of Contract No. _____, by and between City of Los Angeles and _____
_____
(Contractor)
to the best of my knowledge and belief, Work specified in said Specifications and said Contract has been completed in strict accordance with Drawings and Specifications therefore, that no lawful debts for labor or materials are outstanding, and that no federal excise tax has been included in Contract price;

That all requests for funds under Items of Contract, including Changes in Work, and under all billings of whatsoever nature are accurate, complete and final and that no additional compensation over and above the final payment now pending shall be requested or is due under Contract or under any adjustment issued thereunder;

That, in accordance with said Subsection 01000.58, upon receipt of said final payment now pending, Affiant acknowledges for himself/herself and for _____,
(Contractor)
that City, Board thereof, Executive Director, Engineer, and any and all authorized employees of City shall thereby be released from any and all claims or liability on account of Work performed under Contract or any additions thereof.

_____
(Affiant)

Subscribed and sworn to before me
this _____ day of _____, 20__.

Notary Public in and for said County of
Los Angeles, State of California
Form 308-E
11/12/73

01 CONTRACTOR/SUPPLIER INFORMATION FORM

DEPARTMENT USE ONLY		
Contract No.:	Award Date:	Contract Term:
Contract Title:		Award Total:

PRIME CONTRACTOR

Business Name: ACCO Engineered Systems, Inc. Award Total: $ $12,569,495.00
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE (OBE)
(Circle all that apply)
Local Business Enterprise: YES X NO _____ (Check only one)
Primary NAICS Code: 238220
Address: 888 E. Walnut St.
City/State/Zip: Pasadena, CA 91101
Telephone: (818) 244-6571 FAX: (818) 548-4402
Contact Person/Title: Patrick Shade
Email Address: pshade@accoes.com
State Contractor's I.D. 120696 DIR Registration No. 1000000546
RAMP Company ID 4569

(SUBCONTRACTOR)/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Nolan Excavation (Micro-business) Award Total: $ $19,044.00
Owner's Ethnicity: N/A Gender: N/A Group: (SBE) VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES _____ NO X (Check only one)
Primary NAICS Code: 23891
Address: 8502 E CHAPMAN AVE STE 459
City/State/Zip: ORANGE, CA 92869
Telephone: (720) 291-2453 FAX: ( )
Contact Person/Title: Jeremy Nolan
Email Address: jnolan@nolanexcavation.com
State Contractor's I.D. 945793 DIR Registration No. 1000030828
RAMP Company ID N/A
Description of Work to be Performed or Items Being Supplied: Provide excavation services

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Karcher Insulation Award Total: $ $291,122.50
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE (OBE)
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 23622
Address: 2300 E Orangewood Ave.
City/State/Zip: Anaheim, CA 92806
Telephone: (714) 606-1191 FAX: ( )
Contact Person/Title: Justin Rigsby Industrial Division – Operations Manager
Email Address: jrigsby@karcherinsulation.com
State Contractor's I.D. 309141 DIR Registration No. 1000006996
RAMP Company ID 80361
Description of Work to be Performed or Items Being Supplied: Various Insualtion on project

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Baker Electric Inc. Award Total: $ $523,250.00
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE (OBE)
(Circle all that apply)
Local Business Enterprise: YES X NO ____ (Check only one)
Primary NAICS Code: 23821
Address: 1298 Pacific Oaks Place
City/State/Zip: Escondido, CA 92029
Telephone: (760) 690-7628 FAX: (760) 745-0321
Contact Person/Title: Moises Velasquez Estimator II
Email Address: mvelasquez@baker-electric.com
State Contractor's I.D. 161756 DIR Registration No. 1000000466
RAMP Company ID 16271
Description of Work to be Performed or Items Being Supplied: Electrical Contractor

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: G & C Equipment Corporation Award Total: $ $35,152.36
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES X NO (Check only one)
Primary NAICS Code: 423740
Address: 879 W 190th Street, Suite 500
City/State/Zip: Gardena, CA 90248
Telephone: (310) 515-6715 FAX: ( )
Contact Person/Title: Justin Green
Email Address: justin@gandccorp.com
State Contractor's I.D. 980369 DIR Registration No. 1000012404
RAMP Company ID 2457
Description of Work to be Performed or Items Being Supplied: Supply various equipment

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: DB Sales and Service Award Total: $ $500,468.78
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES NO X (Check only one)
Primary NAICS Code: 42372
Address: 11582 Markon Dr.
City/State/Zip: Garden Grove, CA 92841
Telephone: (714) 719-1672 FAX: ( )
Contact Person/Title: Austin Buckels Director of Sales
Email Address: austin.buckels@dbsales.net
State Contractor's I.D. N/A DIR Registration No. N/A
RAMP Company ID 100915
Description of Work to be Performed or Items Being Supplied: Supply coils, compressors and additional equipment.

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Orravan Automation Award Total: $ $1,107,416.65
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES X NO _____ (Check only one)
Primary NAICS Code: 238220
Address: 6134 Faculty Ave.
City/State/Zip: Lakewood, CA 90712
Telephone: (562) 228-5983 FAX: ( )
Contact Person/Title: Daniel Navarro
Email Address: daniel@orravan.ai
State Contractor's I.D. 1025455 DIR Registration No. 1000008213
RAMP Company ID 201301
Description of Work to be Performed or Items Being Supplied: daniel@orravan.ai
Supply Building automation system scope of work.

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: George Yardley Co. Award Total: $ $53,140.64
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES _____ NO X (Check only one)
Primary NAICS Code: 4251
Address: 3401 W. Lake Center Drive
City/State/Zip: Santa Ana, CA 92704
Telephone: (714) 241-7700 FAX: ( )
Contact Person/Title: Rob Yardley
Email Address: Rob@georgeyardley.com
State Contractor's I.D. N/A DIR Registration No. N/A
RAMP Company ID 26998
Description of Work to be Performed or Items Being Supplied: Supplying dampers.

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Hill Crane Service, Inc. Award Total: $ $57,839.25
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES X NO (Check only one)
Primary NAICS Code: 33621
Address: 3333 Cherry Ave.
City/State/Zip: Long Beach, CA 90807
Telephone: (562) 595-6031 FAX: ( )
Contact Person/Title: Devin Danley
Email Address: Devin@hillcrane.com
State Contractor's I.D. 249128 DIR Registration No. 1000007494
RAMP Company ID 112684
Description of Work to be Performed or Items Being Supplied: Crane hoisting services.

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Kindness General Contractors, LLC Award Total: $ $368,000.00
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES NO X (Check only one)
Primary NAICS Code: 23622
Address: 6461 Global Drive
City/State/Zip: Cypress, CA 90630
Telephone: (714) 231-4776 FAX: ( )
Contact Person/Title: Val Gonzalez
Email Address: vgonzalez@kgcinc.com
State Contractor's I.D. 780044 DIR Registration No. 1000000174
RAMP Company ID 79737
Description of Work to be Performed or Items Being Supplied: general contracting services/scope

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: San Joaquin Chemicals, Inc. Award Total: $ $64,432.20
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE (OBE)
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 22131
Address: 4684 E Hedges Ave.
City/State/Zip: Fresno, CA 93703
Telephone: (818) 612-9269 FAX: ( )
Contact Person/Title: James Alewine
Email Address: jalewine@sjc-inc.com
State Contractor's I.D. 461677 DIR Registration No. 1000005464
RAMP Company ID 3522
Description of Work to be Performed or Items Being Supplied: Chemical water treatment

SUBCONTRACTOR/(SUPPLIER) INFORMATION FORM (CIRCLE ONE)

Business Name: Vertiv Corporation Award Total: $ $188,146.14
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE (OBE)
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 33599
Address: 2 Ada, Suite 100
City/State/Zip: Irvine, CA 92618
Telephone: (949) 500-7744 FAX: ( )
Contact Person/Title: Ray Faridnia
Email Address: ray.faridnia@vertiv.com
State Contractor's I.D. N/A DIR Registration No. N/A
RAMP Company ID 57977
Description of Work to be Performed or Items Being Supplied: Supply Liebert units per spec

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Vertical Systems Award Total: $ $1,727,803.00
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 236220
Address: 12774 Florence Ave
City/State/Zip: Santa Fe Springs, CA 90670
Telephone: (714) 726-6500 FAX: ( )
Contact Person/Title: Kevin Lynch
Email Address: Kevin@vertisys.net
State Contractor's I.D. N/A DIR Registration No. N/A
RAMP Company ID 111335
Description of Work to be Performed or Items Being Supplied: Supply evap condenser, fan coil units and chillers per spec

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Dawson Co. Award Total: $ $45,105.76
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 42372
Address: 1681 W. Second St.
City/State/Zip: Pomona, CA 91766
Telephone: (626) 429-9305 FAX: ( )
Contact Person/Title: Jorge Choy
Email Address: jchoy@Dawsonco.com
State Contractor's I.D. N/A DIR Registration No. N/A
RAMP Company ID 63702
Description of Work to be Performed or Items Being Supplied: Supply pumps per spec

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Matrix Air & Hydronic Balancing Award Total: $ $165,772.50
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 238990
Address: 8039 Painter Ave
City/State/Zip: Whittier, CA 90602
Telephone: (562) 383-1994 FAX: ( )
Contact Person/Title: Alex Gonzalez
Email Address: agonzalez@matrixairbalance.com
State Contractor's I.D. 1106383 DIR Registration No. 1001066728
RAMP Company ID 210518
Description of Work to be Performed or Items Being Supplied: Provide balancing services per spec.

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Air Treatment Corp. Award Total: $ $28,262.50
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 42374
Address: 640 N. Puente St.
City/State/Zip: Brea, CA 92821
Telephone: (714) 402.3129 FAX: ( )
Contact Person/Title: Nathan Hoffman
Email Address: nhoffman@airtreatment.com
State Contractor's I.D. N/A DIR Registration No. N/A
RAMP Company ID 7301
Description of Work to be Performed or Items Being Supplied: Supply VFD equipment per spec

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Matrix Air & Hydronic Balancing Award Total: $ $165,772.50
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 238990
Address: 8039 Painter Ave
City/State/Zip: Whittier, CA 90602
Telephone: (562) 383-1994 FAX: ( )
Contact Person/Title: Alex Gonzalez
Email Address: agonzalez@matrixairbalance.com
State Contractor's I.D. 1106383 DIR Registration No. 1001066728
RAMP Company ID 210518
Description of Work to be Performed or Items Being Supplied: Provide balancing services per spec.

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Air Treatment Corp. Award Total: $ $28,262.50
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE OBE
(Circle all that apply)
Local Business Enterprise: YES ____ NO X (Check only one)
Primary NAICS Code: 42374
Address: 640 N. Puente St.
City/State/Zip: Brea, CA 92821
Telephone: (714) 402.3129 FAX: ( )
Contact Person/Title: Nathan Hoffman
Email Address: nhoffman@airtreatment.com
State Contractor's I.D. N/A DIR Registration No. N/A
RAMP Company ID 7301
Description of Work to be Performed or Items Being Supplied: Supply VFD equipment per spec

Continued on the next page

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Brunton Enterprises Inc. dba Plas-Tal Award Total: $ $323,719.25
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE (OBE)
(Circle all that apply)
Local Business Enterprise: YES _____ NO X (Check only one)
Primary NAICS Code: 87801
Address: 8815 S. Sorensen Ave.
City/State/Zip: Santa Fe Springs, CA 90670
Telephone: (951) 893-8686 FAX: ( )
Contact Person/Title: Josh Hoblick
Email Address: Joshua@plas-tal.com
State Contractor's I.D. 715349 DIR Registration No. 1000030755
RAMP Company ID 37660
Description of Work to be Performed or Items Being Supplied: provide sheetmetal per spec.

SUBCONTRACTOR/SUPPLIER INFORMATION FORM (CIRCLE ONE)

Business Name: Trane Us Inc. Award Total: $ $269,493.35
Owner's Ethnicity: N/A Gender: N/A Group: SBE VSBE MBE WBE DVBE (OBE)
(Circle all that apply)
Local Business Enterprise: YES _____ NO X (Check only one)
Primary NAICS Code: 23822
Address: 3253 E Imperial Hwy
City/State/Zip: Brea, CA 92821
Telephone: (888) 973-9005 FAX: ( )
Contact Person/Title: Omar Chamma
Email Address: ochamma@trane.com
State Contractor's I.D. 1066318 DIR Registration No. 1000615693
RAMP Company ID 107658
Description of Work to be Performed or Items Being Supplied: Provide equipment per spec.

Ronald Talarico
Authorized signature

7/8/25
Date

Refer to Subsection 00030.06 for SBE, VSBE, DVBE, MBE, WBE, and OBE definitions and refer to Subsection 00030.10 for definition of Local Business Enterprise (LBE).

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm ACCO Engineered Systems

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or (No)	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or (No)	(Circle One)

Is your firm a DVBE MBE WBE (OBE) (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE (Circle One)
(Non-LBE) (Circle One)

Signature Ronald Falasca Title Senior Vice President

Printed Name Ronald Falasca Date Signed 7/8/25

NOTARY

State of California *See attached CA acknowledgement

County of _____

CALIFORNIA ACKNOWLEDGMENT CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles

On July 8, 2025 before me, Jarred Taecharatkij, Notary Public,
Date *Here Insert Name and Title of the Officer*

personally appeared Ronald Falasca
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

JARRED TAECHARATKIJ
Notary Public - California
Los Angeles County
Commission # 2497598
My Comm. Expires Aug 15, 2028

Place Notary Seal and/or Stamp Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____	Signer's Name: _____
☐ Corporate Officer – Title(s): _____	☐ Corporate Officer – Title(s): _____
☐ Partner – ☐ Limited ☐ General	☐ Partner – ☐ Limited ☐ General
☐ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer is Representing: _____	Signer is Representing: _____

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02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm NOLAN EXCAVATION INC.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
Non-LBE	(Circle One)

Signature _____ Title PRESIDENT

Printed Name Jeremy Nolan Date Signed 7/10/25

NOTARY

State of California * See attached CA acknowledgement

County of _____

On 7/10/25 before me, Jeremy Dolan / President
Date Here insert Name and Title of the Officer

personally appeared _____
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above Signature_____

_____
Signature of Notary Public

CALIFORNIA ACKNOWLEDGMENT CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles }

On July 11, 2025 before me, Jarred Taecharatkij, Notary Public,
Date *Here Insert Name and Title of the Officer*

personally appeared Jeremy Raymond Nolan
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

JARRED TAECHARATKIJ
Notary Public - California
Los Angeles County
Commission # 2497598
My Comm. Expires Aug 15, 2028

Place Notary Seal and/or Stamp Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____	Signer's Name: _____
☐ Corporate Officer – Title(s): _____	☐ Corporate Officer – Title(s): _____
☐ Partner – ☐ Limited ☐ General	☐ Partner – ☐ Limited ☐ General
☐ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer is Representing: _____	Signer is Representing: _____

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CALIFORNIA JURAT **GOVERNMENT CODE § 8202**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California

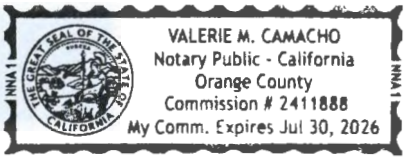
County of Orange

Subscribed and sworn to (or affirmed) before me on this 11th *Date* day of July *Month*, 20 25 *Year*, by

(1) Shane Dean Sullivan (aka Shane D. Sullivan)

(and (2) _____),
Name(s) of Signer(s)

proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.



Place Notary Seal and/or Stamp Above

Signature _____
Signature of Notary Public

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Enterprise Affidavit

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: No Other Signers

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On _____ before me, _____
Date Here insert Name and Title of the Officer

personally appeared _____
Name(s) of Signer(s)

_____

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above Signature_____

_____
Signature of Notary Public

Business Outreach

Investing In Southern California Businesses

Certified Small Business Enterprise

Vendor Account Number: 167307

Lisa Lazaruk
Karcher Insulation, Inc
2300 E. Orangewood Ave
Anaheim, CA 92806

Thank you for submitting your Vendor Application seeking Small Business Enterprise recognition with the Coalition of Southern California Public Agencies. Per our evaluation of the information, you provided in your application, and the North American Industry Classification System codes you identified, your status as a Small Business Enterprise (SBE) has been approved. The following organizations recognize this certification:

The Metropolitan Water District of Southern California
Port of Long Beach
San Diego County Water Authority
Los Angeles Unified School District
Los Angeles Community College District

Metropolitan is pleased to issue this SBE Certificate subject to the terms and conditions identified below:

NAICS code(s) for which SBE status is recognized:

236210 - Industrial Building Construction
236220 - Commercial and Institutional Building Construction
238290 - Other Building Equipment Contractors

SBE Certificate Effective Date: 03/18/24
SBE Certificate Expiration Date: 03/18/27

You have passed your company's recent random audit.

Work Performed by your company that falls within the NAICS code(s) listed above will be counted as SBE participation for work performed on contracts procured by the above agencies.

The agencies reserve the right to withdraw this certification if it is determined that certification was knowingly obtained by false, misleading, or incorrect information and reserve the right to audit all statements. If any company attempts to falsify or misrepresent information to obtain certification, the company may be disqualified from participating in any contracts for up to five years.

SBE Certification is valid for a period of three (3) years. To maintain SBE status, Vendors must update their existing SBE Vendor Application on or before the expiration date mentioned above. All information is subject to verification.

Any changes in your status may impact your certification, and you must update your account information online. A copy of your data can be viewed by logging into your Vendor Profile and visiting the Small Business Certification tab.

Sincerely,
John J. Arena
Business Outreach Program Manager
The Metropolitan Water District of Southern California

700 N. Alameda Street, Los Angeles, California 90012 Mailing Address: Box 54153, Los Angeles, CA 90054-0153
Telephone (213) 217-7444 FAX: 213.217.6002

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Karcher Insulation, Inc.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)	NETConnect Certificate attached
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)	

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
Non-LBE	(Circle One)

Signature _____ Title President

Printed Name Shane D. Sullivan Date Signed 7/11/25

NOTARY

State of California

County of _____

SEE ATTACHED CERTIFICATE

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Baker Electric & Renewables LLC

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or (No)	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or (No)	(Circle One)

Is your firm a DVBE MBE WBE (OBE) other business enterprise (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

(LBE)	(Circle One)
Non-LBE	(Circle One)

Signature  Title President

Printed Name Ted Baker Date Signed 7-11-2025

NOTARY

State of California

County of San Diego

On 7/11/2025 before me, JESSICA GETCHEL NOTARY PUBLIC
Date Here insert Name and Title of the Officer

personally appeared TED BAKER
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

JESSICA GETCHEL
Notary Public - California
San Diego County
Commission # 2476397
My Comm. Expires Jan 9, 2028

Place Notary Seal Above Signature

Signature of Notary Public

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm G4C Equipment Corp.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	(Yes) or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or (No)	(Circle One)

Is your firm a (DVBE) (MBE) WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

(LBE)	(Circle One)
Non-LBE	(Circle One)

Signature [signature] Title Project Manager

Printed Name Athlein Lapid Date Signed 7/10/24

NOTARY

State of California

County of Los Angeles

On July 10, 2025 before me, Eugene Hale / President
Date Here insert Name and Title of the Officer

personally appeared Athlein Laguid, Eugene Hale
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

NOEMIE GARCIA BUNAG
Notary Public - California
Los Angeles County
Commission # 2445526
My Comm. Expires May 26, 2027

WITNESS my hand and official seal.

Place Notary Seal Above Signature

Signature of Notary Public

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm MERTZ ENTERPRISES INC. dba DB Sales & Service

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
Non-LBE	(Circle One)

Signature Tracy Norton Title Director of Finance + Admin

Printed Name TRACY NORTON Date Signed 7/11/2025

NOTARY

State of California

County of

On _____ before me, _____
Date Here insert Name and Title of the Officer

personally appeared _____
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above Signature_____

_____
Signature of Notary Public

See Attach California Acknowledgment

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of ORANGE

On 07/11/2025 before me, B. VALDIVIA, NOTARY PUBLIC,
Date *Here Insert Name and Title of the Officer*

personally appeared Tracy Norton
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

B. VALDIVIA
Notary Public - California
Orange County
Commission # 2380128
My Comm. Expires Oct 26, 2025

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature
Signature of Notary Public

Place Notary Seal and/or Stamp Above

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Subcontractor/Supplier ownership and Local Business Enterprise Affidavit

Document Date: Number of Pages:

Signer(s) Other Than Named Above:

Capacity(ies) Claimed by Signer(s)

Signer's Name:	Signer's Name:
☐ Corporate Officer – Title(s):	☐ Corporate Officer – Title(s):
☐ Partner – ☐ Limited ☐ General	☐ Partner – ☐ Limited ☐ General
☐ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian of Conservator	☐ Trustee ☐ Guardian of Conservator
☐ Other:	☐ Other:
Signer is Representing:	Signer is Representing:

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02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Orravan Mechanical Inc.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	(Yes) or No	(Circle One)
Very Small Business Enterprise (VSBE)	(Yes) or No	(Circle One)

Is your firm a DVBE (MBE) WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

ID. 201301 (LBE) (Circle One)
Non-LBE (Circle One)

Signature [signature] Title CFO

Printed Name Danny Navarro Date Signed 2-10-2025

NOTARY

State of California

County of _____

See Attached Notary Certificate

CALIFORNIA ALL-PURPOSE CERTIFICATE OF ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California

County of Los Angeles

On 7/10/25 before me, LaShon James-Major Notary Public personally appeared

Daniel Navarro

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(ies), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature LaShon James-Major (Seal)

LASHON JAMES-MAJOR
COMM. # 2508200
NOTARY PUBLIC-CALIFORNIA
LOS ANGELES COUNTY
My Comm. Expires JAN 25, 2029

ADDITIONAL OPTIONAL INFORMATION

DESCRIPTION OF ATTACHED DOCUMENT

Subcontractor... Enterprise
(Title or description of attached document)

Affidavit
(Title or description of attached document continued)

NUMBER OF PAGES 1 DOCUMENT DATE 7/10/25

(Additional Information)

CAPACITY CLAIMED BY SIGNER

- ☐ Individual (s)
- ☐ Corporate Officer

(Title)

- ☐ Partner (s)
- ☐ Attorney-in-fact
- ☐ Trustee (s)
- ☐ Other

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm George Yardley Co, Inc.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
Non-LBE	(Circle One)

Signature Rob Yardley Title President

Printed Name Rob Yardley Date Signed 07-10-25

NOTARY

State of California

County of ORANGE

On 7.10.25 (Date) before me, BRIJ PRASAD, NOTARY PUBLIC (Here insert Name and Title of the Officer)

personally appeared ROB YARDLEY (Name(s) of Signer(s))

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she~~/~~they~~ executed the same in his/~~her~~/~~their~~ authorized capacity(~~ies~~), and that by his/~~her~~/~~their~~ signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

BRIJ PRASAD
Notary Public - California
Orange County
Commission # 2518243
My Comm. Expires May 19, 2029

Place Notary Seal Above Signature

Signature of Notary Public

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Hill crane service, inc

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
Non-LBE	(Circle One)

Signature _____ Title CEO

Printed Name Christopher Hill Date Signed 7/11/25

NOTARY

State of California

County of LA

On 7/11/25 before me, Kelly Higgins, Notary Public
Date Here insert Name and Title of the Officer

personally appeared Christopher Hill
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(ies), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above Signature Kelly Higgins

Signature of Notary Public

KELLY ANN HIGGINS
Notary Public - California
Los Angeles County
Commission # 2518437
My Comm. Expires May 17, 2029

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm
Kindness General Contractors, LLC

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or [No]	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or [No]	(Circle One)

Is your firm a DVBE MBE WBE [OBE] (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE (Circle One)
[Non-LBE] (Circle One)

Signature _____ Title President

Printed Name Jeff Kindness Date Signed 07/11/2025

CALIFORNIA NOTARY ACKNOWLEDGEMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Orange

On 7/11/25 before me, Elaine Abudayyeh - Notary Public (insert name and title of the officer), personally appeared Jeff Kindness, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal. Signature Elaine Abudayyeh. (Seal)

ELAINE ABUDAYYEH
Notary Public - California
Orange County
Commission # 2462313
My Comm. Expires Sep 5, 2027

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm SAN JOAQUIN CHEMICALS, INC.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE (Circle One)
Non-LBE (Circle One)

Signature _____ Title Southern Area Manager

Printed Name James Alewine Date Signed July 16, 2024

NOTARY

State of California

County of _____

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles)

On July 11, 2025 before me, Jacqueline Amezcua, Notary Public
(insert name and title of the officer)

personally appeared James Alewine ----------,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(ies), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

JACQUELINE AMEZCUA
Notary Public - California
Los Angeles County
Commission # 2502890
My Comm. Expires Nov 21, 2028

Signature Jacqueline Amezcua (Seal)

On _____ before me, _____
Date Here insert Name and Title of the Officer

personally appeared _____
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

See Notary Attachment

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above Signature_____

_____
Signature of Notary Public

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Vertiv Corporation

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or (No)	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or (No)	(Circle One)

Is your firm a DVBE MBE WBE (OBE) [Other Business Enterprise] (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
(Non-LBE)	(Circle One)

Signature _____ Title SR. ACCOUNT REPRESENTATIVE

Printed Name RAY FARIDNIA Date Signed 7/14/25

NOTARY

State of California

County of Orange

On July 14, 2025 (Date) before me, Yalda Parva, Notary Public (Here insert Name and Title of the Officer)

personally appeared Ray Faridnia (Name(s) of Signer(s))

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above Signature

Signature of Notary Public

YALDA PARVA
Notary Public - California
Orange County
Commission # 2434418
My Comm. Expires Jan 15, 2027

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Vertical Systems

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or (No)	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or (No)	(Circle One)

Is your firm a DVBE MBE WBE (OBE) (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

(LBE) (Circle One)
(Non-LBE) (Circle One)

Signature [signature] Title Partner

Printed Name Vince Gomez Date Signed 7/10/2025

NOTARY

State of California

County of Los Angeles

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles)

On July 10, 2025 before me, L. Fay Storm, Notary Public
(insert name and title of the officer)

personally appeared Vince Gomez,
who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

L. FAY STORM
COMM. # 2409856
NOTARY PUBLIC • CALIFORNIA
LOS ANGELES COUNTY
Comm. Exp. JULY 4, 2026

Signature L Fay Storm (Seal)

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Richard S. Dawson Company dba Dawson Company

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
Non-LBE	(Circle One)

Signature _____ Title Executive Vice President

Printed Name David Hernandez Date Signed July 11,2025

NOTARY

State of California

County of Los Angeles

On July 11, 2025 before me, Elena Pryakhina
Date Here insert Name and Title of the Officer

personally appeared David Hernandez
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

ELENA PRYAKHINA
Notary Public - California
Los Angeles County
Commission # 2488619
My Comm. Expires Apr 30, 2028

Place Notary Seal Above Signature Elena Pryakhina

Signature of Notary Public

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm

MATRIX AIR & HYDRONIC BALANCING CO

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or No	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or No	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
Non-LBE	(Circle One)

Signature _____ Title President

Printed Name Alex Gonzalez Date Signed 7-14-25

NOTARY

State of California See Attached

County of _____

CALIFORNIA ACKNOWLEDGMENT **CIVIL CODE § 1189**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Los Angeles }

On July 14, 2025 before me, Diana L Alley, Notary Public,
Date *Here Insert Name and Title of the Officer*

personally appeared Alex Gonzalez
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

DIANA L. ALLEY
Notary Public - California
Los Angeles County
Commission # 2487297
My Comm. Expires Apr 19, 2028

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature Diana L Alley
Signature of Notary Public

Place Notary Seal and/or Stamp Above

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____	Signer's Name: _____
☐ Corporate Officer – Title(s): _____	☐ Corporate Officer – Title(s): _____
☐ Partner – ☐ Limited ☐ General	☐ Partner – ☐ Limited ☐ General
☐ Individual ☐ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer is Representing: _____	Signer is Representing: _____

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02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Air Treatment Corporation

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or (No)	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or (No)	(Circle One)

Is your firm a DVBE MBE WBE (OBE) (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
(Non-LBE)	(Circle One)

Signature Linda Forrett Title Credit Mgr.

Printed Name Linda Forrett Date Signed 7/10/25

NOTARY

State of California see attached certificate

County of

On _____ before me, _____
Date Here insert Name and Title of the Officer

personally appeared _____
Name(s) of Signer(s)

_____

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

see attached certificate

Place Notary Seal Above Signature_____

_____
Signature of Notary Public

CALIFORNIA ACKNOWLEDGMENT CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of *California*
County of Orange

On 7/10/25 (*Date*) before me, Leo Guiala, Notary Public (*Here Insert Name and Title of the Officer*),

personally appeared Linda Porrett (*Name(s) of Signer(s)*),

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

LEO GUIALA
Notary Public - California
Orange County
Commission # 2383233
My Comm. Expires Nov 16, 2025

Place Notary Seal and/or Stamp Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

©2019 National Notary Association

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Plas-Tal Mfg. Co.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or (No)	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or (No)	(Circle One)

Is your firm a DVBE MBE WBE OBE (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE	(Circle One)
(Non-LBE)	(Circle One)

Signature [signature] Title President

Printed Name Sean Brunton Date Signed 7/14/25

NOTARY

State of California

County of Los Angeles

On 07/14/2025 before me, Victoria Ann Nicasio, Notary Public
Date Here insert Name and Title of the Officer

personally appeared Sean Brunton
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

VICTORIA ANN NICASIO
Notary Public - California
Los Angeles County
Commission # 2419017
My Comm. Expires Oct 1, 2026

WITNESS my hand and official seal.

Place Notary Seal Above Signature Victoria Ann Nicasio

Signature of Notary Public

02 SUBCONTRACTOR/SUPPLIER OWNERSHIP AND LOCAL BUSINESS ENTERPRISE AFFIDAVIT

AFFIDAVIT

"The undersigned declares under penalty of perjury pursuant to the laws of the State of California that the following information and information contained on the attached Contractor/Supplier Information Form is true and correct and includes all material information necessary to identify and explain the operations of

Name of Firm Trane U.S. Inc.

as well as the ownership thereof. Further, the undersigned agrees to provide, upon request, either through the prime contractor or, directly to Harbor Department, complete and accurate information regarding ownership in the named firm, and all of its domestic and foreign affiliates, any proposed changes of the ownership and to permit the audit and examination of firm ownership documents, and the ownership documents of all of its domestic and foreign affiliates, in association with this Contract."

Please indicate the ownership of your company as defined in Subsection 00030.06 of BIDDING DOCUMENTS Section:

Small Business Enterprise (SBE)	Yes or [No]	(Circle One)
Very Small Business Enterprise (VSBE)	Yes or [No]	(Circle One)

Is your firm a DVBE MBE WBE [OBE] (Circle at least one)

Please indicate the local business enterprise (LBE) status of your company as defined in Subsection 00030.10 of BIDDING DOCUMENTS Section:

LBE (Circle One)
[Non-LBE] (Circle One)

Signature _____ Title Team Lead

Printed Name Omar Chamma Date Signed 7-14-25

NOTARY

State of California

County of Orange

On July 14, 2025 before me, Annamarie Ochoa
Date Here insert Name and Title of the Officer

personally appeared _____
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above Signature Please See Attached

Signature of Notary Public

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT **CIVIL CODE § 1189**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)
County of Orange)

On July 14, 2025 before me, Annamarie Orcher, Notary Public.
Date *Here Insert Name and Title of the Officer*

personally appeared Omar Chamma
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature _____
Signature of Notary Public

ANNAMARIE ORCHER
Notary Public - California
Orange County
Commission # 2382908
My Comm. Expires Nov 13, 2025

OPTIONAL

Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Subcontractor / Supplier Ownership and Local Business Enterprise Affidavit

Document Date: July 14, 2025 Number of Pages: _____

Signer(s) Other Than Named Above: Omar Chamma

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03 SUPPLIER LIST

Supplier information is required for calculation of SBE and VSBE participation. Photocopy this form for additional firms. Please list SBE and VSBE Suppliers that are being used to achieve the minimum required SBE and VSBE participation levels.

Supplier Name and Location		Amount	SBE Yes or No	VSBE Yes or No	Local Business Yes or No
Name	G & C Equipment Corporation	$35,152.36	Yes	No	No
Address	879 W. 190th Street				
City, State, Zip	Gardena CA 90248				
Phone	(310) 515-6715				
Description of Items Being Supplied:	Supply various equipment				

Name	DB Sales and Service	$500,468.78	No	No	No
Address	11582 Markon Dr.				
City, State, Zip	Garden Grove, CA 92841				
Phone	(714)719-1672				
Description of Items Being Supplied:	Supply coils, compressors and additional equipment.				
714					

Name	George Yardley Co.	$53,140.64	No	No	No
Address	3401 W. Lake Center Drive				
City, State, Zip	Santa Ana, CA 92704				
Phone	(714)241-7700				
Description of Items Being Supplied:	Supplying dampers.				

SUBTOTAL	**DEPARTMENT USE ONLY**				

END OF SECTION

03 SUPPLIER LIST

Supplier information is required for calculation of SBE and VSBE participation. Photocopy this form for additional firms. Please list SBE and VSBE Suppliers that are being used to achieve the minimum required SBE and VSBE participation levels.

Supplier Name and Location		Amount	SBE Yes or No	VSBE Yes or No	Local Business Yes or No
Name	Vertical Systems	$1,727,803.00	No	No	No
Address	12774 Florence Ave.				
City, State, Zip	Santa Fe Springs, CA 90670				
Phone	(714)726-6500				
Description of Items Being Supplied:	Supply evap condenser, fan coil units and chillers per spec				

Name	Dawson	$45,105.76	No	No	No
Address	1681 W. Second St.				
City, State, Zip	Pomona, CA 91766				
Phone	(626)429-9305				
Description of Items Being Supplied:	Supply pumps per spec				

Name	Vertiv Corporation	$188,146.14	No	No	No
Address	2 Ada, Suite 100				
City, State, Zip	Irvine, CA 92618				
Phone	(949)500-7744				
Description of Items Being Supplied:	Supply Libert units per spec				

SUBTOTAL	**DEPARTMENT USE ONLY**				

END OF SECTION

03 SUPPLIER LIST

Supplier information is required for calculation of SBE and VSBE participation. Photocopy this form for additional firms. Please list SBE and VSBE Suppliers that are being used to achieve the minimum required SBE and VSBE participation levels.

Supplier Name and Location		Amount	SBE Yes or No	VSBE Yes or No	Local Business Yes or No
Name	Air treatment Co.	$28,262.50	No	No	No
Address	879 W. 190th Street				
City, State, Zip	Gardena CA 90248				
Phone					
Description of Items Being Supplied:	Supply VFD equipment per spec				

Name	Trane	$269,493.35	No	No	No
Address	3253 E. Imperial Hwy				
City, State, Zip	Brea, CA 92821				
Phone	(626)255-3170				
Description of Items Being Supplied:	Supply equipment per spec				

Name					
Address					
City, State, Zip					
Phone					
Description of Items Being Supplied:					

SUBTOTAL	**DEPARTMENT USE ONLY**				

END OF SECTION

FORM 50

Bidder Certification

Los Angeles City ETHICS COMMISSION

This form must be submitted with your bid or proposal to the City department that is awarding the contract noted below. If you have questions about this form, please contact the Ethics Commission at (213) 978-1960.

☑ **Original Filing** ☐ **Amendment:** Date of Signed Original _____ Date of Last Amendment _____

Reference Number (Bid, Contract, or RAMP)	Awarding Authority (Department awarding the contract)
222187	City of Los Angeles: HARBOR DEPARTMENT
Bidder Name	
ACCO Engineered Systems, Inc.	
Address	
888 E. Walnut St. Pasadena, CA 91101	
Email Address	**Phone Number**
pshade@accoes.com	(818) 482-4656

Certification

I certify the following on my own behalf or on behalf of the entity named above, which I am authorized to represent:

A. I am applying for one of the following types of contracts with the City of Los Angeles:

1. A goods or services contract with a value of more than $25,000 and a term of at least three months;
2. A construction contract with any value and duration;
3. A financial assistance contract, as defined in Los Angeles Administrative Code § 10.40.1(h), with a value of at least $100,000 and a term of any duration; or
4. A public lease or license, as defined in Los Angeles Administrative Code § 10.40.1(i), with any value and duration.

B. I acknowledge and agree to comply with the disclosure requirements and prohibitions established in the Los Angeles Municipal Lobbying Ordinance if I qualify as a lobbying entity under Los Angeles Municipal Code § 48.02.

I certify under penalty of perjury under the laws of the City of Los Angeles and the state of California that the information in this form is true and complete.

Chuck Darway, Vice President	
Name	Signature
	5-29-25
Title	Date

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

This form must be completed in its entirety and submitted with your bid or proposal to the City department that is awarding the contract. Failure to submit a completed form may affect your bid or proposal. If you have questions about this form, please contact the Ethics Commission at (213) 978-1960.

☑ **Original Filing** ☐ **Amendment:** Date of Signed Original _____ Date of Last Amendment _____

Reference Number (Bid, Contract, or RAMP): 222187 Date Bid Submitted: 07/09/25

Contract Description (Title of the RFP or City contract solicitation and description of the services to be provided):
Harbor Administration Building HVAC Replacement

Awarding Authority (Department awarding the contract): City of Los Angeles: HARBOR DEPARTMENT

Bidder Name: ACCO Engineered Systems, Inc.

Bidder Address: 888 E. Walnut St. Pasadena, CA 91101

Bidder Email Address: pshade@accoes.com Bidder Phone Number: (818) 482-4656

Schedule Summary

Please complete all three of the following:

	Yes	No
1. **SCHEDULE A — Bidder's Principals** *(check one)* The bidder has one or more **PRINCIPALS,** as defined in LAMC § 49.7.35(A)(6). At least one principal is required for entities. *(If you check "Yes", Schedule A is required.)*	☑	☐
2. **SCHEDULE B — Subcontractors and Their Principals** *(check one)* The bidder has one or more **SUBCONTRACTORS** on this bid or proposal with subcontracts worth $100,000 or more. *(If you check "Yes", Schedule B is required.)*	☑	☐

3. **TOTAL NUMBER OF PAGES SUBMITTED** (including this cover page): 9

Certification

I certify the following under penalty of perjury under the laws of the City of Los Angeles and the state of California: A) I understand, will comply with, and have notified my principals and subcontractors of the requirements and restrictions in Los Angeles City Charter § 470(c)(12) and any related ordinances; B) I understand that I must amend this form within ten business days if any information changes; C) I am the bidder named above or I am authorized to represent the bidder named above, and my name appears below; and D) The information provided in this form is true and complete to the best of my knowledge and belief.

Chuck Darway, Vice President
Name

Signature

Title

5-29-25
Date

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

Schedule A - Bidder's Principals

Please identify the names and titles of all the bidder's principals (attach additional sheets if necessary). Principals include a bidder's board chair, president, chief executive officer, chief operating officer, and individuals who serve in the functional equivalent of one or more of those positions. Principals also include individuals who hold an ownership interest in the bidder of at least 20 percent and employees of the bidder who are authorized by the bid or proposal to represent the bidder before the City.

Name: _____ Title: _____
Address: _____

Name: _____ Title: _____
Address: _____

Name: _____ Title: _____
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Name: _____ Title: _____
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Name: _____ Title: _____
Address: _____

Name: _____ Title: _____
Address: _____

☒ **Check this box if additional Schedule A pages are attached.**

See attached "Schedule A"

acco engineered systems
AND SUBSIDIARY COMPANIES

2025 OFFICERS

JEFFREY R. MARRS
President and Chief Executive Officer

BRADLEY G. GRAHAM
Chief Financial Officer and Treasurer

ROBERT M. OSIER
Corporate Secretary and General Counsel

ADDITIONAL OFFICERS

CHARLES J. DARWAY, Executive Vice President, Construction
MICHAEL J. POTTS, Executive Vice President, Facility Service
LEON ID KOFMAN, Chief Information Officer
CURTIS J. CADY, Senior Vice President, Technology, Responsible Managing Officer- Contractor's License
RONALD A. FALASCA, Senior Vice President, Construction
RICHARD J. FERREIRA, Senior Vice President, Facility Service
KEVIN P. FITZGERALD, Senior Vice President, Construction
BRYAN P. GRAHAM , Senior Vice President, Operations & Compliance, Responsible Managing Officer-Contractor's License
GREGORY M. HOLBROOK, Senior Vice President, Construction
JUSTIN B. KIRCHART, Senior Vice President, Administration, Senior Vice President, Facility Service
RICK R. RILEY, Senior Vice President, Construction Operations
NATALIE ABDOU, Vice President, Executive Office
JONATHAN B. BELL, Vice President, Construction
ROBERT A. FELIX, Vice President, Construction, Responsible Managing Officer Contractor's License
MICHAEL V. HEATH, Vice President, Engineering
JEANETTE D. JAMES, Vice President, Construction
LARRY K. JIMENEZ, Vice President, Construction
KENNETH M. LINDSEY, Vice President, Construction
ANDREW LORANCE, Vice President, Business Operations & Technology
ROBERT F. MCKENZIE, Vice President, Construction
DARLENE J. MITCHELL, Vice President, Information Technology
CHARLES J. OBEROSLER, Vice President, Construction
CHRISTOPHER F. WAY, Vice President, Procurement
ANTHONY A. RUBALCAVA, Responsible Managing Officer, Civil-Structural Engineering Business Registration
ERIK A. DIBBLE, Assistant Secretary
MICHAEL V. AVAKIAN, Assistant Secretary
JOHN C. EBERSBERGER, Assistant Secretary
SCOTT B. ELLIS, Assistant Secretary
ADAM S. FOGEL, Assistant Secretary
JODI L. DREWERY, Assistant Secretary
JOSE A. LEMUS, Assistant Secretary, ACCO Engineered Systems, Inc. DBA Geo. H. Wilson Mechanical Contractors
HELEN E. LEONARD, Assistant Secretary
ADRIAN S. MENENDEZ, Assistant Secretary
RYAN NOVACEK, Assistant Secretary
DAVID B. OSBURN, Assistant Secretary
HUGH D. PALMER, Assistant Secretary
CARLTON A. SEYFORTH, Assistant Secretary

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

Schedule B - Subcontractors and Their Principals

Please identify all subcontractors whose subcontracts are worth $100,000 or more. Separate Schedule B pages are required for each subcontractor who meets the threshold.

Subcontractor's Name

Matrix Air & Hydronic Balancing Co.

Subcontractor's Address

8039 Painter Ave. Suite #202 Whittier, CA 90602

Please check one of the following options:

This subcontractor has one or more principals. [X] **Yes*** [ ] **No**

* *Each principal's name and title must be identified below. Attach additional sheets if necessary. Principals include a subcontractor's board chair, president, chief executive officer, chief operating officer, and individuals who serve in the functional equivalent of one or more of those positions. Principals also include individuals who hold an ownership interest in the subcontractor of at least 20 percent and employees of the subcontractor who are authorized by the bid or proposal to represent the subcontractor before the City.*

Name: Alex Stanley Gonzalez Title: CEO

Address: 8039 Painter Ave. Suite #202 Whittier, CA 90602

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

[ ] **Check this box if additional Schedule B pages are attached.**

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

Schedule B - Subcontractors and Their Principals

Please identify all subcontractors whose subcontracts are worth $100,000 or more. Separate Schedule B pages are required for each subcontractor who meets the threshold.

Subcontractor's Name

Karcher Insulation, Inc.

Subcontractor's Address

2300 E Orangewood Ave, Anaheim, CA 92806

Please check one of the following options:

This subcontractor has one or more principals. [X] **Yes*** [ ] **No**

* *Each principal's name and title must be identified below. Attach additional sheets if necessary. Principals include a subcontractor's board chair, president, chief executive officer, chief operating officer, and individuals who serve in the functional equivalent of one or more of those positions. Principals also include individuals who hold an ownership interest in the subcontractor of at least 20 percent and employees of the subcontractor who are authorized by the bid or proposal to represent the subcontractor before the City.*

Name: Shane D. Sullivan Title: President

Address: 2300 E Orangewood Ave, Anaheim, CA 92806

Name: Les Winter Title: Chief Financial Officer

Address: 2300 E Orangewood Ave, Anaheim, CA 92806

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

Name: _____ Title: _____

Address: _____

[ ] **Check this box if additional Schedule B pages are attached.**

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

Schedule B - Subcontractors and Their Principals

Please identify all subcontractors whose subcontracts are worth $100,000 or more. Separate Schedule B pages are required for each subcontractor who meets the threshold.

Subcontractor's Name

Baker Electric

Subcontractor's Address

1298 Pacific Oaks Pl, Escondido, CA 92029

Please check one of the following options:

This subcontractor has one or more principals. [X] **Yes*** [ ] **No**

* *Each principal's name and title must be identified below. Attach additional sheets if necessary. Principals include a subcontractor's board chair, president, chief executive officer, chief operating officer, and individuals who serve in the functional equivalent of one or more of those positions. Principals also include individuals who hold an ownership interest in the subcontractor of at least 20 percent and employees of the subcontractor who are authorized by the bid or proposal to represent the subcontractor before the City.*

Name: Ted Baker Title: CEO
Address: 1298 Pacific Oaks Pl, Escondido, CA 92029

Name: Brian Miliate Title: CFO
Address: 1298 Pacific Oaks Pl, Escondido, CA 92029

Name: Harold D. Carlisle Title: Vice President
Address: 1298 Pacific Oaks Pl, Escondido, CA 92029

Name: Title:
Address:

Name: Title:
Address:

Name: Title:
Address:

[ ] **Check this box if additional Schedule B pages are attached.**

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

Schedule B - Subcontractors and Their Principals

Please identify all subcontractors whose subcontracts are worth $100,000 or more. Separate Schedule B pages are required for each subcontractor who meets the threshold.

Subcontractor's Name
ORRAVAN MECHANICAL INC
Subcontractor's Address
3323 E 59th St, Long Beach, CA 90805

Please check one of the following options:

This subcontractor has one or more principals. [X] **Yes*** [ ] **No**

***** *Each principal's name and title must be identified below. Attach additional sheets if necessary. Principals include a subcontractor's board chair, president, chief executive officer, chief operating officer, and individuals who serve in the functional equivalent of one or more of those positions. Principals also include individuals who hold an ownership interest in the subcontractor of at least 20 percent and employees of the subcontractor who are authorized by the bid or proposal to represent the subcontractor before the City.*

Name: Rigo Navarro Title: CEO
Address: 3323 E 59th St, Long Beach, CA 90805

Name: Daniel Navarro Title: Officer
Address: 3323 E 59th St, Long Beach, CA 90805

Name: Rigo Navarro Jr. Title: Officer
Address: 3323 E 59th St, Long Beach, CA 90805

Name: Title:
Address:

Name: Title:
Address:

Name: Title:
Address:

[ ] **Check this box if additional Schedule B pages are attached.**

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

Schedule B - Subcontractors and Their Principals

Please identify all subcontractors whose subcontracts are worth $100,000 or more. Separate Schedule B pages are required for each subcontractor who meets the threshold.

Subcontractor's Name
KINDNESS GENERAL CONTRACTORS LLC
Subcontractor's Address
6461 GLOBAL DRIVE CYPRESS, CA 90630

Please check one of the following options:

This subcontractor has one or more principals. [X] **Yes*** [ ] **No**

* *Each principal's name and title must be identified below. Attach additional sheets if necessary. Principals include a subcontractor's board chair, president, chief executive officer, chief operating officer, and individuals who serve in the functional equivalent of one or more of those positions. Principals also include individuals who hold an ownership interest in the subcontractor of at least 20 percent and employees of the subcontractor who are authorized by the bid or proposal to represent the subcontractor before the City.*

Name: JEFFREY ALAN KINDNESS Title: CEO and President
Address: 6461 GLOBAL DRIVE CYPRESS, CA 90630

Name: _____ Title: _____
Address: _____

Name: _____ Title: _____
Address: _____

Name: _____ Title: _____
Address: _____

Name: _____ Title: _____
Address: _____

Name: _____ Title: _____
Address: _____

[ ] **Check this box if additional Schedule B pages are attached.**

FORM 55

Prohibited Contributors
(Bidders)

Los Angeles City ETHICS COMMISSION

Schedule B - Subcontractors and Their Principals

Please identify all subcontractors whose subcontracts are worth $100,000 or more. Separate Schedule B pages are required for each subcontractor who meets the threshold.

Subcontractor's Name

Plas-Tal Manufacturing

Subcontractor's Address

8815 S. Sorensen Ave., Santa Fe Springs, CA 90670

Please check one of the following options:

This subcontractor has one or more principals. [X] **Yes*** [ ] **No**

* *Each principal's name and title must be identified below. Attach additional sheets if necessary. Principals include a subcontractor's board chair, president, chief executive officer, chief operating officer, and individuals who serve in the functional equivalent of one or more of those positions. Principals also include individuals who hold an ownership interest in the subcontractor of at least 20 percent and employees of the subcontractor who are authorized by the bid or proposal to represent the subcontractor before the City.*

Name: Sean Brunton Title: CEO, President
Address: 8815 S. Sorensen Ave., Santa Fe Springs, CA 90670

Name: Alan Baker Title: Vice President
Address: 8815 S. Sorensen Ave., Santa Fe Springs, CA 90670

Name: Gary Title Title: CFO
Address: 8815 S. Sorensen Ave., Santa Fe Springs, CA 90670

Name: Title:
Address:

Name: Title:
Address:

Name: Title:
Address:

[ ] **Check this box if additional Schedule B pages are attached.**

01 DRAWINGS

Drawings listed in this Section, together with any drawings, standards, and reports referred to on the listed Drawings, show Work contemplated and are a part of Contract Documents.

Drawing No.	Title
1-3577	Harbor Administration Building HVAC Replacement

02 REFERENCE REPORTS*

*All Reference Reports listed are available for review in the online bid package. Refer to NOTICE INVITING BIDS Section for more information.

1. Limited Hazardous Materials Survey Report by TRC.Project No. 638108.000.000, dated January 9, 2025.

03 REFERENCE DRAWINGS*

*All Reference Drawings listed are available for review in the online bid package. Refer to NOTICE INVITING BIDS Section for more information.

Drawing No.	Title
SP-001	Cover Sheet (Johnson Controls)
SP-101	4TH Floor Piping Plan (Johnson Controls)
SP-102	5th Floor Piping Plan (Johnson Controls)
SP-103	1st Floor Piping Plan and Section View (Johnson Controls)
7 – 400	Los Angeles Harbor Department Administrative Office Facility
1-1360-1001	Harbor Administration Building Workstations at Library Area
1-1360-1012	HAB Fifth Floor Executive Director Office Relocation
1-1360-1015	Harbor Administration Building Lighting Renovations
1-1360-1021	Harbor Administration Building 5th Floor Executive Offices
1-1360-1034	LAHD Administrative Building 4th Floor
1-2486	POLA Administrative Building Computer Room Air Conditioning System
1-2651	POLA Administrative Building Boiler Upgrade
1-2664	Port Police Locker Room
1-2700	HAB Conference Rooms Modifications
1-2760	POLA Administrative Bldg 1st Floor Port Command Center HVAC Upgrade
1-2799	Harbor Administrative Building Servery Renovation Main Lobby Security Improvements

1-2918	Harbor Administration Building Servery Renovation Main Lobby Security Improvements
1-3383	Harbor Administration Building 4th and 5th Floors Workspace Solutions
1-3394	Harbor Department Administration Building First Floor Employee Restrooms and Showers Remodel
1-3456	Harbor Administration Building – 2nd Floor Cyber Resilience Center Remodel

END OF SECTION

01 ABBREVIATIONS AND DEFINITIONS

a ABBREVIATIONS:

AASHTO: American Association of State Highway and Transportation Officials

ACI: American Concrete Institute

ANSI: American National Standards Institute

AREMA: American Railroad Engineering and Maintenance of Way Association

ASTM: American Society for Testing and Materials

AWPA: American Wood Protection Association

AWPB: American Wood Preservers Bureau

AWS: American Welding Society

AWWA: American Water Works Association

CRSI: Concrete Reinforcing Steel Institute

DBE: Disadvantaged Business Enterprise

DWP: Department of Water and Power

ICEA: Insulated Cable Engineers Association

IES: Illumination Engineering Society

IEEE: Institute of Electrical and Electronics Engineers

LAHD: Los Angeles Harbor Department

LBE: Local Business Enterprise

MBE: Minority Business Enterprise

NEC: National Electrical Code

NEMA: National Electrical Manufacturers Association

NFPA: National Fire Protection Association

01000.01 Cont'd.

OBE:	Other Business Enterprise
OSHA:	Occupational, Safety, and Health Administration
POLA:	Port of Los Angeles
PVC:	Polyvinyl chloride
RS:	Reference Specifications
SBE	Small Business Enterprise
SSPC:	Society for Protective Coatings
UDBE:	Underutilized Disadvantaged Business Enterprise
UL:	Underwriters Laboratories, Inc.
VSBE:	Very Small Business Enterprise
WBE:	Women Business Enterprise

b DEFINITIONS:

Applicable Laws: Any and all federal, state, county, or governmental agency laws, statues, ordinances, standards, codes, rules, ordinances, resolutions, orders, or requirements adopted or implemented under color of law, in effect at any point during the term of Contract, pertaining to: Project, performance of Work by Contractor and/or those operating for or on behalf of Contractor, operation and occurrences on Project Site; use, occupancy, and/or condition of Laydown Area(s) and Contract Documents.

Award: The acceptance, by City, of the successful Bidder's proposal.

Backland: The area of a marine terminal’s property behind the wharf where cargo, containers, chassis and other equipment are stored and other non-water invasive equipment and facilities are located.

Bidder: The person, firm, or corporation submitting a bid for Work.

Board: Board of Harbor Commissioners; the body vested with the control and management of Harbor Department of City of Los Angeles, as created by and operating under City Charter.

01000.01 Cont'd.

Business Day: Monday, Tuesday, Wednesday, Thursday, and Friday during working hours (8 am to 5 pm with a non-paid 1-hour break), with the exception of City of Los Angeles holidays.

Calendar Day: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday. The term day(s) whether used on Drawings or Specifications are consecutive Calendar Days unless otherwise specified.

Changes in Work: A written order from City to Contractor covering changes in Drawings, Specifications, or Bid Proposal Line Items quantities and establishing the basis of payment and Contract Time adjustments, if any, for Work affected by such changes. Change Orders (COs) as defined in Cost-Plus Change Work Order (Change Orders) Subsection of this Section, and Authorities for Adjustment (AFAs) as defined in Authority for Adjustments Subsection of this Section, is considered to be Changes in Work.

City: City of Los Angeles, California.

Consultant: A firm under contract or agreement with Department to perform services.

Contamination: A spill, discharge, or release of any Environmentally Regulated Material.

Contract Documents: "Contract Documents" shall consist of Notice Inviting Bids, Information for Bidders, Bidding Documents, Contract, Performance Bond, Payment Bond, Affidavits of Completion, SBE/VSBE/MBE/WBE/DVBE/OBE/LBE Information, and Contract Documents Sections of this Specification No. 2837 together with Contractor supplied documents required by these sections, and Specifications, Drawings, standard plans, and reference specifications referenced in Specifications or on Drawings, the appendices, addenda, permits, and Changes in Work.

Contract: The written agreement executed by Contractor and City covering Work not to exceed three (3) years commencing on Effective Date.

Contractor: The individual, firm, or corporation with whom Contract is made, or its legal representative.

Contract Time: The number of Calendar Days, stated in Contract Time Article of CONTRACT Section, allowed for completion of Work including any maintenance or plant establishment period and authorized time extensions. The first Notice to Proceed (NTP) shall specify the date on which Contract Time begins.

days: See definition for Calendar Day.

01000.01 Cont'd.

Department: Harbor Department of City of Los Angeles.

Drawings: The official drawings or exact reproductions approved by Engineer, which show Project Site and any Laydown Area(s), character, dimensions, and details of Work.

Effective Date: The date of execution of Contract by Executive Director upon authorization of Board, subject to the provisions of Charter Section 245 of City of Los Angeles.

Engineer: Chief Harbor Engineer of Construction Division of Department or designated representative.

Environmentally Regulated Material: Any material, pollutant, hazardous or toxic substance, material, or waste at any concentration, that is or becomes regulated by the United States, the State of California, or any local or governmental authority having jurisdiction over Project Site and any Laydown Area(s) and/or Contractor's undertaking of Work. Environmentally Regulated Materials shall mean: (i) "hazardous substance" as defined by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); (ii) "hazardous waste" as defined in Resource Conservation and Recovery Act (RCRA); (iii) Any pollutant, contaminant, or hazardous, dangerous, or toxic chemical, material, or substance, within the meaning of any other applicable federal, state, or local law, regulation, ordinance, or requirement (including consent decrees and administrative orders imposing liability or standard of conduct concerning any hazardous, dangerous, or toxic waste, substance, or material, now or hereinafter in effect); (iv) Radioactive material, including any source, special nuclear, or byproduct material as defined in the Atomic Energy Act of 1954 (42 USCS §§ 2011 et seq.) in its present or successor form; (v) Asbestos in any form or condition; (vi) Polychlorinated biphenyls ("PCBs") and any substance or compound containing PCBs; and (vii) Petroleum products.

Executive Director: Executive Director of Department or designated representative.

Inspector: An authorized representative of Engineer assigned to make all necessary inspections and tests of Work performed and being performed, and of the materials furnished and being furnished by Contractor.

Landside: Project activity approach from land, for example, pile driving from landside.

01000.01 Cont'd.

Laydown Area(s): Specific area or real property, ground, pavement, or water access expressly identified either on Drawings if applicable or in writing by Executive Director, located near or at Project Site, designated for the following uses and no others: delivery, storage, and handling of the materials and equipment to be installed or constructed as part of Work, field offices, parking, and access.

Notice of Award: The letter informing Contractor that Award of Contract has been made. The date on the Notice of Award starts the 30-day period for execution of Contract and the 14-day period for submittal and approval of acceptable bonds and insurance.

Notice(s) to Proceed: The letter(s) from Engineer which notify(ies) Contractor of the effective date Contract Time shall begin, and authorizes Work or items of Work to be started.

Project: The structure or improvement to be constructed in whole or in part, through the performance of Contract.

Project Site: The entire area of real property on which Work is to be performed. Area or areas where Project materials and equipment, as described in NOTICE INVITING BIDS Section and SUMMARY OF WORK Section of Specifications are installed or constructed.

Proposal: The written offer of Bidder (when submitted on the approved proposal form) to furnish the necessary materials, and perform Work in accordance with Contract Documents.

Specifications: The portion of Contract Documents containing written technical descriptions, instructions, provisions, general conditions, supplementary conditions, and detailed requirements pertaining to materials, methods, and manner of performing Work and to the quality of Work to be furnished and installed under Contract. Standards for specifying materials and testing which are cited in Specifications by reference shall have the same force and effect as if included in Contract Documents.

Substantial Completion: Upon satisfactory completion of Work, Engineer shall issue a Substantial Completion letter to Contractor to indicate a stop in Contract Time and that Work is acceptable for its intended use. Such Substantial Completion letter may include a list of punch list items that must be completed by Contractor prior to final acceptance of Work by Department.

Superintendent: Contractor's executive representative who is present on Project Site and any Laydown Area(s) during construction, authorized to receive and fulfill instructions from Engineer, and who shall supervise and direct the construction.

01000.01 Cont'd.

Waterside: Project activity approach from water, for example, pile driving from waterside.

Work: The furnishing of labor, materials, tools, equipment, and incidentals necessary and convenient to Contractor's performance of all duties and obligations imposed by Contract. Unless otherwise noted, Work shall be performed on Project Site and any Laydown Area(s).

02 TIME FOR SUBMITTAL OF BONDS

a Within 14 days of Notice of Award, and prior to, or concurrently with execution of Contract, Contractor shall furnish City a performance bond and a payment bond.

03 PERFORMANCE BOND

a A satisfactory performance bond in a form approved by the City Attorney shall be furnished as a guarantee of the faithful performance of Contract in the sum of 100 percent of the total amount of Contract.

b The form of bond is included in Section 00070.

c No payment shall be made to Contractor until Contractor's performance bond has been approved by the City Attorney.

04 PAYMENT BOND

a If bid exceeds $25,000, a satisfactory payment bond in a form approved by the City Attorney shall be furnished in the sum of 100 percent of the total amount of Contract to secure payment of all claims, demands, liens or charges of the State of California, of material suppliers, mechanics, or laborers employed by Contractor or by any subcontractor.

b The form of bond is included in Section 00074.

c No payment shall be made to Contractor until Contractor's payment bond has been approved by the City Attorney.

05 RESPONSIBILITY FOR LOSS

a During use and occupancy of Project Site and any Laydown Area(s) and progress of Work under Contract and until its final acceptance, Contractor shall have the charge and care thereof and shall take every necessary precaution against injury or damage to any part thereof by the action of the elements, or from any other cause whatsoever whether arising from the execution or from the non-execution of Work.

01000.05 Cont'd.

b Contractor shall, at Contractor's sole cost and expense, except as provided in Paragraph c of this Subsection, rebuild, repair, restore and make good all injuries or damages to any portion of Work from any and all causes before its completion and final acceptance, and shall deliver Work complete in accordance with the terms of Contract.

c Contractor shall not be required to pay more than 5% of the contracted amount to rebuild, repair, restore, and make good all injuries or damages to any portion of Work, built in accordance with accepted and applicable building standards, Drawings, and Specifications, that has been damaged by an earthquake in excess of a magnitude of 3.5 on the Richter scale or tidal wave.

06 PREVAILING WAGES

a Contractor shall pay the general prevailing rate of per diem wages and rates for legal holiday and overtime work currently being paid in the area where Work is being performed.

b Pursuant to the provisions of the Labor Code of the State of California, the general prevailing rate of wages for each craft, classification or type of workers needed in the execution of contracts under the jurisdiction of Board, shall be those rates as determined by the Director of the Department of Industrial Relations of the State of California. Copies of the applicable Determinations by the said Director are on file in Construction Division and are hereby incorporated and made a part hereof the same as though fully set forth herein. Copies of the applicable Determinations may be obtained at or by request to Department.

c When Contractor has been determined to be in violation of Section 377 of City Charter making applicable the provisions of the California Labor Code relating to the payment of not less than the prevailing per diem wages on public works, deductions may be made from moneys due or to become due Contractor in the amount of twice the difference between such stipulated prevailing rates, and the amount paid to each wage worker for each Calendar Day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate.

d Contractor shall also comply with Section 1775 of the Labor Code providing for a penalty per day as determined by the Labor Commissioner for each Calendar Day, or part thereof, for which each worker was paid less than the prevailing wage.

01000.06 Cont'd.

e Contractor and subcontractors shall keep an accurate record showing the names and occupations of all workers employed by them in connection with any Work done under Contract, and the per diem wages paid to each of such workers, and shall keep such record open at all reasonable hours to the inspection of Board and to the State Division of Labor Law Enforcement. Contractor in all other respects shall comply with Section 1776 of the Labor Code.

f No later than the end of the work day following the day on which Work was performed by Contractor, or any subcontractor, Contractor and applicable subcontractor(s) shall complete and furnish Contractor Daily Field Report, included as Subsection 67 of this Section, to Inspector. When Work has been performed, Contractor shall submit a form regarding all employees and equipment at Project Site and any Laydown Area(s) on the work day, and Contractor shall submit a separate form for each subcontractor regarding each subcontractor's employees and equipment at Project Site and any Laydown Area(s) on the work day. Each field report shall:

1 Identify Project title, Specification number, name of Contractor or subcontractor, and date on which Work was performed.

2 Show the names of the workers and identify their applicable company affiliation (Prime Contractor, subcontractor, supplier, or vendor).

3 Show the labor classification for each worker. If worker is an operating engineer or teamster, Contractor or subcontractor must indicate which piece of equipment was operated by the worker.

4 Show the Start Time and End Time for the worker listed, as well as the total hours worked by the worker on the work day.

5 Show the type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable, utilized on the work day.

6 Contain the printed name and title for Contractor or subcontractor representative, and shall be dated and signed by same.

g Contractor shall submit the original (wet signature by Contractor or subcontractor) to Inspector for review. If additional space is needed, a second form, with pages numbered accordingly, can be completed.

01000.06 Cont'd.

h Inspector shall compare Inspector's records with the report submitted by Contractor, discuss any apparent discrepancies with Contractor, and reconcile the report (and have it re-submitted, if necessary). Once the report is agreed upon by Contractor and Inspector, Inspector prints his/her name on the report and dates and signs the report. Each party shall retain a copy of the report, signed by both parties.

i Certified payrolls from Contractor and all subcontractors shall be submitted to City weekly through the Department of Public Works Bureau of Contract Administration's Online Certified Payroll System (OCPS) and shall be accompanied by a Statement of Compliance, signed electronically on OCPS by Contractor or Contractor's agent attesting that the payrolls are correct and complete and the wage rates contained therein are not less than those set by the applicable wage determinations incorporated into Contract. City reserves the right to reject incomplete payroll reports and request re-submittal of complete reports.

07 WAGE AND EARNING ASSIGNMENT ORDERS/NOTICES OF ASSIGNMENTS

a Contractor and its subcontractors shall comply with all applicable state and federal employment reporting requirements for Contractor's and/or subcontractor's employees.

b Contractor and/or subcontractor shall certify that the principal owner(s) are in compliance with any Wage and Earnings Assignment Orders and Notices of Assignment applicable to them personally. Contractor or subcontractor shall comply with all lawfully served Wage and Earnings Assignment Orders and Notices of Assignments in accordance with California Family Code §§5230 et. seq. Contractor or subcontractor shall maintain such compliance throughout the term of Contract.

08 WORKING HOURS

a To minimize impacts to building operations, Work shall be performed outside of regular work hours on nights and weekends as described below. Work on-site during this time period shall be defined as Work Session.

b Work shall be accomplished during weekday (Monday through Friday) and weekends (Saturday and Sunday) nighttime hours (6 pm ~~8 pm~~ to 6 am ~~5 am~~) and shall be part of the base bid of Contract. Work shall not:

1 conflict with noise laws, ordinances, regulations, City code, or
2 create unsafe working conditions or poor quality control provisions.

c Requests for work on weekends (Saturday and Sunday) ~~during daytime hours (8 am to 5 pm)~~ or City holidays shall be made in writing to Engineer 48 hours prior to the desired start of work.

09 APPRENTICE UTILIZATION ON PUBLIC WORKS

a Contractor shall comply with the Provisions of Labor Code, State of California, Section 1777.5 relating to apprentice employment and training. Contractor shall assume full responsibility for compliance with said Section with respect to all apprenticeable occupations upon Project.

b Section 1777.5 does not apply to prime contracts involving less than $30,000.

10 NON-DISCRIMINATION PROVISIONS

a Contractor shall agree to City of Los Angeles Non-discrimination provisions as provided in Subsections 00030.03 and 00030.04 of BIDDING DOCUMENTS Section.

11 BOARD RIGHT TO TERMINATE CONTRACT

a Board may terminate Contract at its own discretion without liability to Contractor for damages when conditions encountered during Work make it impossible or impracticable to proceed, or when City is prevented from proceeding with Contract by act of God, by law, or by official action of a public authority.

b Upon termination, Contractor may receive payment on the basis shown below in consideration of its irrevocable written agreement to release any and all claims and/or causes of action against City arising out of or related to such termination and to indemnify and hold City harmless from any and all liability, claims and/or causes of action arising from or related to such termination. City shall prepare such written agreement.

1 <u>Termination occurs prior to the Notice to Proceed date</u>
Subject to Contractor's full satisfaction of the requirements of Paragraph b of this Subsection, Contractor shall be entitled to payment as shown below.

01000.11 Cont'd.

Value of Contract	Payment Due to Contractor
$0 to $1,000,000	10% of Contract amount
$1,000,001 to $5,000,000	$100,000 plus 5% of Contract amount above $1,000,000
$5,000,001 to $10,000,000	$300,000 plus 2.5% of Contract amount above $5,000,000
$10,000,001 to $50,000,000	$425,000 plus 1% of Contract amount above $10,000,000
$50,000,001 to $100,000,000	$825,000 plus 0.5% of Contract amount above $50,000,000
Above $100,000,000	$1,075,000 regardless of Contract amount

2 Termination occurs after the Notice to Proceed date

Subject to Contractor's full satisfaction of the requirements of Paragraph b of this Subsection, Contractor shall be entitled to the estimates and payment for all Work done to the date of termination, if any, plus a percentage of the value of Work remaining (determined by subtracting payments made, or due, from Contract price), as shown below.

Value of Work Remaining	Payment Due to Contractor
$0 to $1,000,000	10% of value of Work remaining
$1,000,001 to $5,000,000	$100,000 plus 5% of value of Work remaining above $1,000,000
$5,000,001 to $10,000,000	$300,000 plus 2.5% of value of Work remaining above $5,000,000
$10,000,001 to $50,000,000	$425,000 plus 1% of value of Work remaining above $10,000,000
$50,000,001 to 100,000,000	$825,000 plus 0.5% of value of Work remaining above $50,000,000
Above $100,000,000	$1,075,000 regardless of value of Work remaining

12 ASSIGNMENTS

a Contractor shall not assign, transfer, convey, sublet, or otherwise dispose of Contract, or rights, title or interest in or to the same or any part thereof, without the previous consent in writing of Executive Director endorsed upon or attached to the copies of Contract filed in Office of Board of Harbor Commissioners.

01000.12 Cont'd.

b Nothing herein contained shall be construed to hinder, prevent or affect an assignment by Contractor for the benefit of Contractor's creditors; and no right under Contract shall be asserted against City, in law or in equity, by reason of any so-called assignment of Contract, or any part thereof, unless authorized as aforesaid by the written consent of Executive Director.

c Any assignment of money shall be subject to all proper setoffs and withholdings in favor of City and to all deductions provided for in Contract. All money withheld whether assigned or not, shall be subject to being used by City for completion of Work, should Contractor be in default.

13 CANCELLATION FOR DEFAULT

a If Contractor fails to begin Work within the time stipulated, or if Work to be done under Contract is abandoned by Contractor, or if Contract is assigned or Work sublet by Contractor otherwise than as herein specified, or if at any time Engineer shall be of the opinion, and shall so certify in writing to Executive Director, that the performance of Contract is unnecessarily or unreasonably delayed, or that Contractor is willfully violating any of the conditions or covenants of Contract or is executing the same in bad faith, or not in accordance with the terms thereof, Executive Director may notify Contractor not to resume, or to discontinue, all Work, or any part thereof, under Contract, by a written notice served upon Contractor.

b Executive Director shall advise the bondsperson(s) or surety(ies) guaranteeing faithful performance of Contract, of the suspension and reasons therefor, and shall notify said bondsperson(s) or surety(ies) that they shall be given fourteen days within which to arrange for the completion of Work in accordance with the terms and provisions of Contract by another contractor or firm of contractors, satisfactory to Executive Director. If such bondsperson(s) or surety(ies) requests additional time in which to arrange for completion of Work, Executive Director may, in its sole and absolute discretion, extend such time period; however, Executive Director is under no obligation to do so.

c Should the bondsperson(s) or surety(ies) fail to effect satisfactory arrangements within the period hereinbefore stipulated, Executive Director shall thereupon have the right without further notice, to exclude Contractor, bondsperson(s) or surety(ies) and any subcontractor or employee upon the line of work from Project Site and any Laydown Area(s) and take possession of all material and equipment, and complete Work by City forces or by letting the unfinished Work to another contractor, or by a combination of such methods.

01000.13 Cont'd.

d The cost of completing Work shall be charged against Contractor and the surety or bondspersons to the extent of their liability. If Department is required to complete Work or satisfy other Contract obligations because of the surety or bondspersons' failure to comply with the bond obligations, then bondspersons or surety shall, nevertheless, immediately reimburse City all costs in excess of Contract amount which City is obligated to pay in order to complete Work. If surety or bondspersons fail to pay such amount immediately upon City's demand, then City shall be entitled to collect interest from bondspersons or sureties on the amounts City is required to pay excess of Contract amount. The interest rate which surety or bondspersons shall pay shall be 2% in excess of the interest rate charged by Bank of America from time to time for prime commercial loans of ninety (90) day maturities. The interest rate shall accrue on all amounts City has had to pay excess of Contract amount from the date of City's payment. Engineer's certificate as to the amount of Work done, the cost, and the excess cost, if any, of completing Work specified by Contract shall be conclusive and binding upon Contractor's assignees and sureties.

e If the surety or bondspersons assumes any part of Work, it shall take Contractor's place in all respects for that part, and shall be paid by City for all work performed by it in accordance with Contract. If the surety or bondspersons assumes the entire Contract, all money due Contractor at the time of Contractor's default shall be payable to the surety as Work progresses, subject to the terms of Contract.

f In lieu of the provisions of this Subsection for setting aside Contract and completing Work for proper cause, City may pay Contractor for the parts already done according to the provisions of Contract and Specifications and may treat the parts remaining undone as if they had never been included or contemplated by Contract. No claim under this provision shall be allowed Contractor for prospective profits on work uncompleted by Contractor.

g The provisions of this Subsection shall be in addition to all other rights and remedies available to City under law.

14 OTHER CONTRACTS

a City reserves the right to have Work done in or about Project Site and any Laydown Area(s) as provided for in Contract, by persons, firms, or corporations other than said Contractor, or to perform the same by force account under the direction and supervision of Engineer.

b Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate Work with others.

c If any part of Contractor's Work depends upon the work of any other contractor for proper execution or results, Contractor shall inspect and promptly report to Engineer any defects in such work that render it unsuitable for such proper execution and results. Failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper.

15 CONTRACT DOCUMENTS COMPLEMENTARY

a Contract Documents are intended to be complementary and to describe and provide for a complete Project. Anything in Specifications and not on Drawings; or on Drawings and not in Specifications, shall be considered as though shown or mentioned in both.

b Information included by specific reference in any of Contract Documents shall be a part of Contract Documents as though reproduced in entirety in the document where the reference occurs.

c While it is believed that much of the information pertaining to conditions which may affect the cost of Work shall be shown on Drawings or indicated in Specifications, City does not warrant the completeness or accuracy of such information. It is Contractor's responsibility to ascertain the existence of any conditions affecting the cost of Work which would have been disclosed by reasonable examination of Project Site and any Laydown Area(s) and Contract Documents.

d All contact information, website addresses, and related references are provided for convenience only, but it is Contractor’s responsibility to obtain the current applicable phone numbers, addresses, and websites in the event that those provided are no longer current.

16 PRECEDENCE OF DOCUMENTS

a If there is a conflict between Contract Documents, the document listed herein as higher in precedence shall control.

b The precedence shall be as follows (ranking 1 as highest):
1 Permits and Permit Documents
2 Specifications (in total)
3 Drawings
4 Standard Plans
5 Reference Specifications

c Authorizations for Adjustments, Cost-plus Change Orders, supplemental agreements, and approved revisions to Drawings and Specifications shall take precedence over documents listed.

d Detailed and large-scale Drawings shall have precedence over general and small-scale Drawings. Drawings shall have precedence over shop drawings.

e Reference drawings are included for information only. Such information is given as being the best factual information available without the assumption of responsibility for its accuracy or for any conclusions that Contractor might draw therefrom.

17 STANDARD SPECIFICATIONS

a Standard Specifications, such as ASTM, ACI, and ANSI, referenced herein shall be of the edition and supplements current as of the date of advertising for bids unless otherwise specified herein.

18 REFERENCE SPECIFICATIONS

a Whenever the words "Reference Specifications" (sometimes abbreviated RS) are used, either in Specifications, or on Drawings, it shall mean "GREEN BOOK - STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION," edition and supplements current as of the date of advertising for bids unless otherwise specified herein.

19 ELECTRONIC COPIES OF CONTRACT DOCUMENTS FURNISHED

a Engineer shall furnish to Contractor, free of charge, electronic files in pdf format of Contract Documents reasonably necessary for the execution of Work.

b These Contract Documents are the property of Department, and shall not be reused on other work.

20 RESPONSIBILITY OF COSTS AND MATERIALS

a Unless otherwise specifically stipulated elsewhere in Contract Documents, Contractor shall provide at its sole cost and expense all materials, labor, water, tools, equipment, light, power, transportation, and other facilities, utilities, and incidentals necessary for the execution and completion of Work.

b Unless otherwise specifically stipulated elsewhere in Contract Documents, all materials, parts, and equipment incorporated in permanent Work shall be new and free from defects.

21 SHOP DRAWINGS AND MATERIALS SAMPLES

a Shop drawings shall consist of drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data prepared by Contractor or any subcontractor, manufacturer, supplier or distributor, to illustrate some portion of Work not covered in necessary detail by Drawings furnished by Department.

b Samples shall consist of physical examples required by Contract to be furnished by Contractor to illustrate materials, labor, and equipment to conform to Specifications, and to establish standards by which completed Work shall be judged for acceptability. These samples are distinguished from test samples obtained for laboratory analysis and destructive testing.

c Contractor shall review and stamp with approval and submit with reasonable promptness and in orderly sequence so as to cause no delay in Work or in the work of any other contractor, all shop drawings and samples required by Contract Documents and subsequently by the course of construction.

d By approving and submitting shop drawings and samples, Contractor thereby represents that it has determined and verified all field measurements, field construction criteria, materials, catalog numbers and similar data, or shall do so, and that each shop drawings and samples has been checked and coordinated with the requirements of Work and of Contract Documents.

01000.21 Cont'd.

e Engineer shall review and approve shop drawings and samples only for conformance with the design concept of Project and with the information given in Contract Documents. Review time shall be 28 Calendar Days, unless otherwise stated in Specifications. The time for City to review items does not commence until Contractor's submittal (or re-submittal, addressing Engineer's corrections/comments resulting from Engineer's review of previous submittal) is complete. Engineer's approval of a separate item shall not indicate approval of an assembly in which the item functions. One copy of all submittals shall be returned to Contractor.

f At the time of submission, Contractor shall inform Engineer, in writing, of any deviation in the shop drawings and samples from the requirements of Contract Documents.

g Contractor shall make any corrections required by Engineer and shall resubmit the required number of corrected copies of shop drawings and samples until approved. Contractor shall direct specific attention in writing to revisions on resubmitted shop drawings other than the corrections requested by Engineer on previous submissions.

h Engineer's approval of shop drawings and samples shall not relieve Contractor of responsibility for any deviation from the requirements of Drawings and Specifications found in the shop drawings and samples unless Contractor has informed Engineer in writing of such deviation at the time of submission and Engineer has given written approval of the specific deviation in letter form separately from any notations on the shop drawings. Engineer's approval shall not relieve Contractor of any responsibility for errors or omissions in the shop drawings and samples.

i No portion of Work requiring shop drawing and sample submission shall commence until the submission has been approved by Engineer. All such portions of Work shall be in accordance with approved shop drawings and samples.

j The cost of furnishing shop drawings and samples shall be considered as included in the prices bid for Work and no addition to Contract price shall be made therefor.

22 SOURCE INSPECTIONS AND SAMPLES FOR TESTING

a Unless otherwise specified, inspection is required at the source for asphalt concrete paving mixtures, structural concrete, metal fabrication, metal casting, welding, concrete pipe manufacture, concrete piles, steel piles, steel pipes, sheet steel piling, protective coating application, and similar shop or plant operations. Steel pipe in sizes less than 18 inches in diameter and vitrified clay and cast iron pipe in all sizes are acceptable upon certification as to compliance with Specifications, subject to sampling and testing by Engineer. Standard items of equipment such as electrical motors, conveyors, elevators, plumbing fixtures, and other similar equipment, are subject to inspection at Project Site and any Laydown Area(s). Special items of equipment such as designed electrical panel boards, large pumps, gangways, floating docks, marine fenders, and other similar equipment, are subject to inspection at the source.

b Before incorporation in Work, Contractor shall submit samples of materials required by Contract Documents. Contractor shall deliver the materials for testing to the place and at the time designated by Engineer.

c Contractor shall notify Engineer in writing at least 15 days in advance, of Contractor's intention to use materials for which tests may be necessary, to allow sufficient time to perform the tests. The notice shall name the proposed supplier and source of the materials.

d Unless otherwise specified, all testing and inspection within 75 miles of Department Administration Building shall be performed by Engineer, at no expense to Contractor.

e Unless otherwise specified, when Contractor intends to purchase materials, fabricate products, or equipment from sources located more than 75 miles from Department Administration Building, an independent inspector or accredited testing laboratory (approved by Engineer), shall be provided by Contractor at Contractor’s sole cost and expense, to inspect and test the materials, equipment, or process. Approval of the independent inspector or accredited testing laboratory shall be obtained before producing any material or equipment. The independent inspector or accredited testing laboratory shall evaluate the materials for conformance with the requirements of Drawings and Specifications. The independent inspector or accredited laboratory shall forward evaluation and test reports to Engineer, with copies provided to Contractor. No materials or equipment shall be shipped nor shall any processing, fabricating, or treating of materials be done without proper inspection by the independent inspector or accredited testing laboratory. Approval by the independent inspector or accredited testing laboratory shall not relieve Contractor of responsibility for complying with the requirements of Contract Documents.

01000.22 Cont'd.

f Testing of the materials furnished by Contractor shall be made by Engineer in accordance with commonly recognized standards or national organization and such special methods and tests as are in use by Engineer in accordance with provisions of Specifications. If materials should fail any tests, retesting shall be performed by Engineer and paid for by Contractor.

g Engineer may waive the materials testing and inspection requirements of Specifications and accept the manufacturer's written certificate of compliance that the materials to be supplied meet the requirements. Materials test data may be required by Engineer to be included with the submittal.

23 DEFECTIVE MATERIALS AND CONSTRUCTION

a Materials and labor not conforming to the requirements of Specifications shall be considered defective and shall be subject to rejection. Defective Work or materials, whether in place or not, shall be removed immediately from Project Site and any Laydown Area(s) by Contractor, when so directed by Engineer.

b Contractor shall be required, at Contractor's sole cost and expense, to replace any inferior material, or correct any imperfect Work whenever discovered, as ordered by Engineer.

c If Contractor fails to replace any defective or damaged Work or material after reasonable notice, Engineer may withhold payments until the defective or damaged Work or material is replaced.

d No material furnished or Work to be done is to be considered as accepted which may be defective or deficient in any of the requirements of Specifications, whether or not due to any negligence of Inspector, or other authorized person, to point out such defect or deficiency during the execution of Contract.

24 PROTECTION OF MATERIALS

a Contractor shall provide and maintain storage facilities and employ such measures as shall preserve the specified quality and fitness of materials to be used in Work. Stored materials shall be reasonably accessible for inspection. Contractor shall also adequately protect new, existing Work and all items of equipment until completion of Contract and acceptance by Executive Director.

b Contractor shall be held responsible for all materials furnished by City after such are delivered at Project Site and any Laydown Area(s) and deductions shall be made from any money due or to become due Contractor to make good any shortages and deficiencies from any cause whatsoever which may result after such delivery, or for any demurrage charges due to delinquency in unloading. In case of suspension of Work from any cause whatever, Contractor shall be responsible for all materials whether furnished by Contractor or by City, and shall properly store such if necessary.

25 AUTHORITY OF ENGINEER

a Board has the final authority in all matters affecting Work covered by Contract Documents. Within the scope of Contract, Engineer shall have the authority to enforce compliance with Contract Documents. Contractor shall promptly comply with instructions from Engineer and Engineer shall have the executive authority to enforce and make effective such decisions and orders.

b On all questions relating to quantities, the acceptability of material, equipment, or Work, the execution, progress or sequence of Work and the interpretation of Contract Documents, the decision of Engineer is final and binding, and shall be precedent to any payment under Contract, unless otherwise ordered by Board.

26 SUBSURFACE DATA AND PHYSICAL CONDITIONS

a Engineer shall make available all information in Department's possession on subsoil conditions in the vicinity of Work. Any additional subsurface exploration shall be done by Contractor at Contractor's sole cost and expense.

b All soil test hole data, water table elevations, and soil analyses apply only at the location of the test holes and to the depths indicated. The indicated elevation of the water table is that existing at the date the test hole data was determined. A difference in elevation between groundwater shown and groundwater actually encountered during construction shall not be considered as a basis for extra compensation.

01000.26 Cont'd.

c Contractor shall promptly, and before such conditions are disturbed, notify Engineer in writing of: 1) Subsurface or physical conditions at Project Site and any Laydown Area(s) differing materially from those indicated in Contract Documents or as given by survey points and instructions, 2) Unknown physical conditions at Project Site and any Laydown Area(s), of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in Contract, or 3) Material that Contractor has suspected to possibly be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law. Engineer shall promptly investigate the conditions, and if Engineer finds that such conditions do so materially differ, or do involve hazardous waste and cause an increase or decrease in the cost of, or the time required for, performance of Contract, an equitable adjustment shall be made in accordance with applicable Contract provisions. Any request by Contractor for adjustment hereunder shall not be allowed unless written notice as herein required has been given. In the event that a dispute arises between City and Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in Contractor's cost of, or time required for, performance of any part of Work, Contractor shall not be excused from any scheduled completion date provided for by Contract but shall proceed with all Work to be performed under Contract. Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

27 PROTECTION OF EXISTING UTILITIES

a Contractor is responsible for the protection of utilities and pipelines shown on Drawings, or otherwise made known to Contractor, which are designated to be protected or to remain in service. If service is interrupted, or utilities damaged by Contractor's operations, Contractor shall restore service and repair the utility to the satisfaction of the owner at Contractor's sole cost and expense.

28 HARBOR DATUM

a All depths and elevations given in Specifications or shown on Drawings are referenced to the plane of the National Geodetic Vertical Datum of 1929 (NGVD 29), Mean Lower Low Water (MLLW) which is assumed as elevation 0.00.

01000.28 Cont'd.

b The approximate range of tides, based on this datum is as follows:

Lowest Tide	-2.5 feet
Mean Lower Low Water	0.0 feet
Mean Sea Level	+2.8 feet
Mean Higher High Tide	+5.4 feet
Highest Tide	+7.5 feet

29 SURVEYING AND STAKING

a Unless otherwise specified, Engineer shall provide and be responsible for surveying needed to construct Project. Contractor shall be responsible for preserving construction survey stakes and marks for the duration of their usefulness. If any construction survey stakes are lost or disturbed and need to be replaced, such replacement shall be by Engineer at the sole cost and expense of Contractor.

b Contractor shall notify Engineer at least two working days before survey services shall be required in connection with the laying out of any portion of Work. Contractor shall dig all holes necessary for line and grade stakes.

c Unless otherwise specified, stakes shall be set and stationed by Engineer for curbs, headers, sewers, storm drains, rough grade, and a corresponding cut or fill to finished grade (or flow line) indicated on a grade sheet.

d Grades for underground piping and conduit shall be set at the surface of the ground. Contractor shall transfer them to the bottom of the trench.

e For all buildings and structures, including wharves, Engineer shall furnish land surveys, base lines, and stakes for locating the principal component parts of Work together with a suitable number of bench marks. Contractor shall develop and make all detail surveys, lines, and elevations as necessary.

f Contractor shall check all the dimensions as a whole and in detail, and shall layout and become responsible for the exact position and elevation of all part of the structures.

30 INSPECTION OF WORK

a All Work done and all material furnished shall be subject to the inspection and approval of Engineer, and Contractor shall perform Work only in the presence of Engineer.

b Work done without proper inspection shall be subject to rejection. Engineer shall at all times have access to Work during its preparation and construction. Contractor shall furnish to Engineer equipment and facilities required for inspection of Work in accordance with the requirements and intentions of Contract Documents.

c The inspection of Work shall not relieve Contractor of any obligation to fulfill all conditions of Contract as prescribed.

d If any Work should be covered up without approval or consent of Engineer, it must, if required by Engineer, be uncovered for examination and properly restored at Contractor's sole cost and expense.

e Re-examination of any Work may be ordered by Engineer, and, if so ordered, Work must be uncovered by Contractor. If such Work is found to be in accordance with Contract Documents, City shall pay the cost of the re-examination and replacement Work. If such Work is not in accordance with Contract Documents, Contractor shall pay such costs.

31 FIELD OFFICE TRAILER AND FIELD PERSONNEL

a Contractor shall be responsible for providing, maintaining, and paying all costs associated with administering and managing Contract, including field and home office personnel, materials, equipment, tools, construction trailers, and any other items necessary until the end of Contract Time including maintenance or plant establishment period.

b Contractor shall provide at all times during construction a competent Superintendent and necessary assistants satisfactory to Engineer. Superintendent shall represent Contractor and all direction given to Superintendent shall be binding as if given to Contractor.

c Contractor’s Superintendent shall be assigned solely to Project and be present on Project Site and any Laydown Area(s) for the entire duration of Contract Time including maintenance or plant establishment period. Contractor’s Superintendent shall not be replaced without notifying and obtaining approval of Engineer in writing at least 14 Calendar Days in advance.

d All requests from Contractor for directions, clarifications, or field instructions and all response thereto shall be in writing.

32 CHARACTER OF WORKERS AND DISCIPLINE AMONG EMPLOYEES

a Contractor shall, at all times employ sufficient labor for completing Work in the manner and time required by Contract Documents.

b All workers shall have sufficient skill and experience to properly perform work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform such work satisfactorily.

c Contractor shall at all times enforce discipline and order among employees, and shall avoid employing on Work any person not skilled in the work assigned.

d Any person employed who is found to be incompetent, intemperate, troublesome, disorderly, or who fails or refuses to perform Work properly and acceptably, shall be immediately removed from Work by Contractor and not be reemployed on Work.

33 CHANGES IN WORK

a City reserves the right, without notice to the sureties, at any time during the life of Contract and without invalidating same, to change Drawings, Specifications, character of Work, quantity of Work, or time within which Contract is to be completed, provided the total arithmetic dollar value of all such changes, both additive and deductive, does not exceed 25 percent of the total Contract price. Should it become necessary to exceed this limitation, the change shall be by written supplemental agreement between Contractor and City, unless both parties agree to proceed with the change by Change Order.

b In giving instructions, Engineer shall have authority to make Changes in Work not involving extra cost when such changes are necessary or expedient to the satisfactory performance and completion of Work.

c Engineer, by written order to Contractor, approved by Executive Director, shall have authority to implement Changes in Work, and/or to grant extensions of time, provided that Changes in Work and/or extensions of time which increase or decrease Contract price by more than $150,000 in any one authorization, and all time extensions in excess of one year, shall become effective only after authority is granted by Board.

d Except in an emergency endangering life or property, no Changes in Work involving additions to Contract price shall be made unless in pursuance of such written order, and no claim for an addition to Contract price shall be valid unless the additional Work was so ordered.

34 COST-PLUS CHANGE ORDER WORK (CHANGE ORDERS)

a If it is impossible or impracticable to ascertain the total cost of Changes in Work to be done before such Work is begun, or if no agreement can be reached on Changes in Work and additions to Contract price, then Engineer may issue a Cost-Plus Change Order (Change Orders) instructing Contractor to do Work, indicating expressly and unmistakably the intention to treat the items as Changes in Work, setting forth the kind, character and limits of Work as far as can be ascertained, the terms under which changes to Contract price shall be determined and the estimated total change in Contract price anticipated thereunder. Change Order shall be fully executed by Department and accepted by Contractor before any Work is started on the items covered by the order. Such Change Order shall become the basis for a later Authority for Adjustment when the amount of adjustment to Contract price can be determined, and the prior approval of Change Order shall be considered necessary authority within the limits of the estimated change in Contract price. Without additional authority, no costs exceeding the estimated amount shall be paid.

b Contractor shall maintain records sufficient to distinguish the direct cost of Change Order Work from the cost of other operations.

c Costs in a Change Order shall be determined as follows:

1 Labor costs shall be based on the prevailing wage scale for each craft or type of worker. Cost of payroll taxes and insurance, health and welfare, pension and vacation are allowable, subject to Contractor's submitting adequate documentation to substantiate cost.

2 Material costs shall be the cost of all materials purchased by Contractor and used in Cost-Plus Change Order Work and shall be the actual cost of such materials, including sales taxes, freight and delivery charges. City reserves the right to approve materials and sources of supply of materials furnished by Contractor, or, if necessary, to facilitate the progress of Work, to furnish the materials to Contractor.

3 Contractor shall be allowed rental for the time that machinery or equipment is required based on the applicable Equipment Rental Rates published by the State of California, Department of Transportation, Division of Construction, current on date of performance of Work; when machinery and equipment not so listed is required, a reasonable rental shall be allowed. In addition, Contractor shall be allowed reasonable move-in and move-out charges on heavy equipment.

01000.34 Cont'd.

4 Equipment and tools having a replacement value of $500 or less, whether or not consumed by use, shall be considered small tools and no payment shall be made therefor.

d Contractor shall notify Inspector at the beginning of each day when Change Order Work is being performed. Contractor shall describe the personnel involved, whether by Contractor forces or by its subcontractors at any tier. Failure to notify Inspector prior to the start of Change Order Work serves as Contractor's waiver to claim for compensation on that day.

e At the end of each day when Change Order Work is performed, Contractor [not subcontractor(s)] shall furnish to Inspector, on Port of Los Angeles Construction Division Time and Material Form, reports of Cost-Plus Work for that day. Form is included at the end of this Section.

The reports shall:

1 Identify party (Contractor or subcontractors at any tier) performing Work.

2 Show names of workers, classifications, and hours worked.

3 Describe and list quantities of materials used.

4 Show type of equipment, size, identification number, and hours of operation, including loading and transportation, if applicable.

5 Describe other services and expenditures in such detail as Engineer may require.

An attempt shall be made to reconcile the report daily, and it shall be signed by Inspector, the subcontractor performing Work (if applicable) and Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the report. Reports by subcontractors or others shall be submitted through Contractor.

In the event that more than one Change in Work is performed by Contractor in a Calendar Day, Contractor shall maintain separate records of labor, construction equipment, and materials for each such change. In the event any subcontractor of any tier shall provide or perform any portion of any changed work, Contractor shall require that each such subcontractor maintain records in accordance with this Subsection.

01000.34 Cont'd.

f All Change Order reports to be submitted on the day that Work is performed, shall be signed by the subcontractor (if applicable) and Contractor or authorized representative, and witnessed by Inspector. Engineer's signature on the report shall indicate agreement with the information reflected therein (except when disagreements remain and each party has placed notes as to the disagreement on the form), not that Contractor is entitled to payment of the costs in the report.

g A subsequent report, also on Port of Los Angeles Construction Division Time and Material Form, shall be submitted by Contractor to Engineer within 5 Business Days after the date that Work was performed. In addition to the information included in the report required on the day that Work is performed, this subsequent report shall itemize all costs for labor, materials, and equipment rental and give a total of costs to date for Change Order Work. This report shall be accompanied by all receipts, delivery tickets, and other documentation that verifies the identified costs.

h Engineer shall compare Engineer's records with Contractor's reports, make the necessary adjustments, and compile the costs of Change Order Work. When such corrected reports are agreed upon and signed by both parties, they shall become the basis of payment. The total cost to City for Work covered by Change Order directive shall under no circumstances exceed a price that is reasonable, competitive and fair to City given the amount of and type of Work involved and the circumstances under which the change is performed. In the event that Contractor shall fail or refuse, for any reason, to maintain or make available for inspection, review, and/or reproduction of such records, adjustments to Contract price or Contract Time, if any, on account of any change to Work may be deemed waived for that day. Contractor's obligation to maintain back-up records hereunder is in addition to, and not in lieu of, other Contractor obligations under Contract Documents with respect to Changes in Work.

i Contractor is responsible for tracking costs and for notifying Engineer in writing when costs approach 50% and 75% of the estimated total change in Contract price set forth in Change Order. In addition, if Changed/Extra Work cannot be completed within the estimated total change in Contract price set forth in Change Order, Contractor shall notify Engineer in writing, and in a timely manner, that the limit requires an increase. City shall only reimburse eligible costs up to the estimated total change in Contract price set forth in Cost-Plus Change Order.

j City may authorize and approve payment for necessary services and expenditures other than labor, materials, and equipment rentals.

01000.34 Cont'd.

k Materials, equipment rental, and other costs shall be substantiated by vendors' invoices submitted with the current reports; or, if not then available, shall be submitted with subsequent reports. If vendors' invoices are not submitted within 30 days after completion of the Cost-Plus Work or if in the opinion of Engineer the cost of materials is excessive, then the cost of such items shall be deemed to be the lowest current wholesale prices at which the items are available in the quantities required, delivered to Project Site and any Laydown Area(s), less cash or trade discounts.

35 AUTHORITY FOR ADJUSTMENTS

a An Authority for Adjustment (AFA) is a document that changes Work and adjusts Contract price. An AFA may be utilized in one of the following manners:

1 A written order implementing Changes in Work for which a total cost has been negotiated prior to the issuance of the order. It is issued by Engineer and expressly indicates the intention to treat the items described therein as Changes in Work. It shall also contain the terms and amount of adjustment to Contract price. In this case, AFA shall be issued and executed before any work is started on the items covered by the order.

2 To finalize (or close-out) one or more Change Orders, or Work initially authorized by Change Order.

3 To adjust the estimated quantities of unit price bid items, and contingency items to agree with the actual quantities required. No mark-up fees shall be allowed for these adjustments.

b Mark-up fees in an Authority for Adjustment for paragraphs a, 1 (negotiated AFAs) and a, 2 (finalized Change Orders) above shall be determined as follows:

1 When extra Work is performed by one or more subcontractors other than Contractor, total mark-up fees shall be 15 percent, broken down as follows: 10 percent for the one or more subcontractors performing Work, and 5 percent for Contractor and all upper tier subcontractors, as shown in Example 1 below.

01000.35 Cont'd.

Example 1:

Value of extra Work:	$100,000
Mark-up fees shall be broken down as follows:	
10 percent of value of extra Work for one or more Subcontractors performing Work	$ 10,000
5 percent of value of extra Work for Contractor and all upper tier subcontractors	$ 5,000
Total AFA amount	$115,000

2 When Work is performed by Contractor only, mark-up fees shall be 10 percent, as shown in Example 2 below.

Example 2:

Value of extra Work:	$100,000
Mark-up fees shall be 10 percent of value of extra Work performed by Contractor	$ 10,000
Total AFA amount	$110,000

3 When part of Work is performed by Contractor and part of Work is performed by one or more subcontractors, mark-up fees shall be as shown in Example 3 below.

Example 3:

Value of extra Work:	$100,000
Assume $40,000 performed by Contractor and $60,000 performed by one or more subcontractors.	
For $40,000 performed by Contractor, mark-up shall be 10 percent of value of extra Work performed by Contractor	$ 4,000
For $60,000 performed by one or more subcontractors, mark-up fees shall be as follows:	
10 percent of value of extra Work for one or more subcontractors performing Work	$ 6,000
5 percent of value of extra Work for Contractor and all upper tier subcontractors	$ 3,000
Total AFA amount	$113,000

4 No percentage shall be paid to Contractor for any material furnished by Department. Where the portion of a change involves credit items for Contract Work not being performed by Contractor or subcontractor on any tier, Contract Work not being performed shall be deducted prior to adding the mark-up fee.

01000.35 Cont'd.

5 Mark-up fees shall apply to labor premium time for Change Order Work, when labor premium time is approved by Engineer.

6 Contractor's mark-up fee percentage shall be considered to include all costs over and above the direct cost of the changed Work, including, but not limited to, the cost of preparing and furnishing all required reports and records sufficient to distinguish the direct cost of Change Order Work from the cost of other operations, overhead, profit, bond premium adjustment, insurance, field and office supervision, preparation of estimates, engineering, scheduling, use of small tools, incidental job burdens, general home office expenses, any impact costs, and other miscellaneous costs.

c Should any lump sum bid item be eliminated in its entirety, or otherwise reduced in scope of Work, payment shall be made to Contractor for Contractor's actual costs incurred in connection with the elimination or reduction in scope of Work. Allowances for overhead and profit shall be based on the actual cost incurred and shall be determined pursuant to Cost-Plus Change Order Work (Change Orders) Subsection. Contractor shall not be entitled to retain any overhead or profit mark up for the reduced quantity of Work eliminated by Engineer.

d If material conforming to Drawings and Specifications is ordered by Contractor for use in the bid item prior to the date of notification of elimination or scope reduction by Engineer, and if the order for the material cannot be canceled or returned without charge, payment shall be made to Contractor for the actual cost or charges for the material. In this case, if the material cannot be returned and payment has been made, the material shall become the property of Department. Department shall also pay Contractor reasonable and necessary charges for handling said material.

36 FORCE ACCOUNT WORK

a If no agreement can be reached on Changes in Work and additions to Contract price, or Contractor refuses to accept an Authority for Adjustment or Cost-Plus Change Order, Executive Director shall have the right to have Work in question done by persons, firms or corporations other than Contractor, or to perform the same by utilizing either City's own forces or forces of Contractor on the basis specified in Authority for Adjustments Subsection and Cost-Plus Change Order Work (Change Orders) Subsection of this Section.

37 REQUEST FOR ADDITIONAL COMPENSATION

a If Contractor alleges that instructions issued after the date of Contract shall result in increases in Contract price, Contractor shall give Engineer written notice thereof within seven Calendar Days after the receipt of such instructions, and in any event before proceeding with Work, except in an emergency endangering life or property. The procedure for accounting for costs shall then be as provided in Cost-Plus Change Order Work (Change Orders) Subsection of this Section. No such notice or request for additional compensation resulting therefrom shall be considered unless Contractor complies with the requirements of this Subsection.

b If Contractor submits a request to Engineer, for additional compensation for any kind of extra Work, said request when filed shall include all necessary evidence to support it. Engineer shall have the right to audit Contractor's request, including the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to verify all costs incurred or which may be incurred and for which a request has been submitted. The right to audit shall include the right to inspect Contractor's plants, or such parts thereof as may be or have been engaged in the performance of Contract.

c Contractor further agrees that the right to audit encompasses all subcontracts and is binding upon all subcontractors. The rights to examine and inspect herein provided shall be exercisable through such representatives as Engineer chooses, during Contractor's normal business hours at the office of Contractor. Contractor shall make available to Engineer for auditing all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of records requested to Engineer. Contractor shall keep all such books and records locally.

38 EMERGENCY WORK

a In an emergency endangering life or posing clear and imminent danger of grievous property damage, Contractor, without special instructions or authorization from Engineer, shall act to prevent such loss or injury until such time as Engineer can be contacted for an assessment of the situation. Contractor shall also so act, without appeal, if so authorized or directed by Engineer. Any compensation requested by Contractor on account of such emergency work, shall be determined by negotiation and agreement between Contractor and City.

01000.38 Cont'd.

b Contractor shall maintain records sufficient to distinguish the direct cost of emergency work from the cost of other operations and shall itemize all costs for labor, material, and equipment rental in connection with emergency work.

39 TEMPORARY SUSPENSION OF WORK

a Engineer may at any time suspend Work, or any part thereof, by giving notice to Contractor in writing ordering suspension of Work for such period as deemed necessary when, in Engineer's opinion, the suspension is necessary to protect the interest of City for any reason whatsoever.

b Contractor shall comply immediately with any written order of Engineer suspending Work. Such suspension shall be without liability to Contractor on the part of City excepting only for such liability as specified in Extensions of Time and Compensable Delays Subsection of this Section.

40 UNAUTHORIZED WORK

a Construction or demolition beyond the lines given and grades shown on Drawings, or any extra Work done without written authority, shall be considered as unauthorized and at the sole cost and expense of Contractor, and shall not be measured or paid for. Construction so done may be ordered removed and demolition so done may be ordered restored at Contractor's sole cost and expense.

b Upon failure on the part of Contractor to comply with any order of Engineer made under the provisions of this Subsection, Engineer shall have authority to cause the order to be done by others, and to deduct the costs from any money due or to become due Contractor.

41 CONTRACTOR TO ABIDE BY APPLICABLE LAWS

a At all times in its performance of Contract, Contractor, at Contractor's sole cost and expense, shall comply with all Applicable Laws pertaining to Work, Project Site and any Laydown Area(s). Contractor is presumed to know both the existence and applicability of such Applicable Laws.

b Contractor shall adhere to the provisions of the California Labor Code including but not limited to those provisions concerning minimum wages, the 8-hour day and 40-hour week, overtime, Saturday, Sunday, and holiday work. Contractor shall forfeit to City the penalties prescribed in the California Labor Code for violations.

01000.41 Cont'd.

c Contractor shall have at Project Site, copies, or suitable extracts of: Construction Safety Orders and General Industrial Safety Orders issued by the State Division of Industrial Safety. Contractor shall comply with provisions of these and all other applicable laws, ordinances, and regulations.

42 EXPLOSIVES

a Explosives may be used only when authorized in writing by Engineer, or as otherwise stated in Contract Documents. Explosives shall be handled, used, and stored in accordance with all applicable regulations.

b Engineer's approval of the use of explosives shall not relieve Contractor from the liability or responsibility for claims arising from the use, handling, transportation, or storage of explosives by Contractor or from blasting operations.

43 PROPRIETARY NAMES AND SUBSTITUTIONS

a Whenever any equipment, material, or process is indicated or specified by patent or proprietary name, or by name of manufacturer, such reference is used to establish the type, function, and quality required. Unless the name is followed by words indicating that no substitution is permitted, such references shall be deemed to be preceded by the words "equal and similar to". Contractor may offer any equipment, material, or process for which Contractor submits data supporting that such are substantially equal to that indicated or specified. Final determination of the acceptability of such substitute items shall rest with Engineer. Engineer may consider the strength, appearance, durability, reliability, dimension, finish, efficiency, maintainability, service history, life cycle cost, and other characteristics of the proposed substitute in making that determination.

01000.43 Cont'd.

b A substitute item shall be a standard, catalogued product of a company regularly engaged in the manufacture of such items. No custom or prototype substitutes shall be accepted. Contractor shall certify that a substitute item shall perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance, and be suited to the same use as the specified item. Contractor shall identify all differences between the proposed substitute and that specified, and state whether or not acceptance of the proposed substitute shall require a change in Contract Documents to adapt the design to the proposed substitute. Any redesign or Changes in Work resulting from acceptance of a substitute shall be at the sole cost and expense of Contractor. Contractor shall furnish such data concerning and perform such testing of the proposed substitute as may be required by Engineer to evaluate the substitute item and determine if it is substantially equal. Additional information requested by Engineer shall be furnished by Contractor within 10 Calendar Days of such request.

c Offers of substitute items shall be made within the first 25 percent of Contract Time. Where CONTRACT Section requires multiple Contract Times, offers of substitute items shall be made within the first 25 percent of Contract Time for the items of Work in which the substituted items are proposed to be incorporated. Contractor shall allow Engineer 28 Calendar Days review time to evaluate substitute items unless otherwise stated in Specifications. No extension of Contract Time shall be authorized for any circumstance developing from the provisions of this Subsection. Failure to comply with the provisions of this Subsection shall be sufficient cause for rejection of a proposed substitute.

44 PATENT RIGHTS

a Contractor agrees to save, keep, hold harmless, and fully indemnify City and any of its officers or agents from all damages, cost, or expenses in law or equity that may at any time arise or to be set up for any infringement of the patent rights of any person or persons, or corporations in consequence of the use by City, or by any of its officers or agents, of articles supplied under Contract, and of which Contractor is not the patentee or assignee, or which Contractor is not lawfully entitled to sell.

b The patent fees or royalties on any patented article or process which may be furnished or used in Work shall be considered as included in the cost of the various items of Work and no separate or extra payment shall be made therefor, regardless of whether notice of patent has or has not been included in any of the documents.

45 HOUSEKEEPING AND MAINTENANCE OF SURFACE AREAS OF PROJECT SITE AND ANY LAYDOWN AREA(S)

a Throughout all phases of construction, including suspension of Work, and until final acceptance of Project, Contractor shall keep the surface of Project Site and any Laydown Area(s) clean and free from rubbish and debris. Contractor shall also abate dust nuisance by cleaning, sweeping, and sprinkling with water, or other means as necessary. The use of water resulting in mud on streets and paved areas shall not be permitted as a substitute for sweeping or other methods.

b Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately and the area shall be cleaned.

c Should conditions warrant, Contractor shall furnish and operate a self-loading motor sweeper with spray nozzles as necessary to keep paved areas acceptably clean wherever construction, including restoration, is incomplete.

d Contractor shall not discharge smoke, dust, or any other air contaminants into the atmosphere in such quantity as shall violate the regulations of any legally constituted authority.

e Prior to completion of Work, Contractor shall remove all plant, tools, equipment and materials, and shall thoroughly clean Project Site and any Laydown Area(s) and leave it with a neat, clean appearance to the satisfaction of Engineer.

46 PROTECTION OF HARBOR WATERS

a Contractor shall keep materials away from drainage structures and the harbor. Contractor shall not allow lumber, blocking, chips, loose piles, rubbish, and all flotsam, jetsam, and contaminants of whatever nature to be deposited in harbor waters. If any of the above should be found floating near Project Site and any Laydown Area(s) or submerged which might detrimentally affect navigation or water quality, it shall be immediately removed by Contractor.

47 PROJECT SITE AND ANY LAYDOWN AREA(S) SECURITY

a Contractor shall keep Project Site and any Laydown Area(s) secure at all times. Contractor shall provide the security fencing, either temporary or permanent to meet this requirement.

48 PUBLIC CONVENIENCE AND PROTECTION

a Contractor shall be responsible for protection of public and private property adjacent to Project Site and any Laydown Area(s) and shall exercise due caution to avoid damage to such property.

b The access rights of the public and lessees of adjacent property shall be considered at all times. Unless otherwise authorized, traffic shall be permitted to pass through Work or an approved detour shall be provided.

c Unless otherwise authorized, Work shall be performed in only one-half of a roadway at one time. One-half shall be kept open and unobstructed until the opposite side is ready for use. If one-half a street only is being improved, the other half shall be conditioned and maintained as a detour.

d Contractor shall provide and maintain all necessary barriers, guards, lights, signs, temporary crossings, flag persons and watchpersons, advise the public of detours and construction hazards and comply with all applicable State, County, and City requirements for closure of streets and Federal and State requirements for use of navigable waters. Contractor shall also be responsible for compliance with additional public safety requirements which may arise during construction. Contractor shall furnish and install, and upon completion of Work, promptly remove all signs and warning devices.

e Contractor shall not interfere with navigation.

49 TEMPORARY UTILITIES

a Contractor shall furnish, install, maintain, and remove all temporary light, power, and water, including piping, wiring, lamps, and other equipment, necessary for Work. Contractor shall not draw water from any fire hydrant, except to extinguish a fire, without first obtaining permission from the water agency concerned.

50 SANITATION

a Contractor shall provide and maintain enclosed toilets for the use of employees engaged in Work. These accommodations shall be maintained in a neat and sanitary condition. They shall also comply with all applicable laws, ordinances, and regulations pertaining to the public health and sanitation.

b Sewage flows shall not be interrupted. Should Contractor disrupt existing sewer facilities, sewage shall be conveyed in closed conduits and disposed of in a sanitary sewer system. Sewage shall not be permitted to flow in trenches, be covered by backfill, or flow into Harbor waters.

51 RAILROAD TRACKS

a City does not guarantee that railroad tracks shall be free from trains and standing cars. Contractor shall exercise such care as shall prevent the displacement, injury or obstruction of any railroad tracks encountered in Work. In case it shall be necessary to protect, raise, lower, displace, or remove railroad tracks for the proper construction of Work, Contractor shall notify the operating railroad and obtain all necessary permission to perform the track work, or have Work performed, as the case may require.

52 CONSTRUCTION SCHEDULE

a Unless otherwise specified, Contractor shall submit a proposed construction schedule to Engineer for review not later than 15 Calendar Days after Notice to Proceed. Failure to submit a schedule within the stated time may result in the withholding of the first progress payment.

b The schedule shall identify all major construction elements, their start date and duration and shall reflect completion of all Work under Contract within the specified time and in accordance with Specifications.

c Seven copies of the schedule shall be submitted on substantial paper of a reasonable and convenient size for handling and filing. Language, symbols, and notations shall be those commonly employed in construction scheduling.

d The time base for reporting construction tasks shall be a regular working day taking into consideration all non-working days.

e The time base for reporting milestones shall be Calendar Days.

f The schedule shall be revised and updated monthly to reflect adjusted event dates, activity completions, additions to Work and late completion time. The schedule shall be revised and resubmitted for Engineer's review whenever Contractor desires to make changes in methods of operation, and whenever the schedule fails to reflect the actual progress.

g Contractor shall include the cost of scheduling and updating the schedule in the prices bid for Work.

53 EXTENSIONS OF TIME AND COMPENSABLE DELAYS

a Contractor's obligations for the performance and completion of Contract within Contract Time are of the essence of Contract. Contractor shall complete the performance of Contract within the time stipulated or within such time as may be extended by City pursuant to Changes in Work Subsection of this Section. Contractor shall be responsible for providing, maintaining, and paying all costs associated with administering and managing Contract including field and home office personnel, materials, equipment, tools, construction trailers, and any other items necessary until the end of Contract Time including any maintenance or plant establishment period.

b Extension of time, when granted, shall be based upon the effect of delays to Project as a whole and shall not be granted unless it can be shown that such delays did, in fact, delay the progress of Project as a whole.

c The time of completion shall be extended only if, in the opinion of Engineer, Contractor is necessarily delayed in completing Contract by a cause that meets all of the following conditions:

1 Such cause is beyond Contractor's control and arises without Contractor's fault;

2 Such cause arises after the opening of bids and neither was nor could have been anticipated before bid opening. Tide conditions shall be conclusively deemed to have been anticipated before opening of bids.

3 The effect of such cause could not be anticipated and avoided or mitigated by the exercise of all reasonable precautions, efforts and measures by Contractor, including re-planning, scheduling, and rescheduling.

d Notwithstanding the provisions of Paragraph c.2 of this Subsection above, a time extension may also be granted for delays caused by precipitation or Stage II Smog Alerts (at the South Coast Air Quality Management District Source Receptor Area 4) subject to the other requirements of this Subsection. However, Contractor shall not be entitled to compensation or additional payment due to such delays.

e Requests for extension of time for Changes in Work shall be negotiated at the time of ordering such changes or after the effects of mitigating rescheduling have become known.

01000.53 Cont'd.

f An extension of time granted shall not release the sureties from their obligations. Work shall continue and be carried on in accordance with all the provisions of Contract and said Contract shall be and shall remain in full force and effect during the continuance and until the completion and final acceptance of Work covered by Contract unless formally suspended or annulled in accordance with the terms of Contract.

g Neither the granting of an extension of time beyond the date fixed for the completion of any part of Work nor the doing and acceptance of any part of Work or materials specified by Contract after the time specified for the completion of Work, shall be deemed to be a waiver by City of City's right to abrogate Contract for abandonment or failure to complete within the time specified, or to impose and deduct damages as may be provided.

h As between Contractor and City, Contractor assumes the risk of any and all costs, expenses and liabilities which Contractor may incur in connection with all suspensions of, or delays in, performance of Contract, regardless of the length thereof, arising from all causes whatsoever including impacts by third parties, except that Contractor may be compensated for delays caused solely by the failure of City to furnish necessary rights of way, failure to provide materials shown in Contract Documents to be furnished by City, for its own convenience or benefit. If Contractor sustains loss as a consequence thereof which could not have been avoided by the judicious handling of forces, equipment and plant, there may be paid to Contractor such amount as Engineer finds to be fair and reasonable compensation for such part of Contractor's actual loss as was unavoidable. In no case, however, shall any compensation be made to cover loss of anticipated profits or indirect losses of any kind. If delays are caused by reasons other than those mentioned specifically in this Subsection, an extension of time may be granted, but Contractor shall not be entitled to compensation or additional payment due to such delays.

i If Contractor desires an extension of time or compensation for a qualifying delay, Contractor shall, within 30 Calendar Days after the beginning of the delay, file with Engineer a written request and report as to the cause and extent of the delay. The request must be made at least 15 Calendar Days before the specified completion date. Failure by Contractor to file these items within the times specified shall be considered grounds for refusal by City to consider such request.

54 LIQUIDATED DAMAGES

a If Contractor fails to complete Work covered by Contract Documents, or any portion thereof, in accordance therewith, within the time for completion stipulated, or within the time for such completion as extended, Contractor shall pay to City the sum stipulated in Contract, for each and every Calendar Day the time consumed in the execution of said Work may exceed the time allowed for that purpose, which said sum is agreed upon, fixed and determined by the parties hereto, as the liquidated damages that City shall suffer by reason of said delay and default. It is expressly understood that it shall be impracticable and extremely difficult to determine or fix the actual loss that City shall suffer by reason of delay in the performance of Work hereunder. City may deduct and retain the amount of such liquidated damages out of any money which may be due or become due Contractor. Such liquidated damages shall be City's sole monetary remedy for delay unless a court of competent jurisdiction finds the liquidated damages provisions in Contract to be invalid or unenforceable, in which case City shall retain all other remedies in law or equity, including without limitation the right to prove and recover actual damages due to delay.

b In the computation of liquidated damages for delay in completion of Work, the time taken by City or allowed a new contractor to whom award may be made for the completion of Contract, as well as the time required for advertising and awarding such new contract, shall be added to the time consumed by the original Contractor up to the date that City shall have notified the original Contractor to suspend Work, and from such total there shall be deducted the time allowed to the original Contractor for completing Work under Contract.

c Contractor shall not be assessed liquidated damages for delay in completion of Project caused by the failure of City or the owner of existing public utilities encountered to relocate same in a timely manner if such utilities are not identified on Drawings or in Specifications.

55 PARTIAL ACCEPTANCE AND USE

a At any time prior to final acceptance, City reserves the right to take over and utilize all, or any portion of, the permanent construction which has been completed, if Engineer determines that such portion of the permanent construction is not required for the operations of Contractor or the use thereof is urgently needed by City. Engineer shall notify Contractor in writing identifying the specific portion or portions of the completed Work to be so utilized or otherwise placed into service. At Engineer's discretion, City may start the guarantee period on the portion of Work being utilized from the date of such acceptance.

01000.55 Cont'd.

b Such action by City shall relieve Contractor of responsibility for injury or damages to said completed portions of the improvement resulting from use or from the action of the elements or from any other cause, except injury or damage resulting from Contractor's operation or negligence. Contractor shall not be required to re-clean such portions of the improvement before final acceptance, except for cleanup made necessary by Contractor's operations.

c At Executive Director's discretion, City may, prior to final acceptance of Contract, upon issuance of substantial completion of Project, release a portion of the retention monies being held.

d Nothing in this Subsection shall be construed as relieving Contractor from full responsibility for correcting defective Work or materials.

e In the event City exercises its right to place into service and utilize all or part of any completed permanent construction, as between City and Contractor, Contractor shall be responsible for only those injuries to persons or property caused by any willful or negligent act or omission of Contractor, subcontractor, their officers, employees or agents or those injuries for which Contractor, subcontractor, their officer, employees or agents would be strictly liable or liable under a warranty.

56 PARTIAL PAYMENTS

a In the event of a lump sum bid on all or any portion of Work upon which partial payments are to be made, Contractor shall, before the first payment becomes due, submit to Engineer a detailed schedule of prices for such units of Work as may be specified by Contractor for permanent Work accomplished and material worked into permanent place. The schedule of prices submitted shall be checked by Engineer, and, if in Engineer's opinion such unit prices appear to be reasonable and properly balanced, they shall be approved and used in the preparation of the monthly estimates. The sum of all extensions, based upon the quantities of the various items for the entire Work covered by Contract and the unit prices as approved, shall be equal to the total amount of Contract.

01000.56 Cont'd.

b Contractor shall, within two weeks after issuance of Notice to Proceed, submit to Engineer a list of rates, without markup set forth in Authority for Adjustments Subsection Paragraph b of this Section, of pay for all labor classifications [for Contractor and subcontractors (listed and not listed) at every tier] as well as hourly equipment costs (rental rates or otherwise). The list of labor rates and equipment costs submitted shall be checked by Engineer, and, if in Engineer's opinion such rates and costs appear to be reasonable, they (along with Engineer's estimate of material costs, or latest verifiable information on material costs) shall be approved and used for reference when evaluating requests for monthly partial pay for Cost-Plus Change Order Work. It is the responsibility of Contractor to request any consideration for rates that represent an increase from those presented, and agreed upon prior to the first payment. This list shall not replace Contractor's obligation to provide backup records for Cost-Plus Work nor allow Contractor to receive compensation for Cost-Plus Work greater than Contractor's actual cost plus markup under Authority for Adjustments Subsection of this Section.

c On or about the first of each calendar month, Engineer shall make an estimate in writing of all permanent Work accomplished and material permanently installed and the total amount of Work done up to the time of such estimate, and the value thereof based upon the unit price stated in the Bid Proposal Line Items or upon the prices agreed in the breakdown of a lump sum or sums stated in the Bid Proposal Line Items. When provided for in Specifications, and subject to the limitations and conditions of Acceptance and Final Payment Subsection of this Section, the cost of materials and equipment delivered but not yet incorporated in Work shall be included in the progress estimate. Contractor shall submit receipts from suppliers identifying the materials and equipment as paid for prior to the item being included in the progress estimate. The progress estimate shall be submitted to Engineer as a payment request. Upon receipt of a properly presented payment request, Engineer shall process the payment in conformance with California Public Contract Code Section 20104.50 for on time and prompt payment to Contractor. The following is a summary of California Public Contract Code Section 20104.50. For the full text, refer to California Public Contract Code Section 20104.50.

1 If City fails to make any progress payment within 30 days after receipt of an undisputed and properly submitted payment request from Contractor for this Contract, City shall pay interest to Contractor equivalent to the legal rate set forth in subdivision (a) of Section 685.010 of the Code of Civil Procedure.

2 Upon receipt of a payment request, City shall act in conformance with both of the following:

01000.56 Cont'd.

a) Each payment request shall be reviewed by City as soon as practicable after receipt for the purpose of determining that the payment request is a proper payment request.

b) Any payment request determined not to be a proper payment request suitable for payment shall be returned to Contractor as soon as practicable, but not later than 7 days, after receipt. A request returned pursuant to this paragraph shall be accompanied by a document setting forth in writing the reasons why the payment request is not proper.

3 The number of days available to City to make a payment without incurring interest pursuant to this section shall be reduced by the number of days by which City exceeds the 7-day return requirement set forth in Subparagraph 2 of Paragraph c of this Article.

4 A progress payment includes all payments due to Contractor, except that portion of the final payment designated by Contract as retention earnings.

5 A payment request shall be considered properly executed if funds are available for payment of the payment request, and payment is not delayed due to an audit inquiry by the financial officer of City.

d From each progress estimate, 5 percent of the amount attributable to Work, including Changes in Work and/or Authorities for Adjustment issued after the original Contract Award, shall be deducted and retained by City, and the remainder less the amount of all previous payments shall be paid to Contractor.

e Contractor shall have the right to substitute approved securities equivalent to the amount retained or request that Department deposit the amount retained in an interest bearing account. The substitution of securities or the deposit of the amount retained shall be at the expense and request of Contractor.

1 If Contractor requests to substitute securities equivalent to the amount retained, City shall place the amount retained on deposit with a state or federally chartered bank as escrow agent after approved securities have been likewise deposited by Contractor. The escrow agent shall thereafter pay the amount retained to Contractor. Contractor shall be the beneficial owner of any securities deposited subject to Paragraph (f) of this Subsection.

01000.56 Cont'd.

2 If Contractor requests City to deposit the amount retained in an interest bearing account with a state or federally chartered bank as escrow agent, City shall do so and the escrow agent shall then pay all interest on said account to Contractor. Contractor shall be the beneficial owner of said account subject to Paragraph (f) of this Subsection.

f Thirty-five Calendar Days following acceptance of Work by Executive Director and upon receipt of written notification of such fact from City, escrow agent shall release to Contractor the securities which have been placed on deposit or the amounts deposited in the interest bearing account. City has the right to order escrow agent to continue to retain necessary securities or deposits sufficient to cover such amounts required by law to be withheld pursuant to properly executed and filed notices to stop payment or as may be authorized by Contract to be further retained.

g Securities eligible for substitution are those listed in Government Code Section 16430 and also bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit, or any other security mutually agreed to by Contractor and City.

h The escrow agent shall be authorized by Contractor to convert deposited securities or interest bearing accounts to cash in the event of default by Contractor and distribute the cash as instructed by City.

i Unless otherwise provided, no payment shall be made for materials delivered to Project Site and any Laydown Area(s) but not incorporated in Work.

j Payment shall not be made for materials wasted or disposed of in a manner not called for under Contract. This includes rejected material not unloaded from vehicles, materials rejected after having been placed and material placed outside of the pay lines. Such quantities shall not be included in the pay quantities. No compensation shall be allowed for disposing of rejected or excess material.

k No estimate or payment shall be required to be made when, in the judgment of Engineer, Work has not proceeded in accordance with the provisions of Contract. The value of any material or Work included in partial estimates, which may subsequently become lost, damaged, or unsatisfactory, shall be deducted from succeeding partial estimates.

57 ACCEPTANCE AND FINAL PAYMENT

a When Work has been satisfactorily completed, Engineer shall determine the quantity of Work performed and prepare the final estimate of the value including all Changes in Work subject to Changes in Work Subsection Paragraphs a through d of this Section, for acceptance by Executive Director (or Board, if necessary).

b The quantities listed in Bid Proposal Line Items do not govern final payment. Payments to Contractor shall be made only for the actual quantities of Contract items constructed in accordance with Drawings and Specifications. All prior partial estimates and payments shall be subject to correction in the final estimate of payments.

c At the expiration of 35 Calendar Days from the date of acceptance of Work by Executive Director, the amount deducted from the estimates and retained by City shall be certified by Engineer as due and in the normal course of City business shall be paid to Contractor except such amounts as are required by law or as are authorized by Contract to be further retained.

d If a notice to stop payment is filed with City due to Contractor's failure to pay for labor or materials used in Work, money due for such labor or materials, plus 25 percent prescribed by law, shall be withheld from payment to Contractor. In accordance with Section 9364 of the California Civil Code, Executive Director may accept a bond by a corporate surety in lieu of withholding payment.

e It is mutually agreed between the parties to Contract that no certificate given or payment made under Contract, except the final certificate or final payment, shall be conclusive evidence of the performance of Contract, either wholly or in part, against any claim of City, and no payments shall be construed to be an acceptance of any defective Work or improper materials.

f When Contractor has exceeded Contract Time and has not yet received an extension of time to complete Contract so that liquidated damages may be assessed, Engineer may withhold an additional amount of money to cover the amount of liquidated damages that shall accrue based on Contractor's estimated Contract completion time as confirmed by Engineer.

58 AFFIDAVIT OF COMPLETION

a Contractor shall, upon completion of Work, including final clean up and demobilization, submit to Engineer (using Forms 298-E, 297-E, or 308-E in Section 00078) a sworn affidavit to the effect that: "to the best of Contractor's knowledge and belief, Work specified in said Specifications and said Contract has been completed in strict accordance with Drawings and Specifications therefor, that no lawful debts for labor or materials are outstanding, and that no federal excise tax has been included in Contract price; that all requests for funds for undisputed Work under Contract, including Changes in Work, and under all billings of whatsoever nature are accurate, complete and final and that no additional compensation over and above the final payment shall be requested or is due under Contract or under any adjustment issued thereunder for said undisputed Work; and that upon receipt of final payment, Contractor and subcontractors acknowledge that City, Board, Executive Director, Engineer, and any and all employees of City and their authorized representatives shall thereby be released from any and all claims or liability for additional sums on account of undisputed Work performed under Contract". Disputed Contract claims in stated amounts may be excluded by Contractor from the operation of the release.

59 GUARANTEE

a Unless provided elsewhere in Specifications, Contractor guarantees all equipment, materials, and work furnished on Project against defective workmanship, material, construction and labor for a period of one year from the date of acceptance of Project by Executive Director (following completion of Project). If the supplier or manufacturer of material or equipment provides a warranty or guarantee, Contractor's guarantee shall be in addition to any warranty or guarantee of the supplier or manufacturer and Contractor shall be a co-guarantor of such equipment and materials for a period of one year from the date of acceptance of Project by Executive Director. Contractor shall supply Department with all warranty and guarantee documents relevant to equipment and materials incorporated in Project and guaranteed by their suppliers or manufacturers.

b It shall be understood that the surety for the performance bond submitted in conformance with the terms of Contract by Contractor for Project is liable on its bond for all obligations of Contractor including guarantee provisions.

01000.59 Cont'd.

c Contractor further agrees, that within ten Calendar Days after being notified in writing by Engineer of any Work not in accordance with requirements of Contract or any defects in Work, Contractor shall commence and prosecute with due diligence all Work necessary to fulfill the terms of this guarantee, and to complete Work within a reasonable period of time, and in the event Contractor fails to so comply, Contractor does hereby authorize City to proceed to have such Work done at Contractor's sole cost and expense and Contractor shall pay the cost thereof upon demand. City shall be entitled to all costs, including reasonable attorney's fees, necessarily incurred upon Contractor's refusal to pay the above costs.

d Notwithstanding the foregoing subsections in the event of an emergency constituting an immediate hazard to the health or safety of City's employees, property or licenses, City may undertake at Contractor's sole cost and expense, without prior notice, all Work necessary to correct such hazardous condition when it was caused by Work of Contractor not being in accordance with the requirements of Contract.

60 NO PERSONAL LIABILITY

a No member of Board or Executive Director, Engineer, any other officer, agent, or authorized employee of City, shall be personally responsible for any liability arising under Contract.

61 NO ESTOPPEL

a City shall not, nor shall any department or officer thereof, be precluded or estopped by any return or certificate made or given by Engineer or other officer, agent, or employee of City under any provisions of Contract from at any time (either before or after the final completion and acceptance of Work and payment therefor) pursuant to any such return or certificate showing the true and correct amount and character of Work done, and materials furnished by Contractor or any person under Contract or from showing at any time that any such return or certificate is untrue and incorrect, or improperly made in any particular, or that Work and materials, or any part thereof, do not in fact conform to Specifications; and City shall not be precluded or estopped, notwithstanding any such return or certificate and payment in accordance therewith, from demanding and recovering from Contractor such damages as it may sustain by reason of Contractor's failure to comply with Specifications.

62 POTENTIALLY SIGNIFICANT CULTURAL MATERIAL

a If potentially significant cultural material is discovered while excavating, Contractor shall immediately cease excavation in the area of discovery and shall not resume excavation in the area until ordered to do so by Engineer. When Contractor is ordered to resume excavation operations, such operations shall be conducted as directed by Engineer.

b "Potentially significant cultural material" as used in this Subsection means artifactual material 50 years old or older.

c Any delays to Project as a whole, caused by compliance with this Subsection shall entitle Contractor to an extension of time equivalent to the period of that delay.

63 STATE TIDELANDS GRANT

a Contract is entered into in furtherance of and as a benefit to the State Tidelands Grant and the trust created thereby. Therefore, Contract is at all times subject to the limitations, conditions, restrictions, and reservations contained in and prescribed by the Act of the Legislature of the State of California entitled "An Act Granting to City of Los Angeles the Tidelands and Submerged Lands of the State Within the Boundaries of Said City," approved June 3, 1923, (Stats. 1929, Ch. 651), as amended, and provisions of Article VI of the Charter of City of Los Angeles relating to such lands. Contractor agrees that any interpretation of Contract and the terms contained herein must be consistent with such limitations, conditions, restrictions, and reservations.

64 RESPONSIBILITY FOR SUBCONTRACTORS

a Contractor shall be fully responsible to City for its acts and/or omissions and for the acts and/or omissions of persons directly employed by Contractor. Additionally, Contractor shall be fully responsible to City for the acts and/or omissions of subcontractors and of persons or entities either directly or indirectly employed by subcontractors. Nothing contained in Contract Documents shall create or be construed as creating a contractual relationship between any subcontractor of Contractor and City.

65 CONTRACTOR'S LIABILITY FOR HAZARDOUS WASTES OR HAZARDOUS SUBSTANCES

a As to Environmentally Regulated Materials whose existence on Project Site and any Laydown Area(s) commenced prior to the effective date of Contract, City shall not seek to hold Contractor liable as an owner, operator, generator, or discharger of such Environmentally Regulated Material.

b Provided that it has complied with all provisions of Contract, including but not limited to Protection of Harbor Waters Subsection of this Section, after final completion and acceptance of Work in strict accordance with Contract Documents, subject to its continuing obligations under Contract Documents (including, without limitation, its obligations under any representations, warranties, and guaranties with respect to Work performed and under Protection of Harbor Waters Subsection of this Section), Contractor shall not be responsible to City for the performance of any further remedial action, removal actions, or cleanup of hazardous waste or hazardous substances at Project Site and any Laydown Area(s) that City may be ordered, directed, or required to perform by any governmental authority after the date of final completion and acceptance of Work.

c Nothing in this Subsection shall limit or restrict the liability or responsibility of Contractor (or any of its subcontractors, consultants, employees, or agents) in the event of any failure to perform or comply with the terms of Contract, any negligence in the performance of Work, or any willful misconduct in connection with the performance of Work, nor shall this Subsection in any way limit or restrict Contractor's responsibilities under Contract and applicable law in connection with the handling, transporting, storing, or disposing of hazardous waste or hazardous substances and/or the arranging therefor.

66 TIME AND MATERIALS FORM

PORT OF LOS ANGELES
CONSTRUCTION DIVISION

CO No.: _____ Page _____ of _____

TIME AND MATERIAL FORM

Contractor: _____
Address: _____
License No.: _____ Phone: _____

Project Title: _____
Spec No: _____ Plan Ref: _____ RFI No.: _____
Contract No.: _____ Spec Ref: _____

Work Performed (Contractor Name): _____

Description of Work: _____

Date Performed: _____ Date of Report: _____

LABOR

Name	Classification	Hours (Reg)	Hours (OT)	Unit Rate	Amount

Labor Subtotal: _____

EQUIPMENT

Make and Model	Hours	Unit Rate	Amount

Equipment Subtotal: _____

MATERIAL

Description	Hours	Unit Rate	Amount

Material Subtotal: _____

Total Amount (Labor/Equipment/Material): _____

Signature acknowledges verification of labor and equipment quantities only. Costs and contract allowability are subject to audit verification in accordance with contract terms. Any costs determined not to be allowable for payment shall be deducted from the time sheet prior to final resolution of the change order.

PRIME CONTRACTOR (PRINT NAME)	SUBCONTRACTOR REPRESENTATIVE (PRINT NAME)	PORT OF LOS ANGELES INSPECTOR (PRINT NAME)
PRIME CONTRACTOR SIGNATURE	SUBCONTRACTOR REPRESENTATIVE SIGNATURE	PORT OF LOS ANGELES INSPECTOR SIGNATURE

67 DAILY FIELD REPORT

Contractor Daily Field Report

Page _____ of _____

PROJECT TITLE: _____ **SPEC NO.:** _____

CONTRACTOR/SUBCONTRACTOR: _____ **WORK DATE:** _____

TYPE [1]	EMPLOYEE NAME	CLASSIFICATION	EQUIP #[2]	START TIME	END TIME	TOTAL

#	QTY	EQUIPMENT DESCRIPTION	HRS	#	QTY	EQUIPMENT DESCRIPTION	HRS
2				12			
3				13			
4				14			
5				15			
6				16			
7				17			
8				18			
9				19			
10				20			

Contractor's Authorized Representative:

_____
PRINT NAME AND TITLE HERE

_____ _____
SIGNATURE DATE

Los Angeles Harbor Department - Construction Division
To be completed by the Project Inspector Only

INSPECTOR: _____ _____
PRINT NAME HERE SIGNATURE

_____
DATE RECEIVED

NOTE 1: TYPE: P- Prime; SC - Subcontractor; S-Supplier; V - Vendor

NOTE 2: EQUIP # - Required if labor classification is Operating Engineer or Teamster

68 LAYDOWN AREA(S)

a Contractor use and occupancy of Laydown Area(s) shall not be revocable during the duration of Contract. Contractor shall not be required to provide payment or compensation for use and occupancy of Laydown Area(s).

b Contractor acknowledges and agrees that Laydown Area(s) is suitable for the use intended and accepts use and occupancy of Laydown Area(s) subject to each and every term and condition of the Port of Los Angeles Tariff No. 4 (Tariff) https://www.portoflosangeles.org/business/tariff, as applicable to Laydown Area(s), as if fully set forth herein. Contractor shall not alter or construct on Laydown Area(s) without first obtaining a Harbor Engineer Permit except for those alterations set forth in this Contract, and complying with Applicable Laws. Contractor shall not cause or permit any Environmentally Regulated Material to be generated, brought onto, handled, used, stored, transported from, received, or disposed of (hereinafter sometimes collectively referred to as “handle” or "handled") in or about Laydown Area(s) except for limited quantities of standard office and janitorial supplies containing chemicals categorized as Environmentally Regulated Material and except as permitted, required, or necessary in conformance with Contract Documents, if any. Contractor shall handle all such Environmentally Regulated Material in strict compliance with Applicable Laws in effect during Contractor’s occupancy.

c Contractor is aware that City’s Department of Water and Power, other utility, or other maintenance or service from or on behalf of City, may need to service or repair certain facilities on Laydown Area(s). If such repair is necessary, Contractor agrees to relocate all of its equipment and other personal property to provide such personnel adequate access. Contractor agrees to complete such relocation within 24 hours of receiving notice from City except in case of emergency. Contractor shall be entitled to an equitable adjustment in Contract Time and/or price for delays as a result of the need to relocate equipment to provide access for any repairs that are beyond the control and without the fault of Contractor and is for City's own convenience or benefit.

01000.68 Cont'd.

d Contractor shall remediate or cause the remediation of any Contamination that occurs in, on, under, or about Laydown Area(s), whether caused by Contractor or any third-party acting for or on behalf of Contractor during Contractor's occupancy, including Contamination of improvements, adjacent harbor waters, soil, sediment, groundwater, or air, or of adjacent Laydown Area(s) (including soil, sediment, groundwater, or air) and including Contamination that is considered a nuisance under Applicable Laws. Remediation shall be to the reasonable satisfaction of City, and the requirements of the applicable governmental agencies including the Regional Water Quality Control Board, by removing or effecting the removal of all Contamination including but not limited to contaminated soil, water, groundwater, sediment, or other material it may place or cause to be placed on site such that no encumbrances, such as deed or land use restrictions, be imposed on Laydown Area(s) as a result of such Contamination. In fulfilling the obligations of this Article, Contractor shall also comply with any other conditions reasonably imposed by City. If Contractor knows or has reasonable cause to believe that Contamination has occurred in, on, under, or about Laydown Area(s), Contractor shall immediately give written notice to City. Contractor shall not be responsible for any Contamination existing on, below, or about Laydown Area(s) prior to the NTP, including contamination as depicted in the baseline report.

01000.68 Cont'd.

e Contractor bears responsibility for full compliance with any and all Applicable Laws regarding the use, storage, handling, distribution, processing, and/or disposal of Environmentally Regulated Material including Contamination, regardless of whether under Applicable Laws the obligation for such compliance or responsibility is placed on the owner of Laydown Area(s), on the owner of any improvements on Laydown Area(s), on the user of Laydown Area(s), or on the user of any improvements on Laydown Area(s). Contractor shall only be responsible for Contamination caused by Contractor, or any third party acting for or on behalf of Contractor and shall not be responsible for any preexisting Contamination on Laydown Area(s) prior to Contractor's first occupancy thereof. Contractor agrees that any claims, damages, fines, or other penalties asserted against or levied on City and/or Contractor as a result of noncompliance with any Applicable Laws by Contractor under this Contract shall be the sole responsibility of Contractor and that Contractor shall indemnify and hold City harmless from any and all such claims, damages, fines, penalties, and/or judgments, as well as any costs expended to defend against such claims, damages, fines, and penalties and/or judgments, including attorneys' and experts' fees. City, at its sole option, may, after providing Contractor with a reasonable opportunity to defend such claims, damages, fines, penalties, and/or judgments pay the claims, damages, fines, penalties, and/or judgments resulting from Contractor's noncompliance with any of the aforementioned authorities, and Contractor shall indemnify and reimburse City for any such payments.

f In discharging Contractor's obligations under this Subsection only, if Contractor disposes of any Contamination, within 30 days of Contractor's receipt of original documents, Contractor shall provide City copies of all records, including a copy of each uniform hazardous waste manifest indicating the quantity and type of material being disposed of, the method of transportation of the material to the disposal site, and the location of the disposal site. Neither City, Port of Los Angeles, nor Los Angeles Harbor Department shall appear on any manifest document as a generator of such material. Contractor shall not be responsible for preexisting contamination. Contractor shall only be responsible for contamination caused by Contractor, or any third-party acting for or on behalf of Contractor, and shall not be responsible for any preexisting contamination on Laydown Area(s) prior to Contractor's first use and occupancy thereof.

01000.68 Cont'd.

g In discharging Contractor's obligations under this Subsection, Contractor shall perform any tests using a State of California Department of Health Services certified testing laboratory or other similar laboratory upon City's written approval. By signing this Contract, Contractor hereby irrevocably directs any such laboratory to provide City, upon written request from City, copies of all of its reports, tests results, and data gathered. As used in this Subsection, "Contractor" includes agents, employees, contractors, subcontractors, and/or invitees of Contractor.

h Contractor shall implement City's Harbor Department's policies, known as Best Management Practices, in order to reduce the potential for pollutants to enter Harbor waters, as follows:

1 Facility Operations: Clean and maintain facility regularly. Use dry cleaning methods whenever possible; avoid washing areas down. Do not allow sweepings or sediment to enter the storm drain or the Harbor. Collect wash water for disposal or direct to a clarifier. Do not encourage scavengers. Do not feed birds, feral cats, sea lions, or other scavengers. Recycle whenever possible.

2 Maintenance Operations: Use drip pans to prevent any drips or leaks from contacting the ground during maintenance and fueling operations. Clean spills or drips immediately using dry methods. Use spill cleanup kits to confine or contain spills. Do not hose down equipment or allow process water to enter the storm drain or the Harbor. Place tarps beneath maintenance and repair operations to prevent materials such as paint chips and metals from contacting the ground.

3 Material and Waste Handling and Storage: Train employees responsible for waste management on handling and disposal procedures. Store all hazardous and universal waste in accordance with all federal, state, and local regulations. Store all materials and waste inside and in secondary containment. If stored outside, store only in designated, covered, and contained areas. Store waste in covered, leak proof, labeled containers. Keep lids closed on all outdoor containers including dumpsters. Store all oily products (e.g. engines), batteries, tires, and metal off the ground and under cover when stored outdoors.

4 Except as may be otherwise provided in this Contract, Contractor's obligations in this Article shall survive the Termination Date of this Contract.

01000.68 Cont'd.

i Upon completion of Work, subject to Protection of Harbor Waters Subsection of Specifications, Contractor shall quit and surrender occupancy and use of Laydown Area(s) to City and shall, without cost to City, remove any and all its property and restore Laydown Area(s) to the same or as good condition as the same were in at the time of the first occupancy thereof, allowing for normal wear and tear, by Contractor. Contractor may incur additional charges and/or withholding of payment if Contractor fails to fully restore Laydown Area(s) to the reasonable satisfaction of Executive Director prior to completion of Work.

j Restoration of Laydown Area(s) must be completed at the time Contractor submits to Engineer the Affidavit of Completion (Affidavit of Completion Subsection of this Section and Forms 298-E, 297-E, or 208-E in AFFIDAVITS OF COMPLETION Section of Specifications).

END OF SECTION

I. The following is being added as Subsection 01000.69 of GENERAL CONDITIONS Section:

69 PARTNERING

a Harbor Department shall implement a cooperative partnering relationship with Contractor in order to effectively complete Contract to the benefit of both parties. The partnering shall be structured to identify and achieve reciprocal goals. It shall focus on good communication and creative cooperation to resolve problems in a timely, professional, and non-adversarial manner. The objective is to provide a quality project, safely, on time and within budget so that all are proud to contribute. The establishment of a partnering relationship shall not change or modify the terms and conditions of Contract, shall not waive any rights or remedies of the parties and shall not relieve either party of the legal requirements of Contract. The word “partnering” as used in this Paragraph denotes a facilitation concept and does not create a partnership or joint venture between the parties. A 2-day initial partnering workshop followed by quarterly follow up partnering sessions shall be conducted during the duration of Contract. Costs for the partnering facilities, including but not limited to, the facility, lodging, meals, and other incidentals associated with the partnering sessions, shall be paid under Partnering Facility allowance bid item of Bid Proposal Line Items. Department shall provide and pay for the facilitator.

II. The following language is being added as Subsection 01000.70 of GENERAL CONDITIONS Section pursuant to California Public Contract Code Section 9204.

70 CALIFORNIA PUBLIC CONTRACT CODE SECTION 9204

(a) The Legislature finds and declares that it is in the best interests of the state and its citizens to ensure that all construction business performed on a public works project in the state that is complete and not in dispute is paid in full and in a timely manner.

(b) Notwithstanding any other law, including, but not limited to, Article 7.1 (commencing with Section 10240) of Chapter 1 of Part 2, Chapter 10 (commencing with Section 19100) of Part 2, and Article 1.5 (commencing with Section 20104) of Chapter 1 of Part 3, this section shall apply to any claim by a contractor in connection with a public works project.

(c) For purposes of this section:

(1) "Claim" means a separate demand by a contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following:

(A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by a public entity under a contract for a public works project.

(B) Payment by the public entity of money or damages arising from work done by, or on behalf of, the contractor pursuant to the contract for a public works project and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled.

(C) Payment of an amount that is disputed by the public entity.

(2) "Contractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who has entered into a direct contract with a public entity for a public works project.

(3) (A) "Public entity" means, without limitation, except as provided in subparagraph (B), a state agency, department, office, division, bureau, board, or commission, the California State University, the University of California, a city, including a charter city, county, including a charter county, city and county, including a charter city and county, district, special district, public authority, political subdivision, public corporation, or nonprofit transit corporation wholly owned by a public agency and formed to carry out the purposes of the public agency.

(B) "Public entity" shall not include the following:

(i) The Department of Water Resources as to any project under the jurisdiction of that department.

(ii) The Department of Transportation as to any project under the jurisdiction of that department.

(iii) The Department of Parks and Recreation as to any project under the jurisdiction of that department.

(iv) The Department of Corrections and Rehabilitation with respect to any project under its jurisdiction pursuant to Chapter 11 (commencing with Section 7000) of Title 7 of Part 3 of the Penal Code.

(v) The Military Department as to any project under the jurisdiction of that department.

(vi) The Department of General Services as to all other projects.

(vii) The High-Speed Rail Authority.

(4) "Public works project" means the erection, construction, alteration, repair, or improvement of any public structure, building, road, or other public improvement of any kind.

(5) "Subcontractor" means any type of contractor within the meaning of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code who either is in direct contract with a contractor or is a lower tier subcontractor.

(d) (1) (A) Upon receipt of a claim pursuant to this section, the public entity to which the claim applies shall conduct a reasonable review of the claim and, within a period not to exceed 45 days, shall provide the claimant a written statement identifying what portion of the claim is disputed and what portion is undisputed. Upon receipt of a claim, a public entity and a contractor may, by mutual agreement, extend the time period provided in this subdivision.

(B) The claimant shall furnish reasonable documentation to support the claim.

(C) If the public entity needs approval from its governing body to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the claim, and the governing body does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a claim sent by registered mail or certified mail, return receipt requested, the public entity shall have up to three days following the next duly publicly noticed meeting of the governing body after the 45-day period, or extension, expires to provide the claimant a written statement identifying the disputed portion and the undisputed portion.

(D) Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. If the public entity fails to issue a written statement, paragraph (3) shall apply.

(2) (A) If the claimant disputes the public entity's written response, or if the public entity fails to respond to a claim issued pursuant to this section within the time prescribed, the claimant may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the public entity shall schedule a meet and confer conference within 30 days for settlement of the dispute.

(B) Within 10 business days following the conclusion of the meet and confer conference, if the claim or any portion of the claim remains in dispute, the public entity shall provide the claimant a written statement identifying the portion of the claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the claim shall be processed and made within 60 days after the public entity issues its written statement. Any disputed portion of the claim, as identified by the contractor in writing, shall be submitted to nonbinding mediation, with the public entity and the claimant sharing the associated costs equally. The public entity and claimant shall mutually agree to a mediator within 10 business days after the disputed portion of the claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator. If mediation is unsuccessful, the parts of the claim remaining in dispute shall be subject to applicable procedures outside this section.

(C) For purposes of this section, mediation includes any nonbinding process, including, but not limited to, neutral evaluation or a dispute review board, in which an independent third party or board assists the parties in dispute resolution through negotiation or by issuance of an evaluation. Any mediation utilized shall conform to the timeframes in this section.

(D) Unless otherwise agreed to by the public entity and the contractor in writing, the mediation conducted pursuant to this section shall excuse any further obligation under Section 20104.4 to mediate after litigation has been commenced.

(E) This section does not preclude a public entity from requiring arbitration of disputes under private arbitration or the Public Works Contract Arbitration Program, if mediation under this section does not resolve the parties' dispute.

(3) Failure by the public entity to respond to a claim from a contractor within the time periods described in this subdivision or to otherwise meet the time requirements of this section shall result in the claim being deemed rejected in its entirety. A claim that is denied by reason of the public entity's failure to have responded to a claim, or its failure to otherwise meet the time requirements of this section, shall not constitute an adverse finding with regard to the merits of the claim or the responsibility or qualifications of the claimant.

(4) Amounts not paid in a timely manner as required by this section shall bear interest at 7 percent per annum.

(5) If a subcontractor or a lower tier subcontractor lacks legal standing to assert a claim against a public entity because privity of contract does not exist, the contractor may present to the public entity a claim on behalf of a subcontractor or lower tier subcontractor. A subcontractor may request in writing, either on his or her own behalf or on behalf of a lower tier subcontractor, that the contractor present a claim for work which was performed by the subcontractor or by a lower tier subcontractor on behalf of the subcontractor. The subcontractor requesting that the claim be presented to the public entity shall furnish reasonable documentation to support the claim. Within 45 days of receipt of this written request, the contractor shall notify the subcontractor in writing as to whether the contractor presented the claim to the public entity and, if the original contractor did not present the claim, provide the subcontractor with a statement of the reasons for not having done so.

(e) The text of this section or a summary of it shall be set forth in the plans or specifications for any public works project that may give rise to a claim under this section.

(f) A waiver of the rights granted by this section is void and contrary to public policy, provided, however, that (1) upon receipt of a claim, the parties may mutually agree to waive, in writing, mediation and proceed directly to the commencement of a civil action or binding arbitration, as applicable; and (2) a public entity may prescribe reasonable change order, claim, and dispute resolution procedures and requirements in addition to the provisions of this section, so long as the contractual provisions do not conflict with or otherwise impair the timeframes and procedures set forth in this section.

(g) This section applies to contracts entered into on or after January 1, 2017.

(h) Nothing in this section shall impose liability upon a public entity that makes loans or grants available through a competitive application process, for the failure of an awardee to meet its contractual obligations.

(i) This section shall remain in effect only until January 1, 2027, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2027, deletes or extends that date.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Scope of Work: Contractor shall perform Work necessary to complete Contract in a satisfactory manner. Furnish transportation, labor, materials, equipment, mobilization, demobilization, and incidentals necessary to perform Work in accordance with Drawing Number 1-3577 including but not limited to the following:

1. Remove and dispose of concrete piers in compressor room.
2. Remove and dispose of cooling plant including compressors, evaporative condenser, cooling coils, refrigerant piping, and associated appurtenances.
3. Remove and dispose of outside air dampers, return air dampers and relief air dampers at built-up air handler.
4. Remove and dispose of filters and filter rack in built-up air handler.
5. Remove and dispose of existing direct digital control (DDC) system serving cooling plant and built-up air handler.
6. Remove, move, and replace ducts on downflow of VAVs (low side) including cans to diffusers.
7. Install VAV boxes with DDC controls and zone temperature sensors.
8. Install new Liebert unit in data center.
9. Install cooling plant including variable speed screw compressors, evaporative condenser, cooling coils, refrigerant piping and associated appurtenances.
10. Install outside air dampers, return air dampers, and relief air dampers at built-up air handler.
11. Install filters and filter rack in built-up air handler.
12. Install DDC control system to serve building HVAC systems.
13. Replace existing vane axial supply and return fans in built-up air handler with supply and return fan walls.

14. Install ~~boiler plant replacement.~~ air to water heat pump and standby electric boiler to replace existing gas-fired heating hot water boiler plant.
15. Install chillers, chiller water pump skid, and associated water piping.
16. Remove and replace existing fan coils, condensing units, and associated equipment.
17. Remove and replace building exhaust fan.
18. Secure necessary permits.
19. Coordinate Work with other subcontractors and tenants.
20. Perform Work to meet required regulatory requirements.
21. Test, adjust, and balance new and modified systems.
22. Clean Project Site and remove debris, equipment, and excess material from office floors daily.
23. Office operation area conditions shall be returned to original conditions after each Work session, including the reinstallation of ceiling tiles in original positions.
24. Complete installation and testing of new/replacement ductwork to ensure satisfactory performance of HVAC system after Work session, for normal building operation next day.
25. Other Work as shown on Drawings.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 LOCATION OF PROJECT

A. Project is located at the Harbor Administration Building, 425 South Palos Verdes Street, San Pedro, CA, 90731.

1.2 ACCESS TO PROJECT

A. Directions to Harbor Administration Building:

1. From downtown Los Angeles: Take the Harbor Freeway (I-110) south and exit at Harbor Boulevard in San Pedro. Proceed south on Harbor Boulevard to West 3rd Street. Turn west on West 3rd Street and continue to South Palos Verdes Street. Turn south on South Palos Verdes Street. Project site is located on the corner of South Palos Verdes Street and West 5th Street. Parking is available in the surface lot on the east side of Palos Verdes Street.

2. From Orange County: Take the San Diego Freeway (I-405) north to the Harbor Freeway (I-110) south and exit at Harbor Boulevard in San Pedro. Proceed south on Harbor Boulevard to West 3rd Street. Turn west on West 3rd Street and continue to South Palos Verdes Street. Turn south on South Palos Verdes Street. Project site is located on the corner of South Palos Verdes Street and West 5th Street. Parking is available in the surface lot on the east side of Palos Verdes Street.

B. Access to Project Site by Contractor’s personnel and equipment shall be coordinated with Engineer.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements concerning the following:

1. Existing Project Site conditions
2. Restrictions upon Contractor's use of Project Site and any Laydown Area(s)
3. Contractor’s on-site traffic control
4. Loads on existing structure

1.2 EXISTING SITE CONDITIONS

A. Project Site consists of a 5 story office building with penthouse in an existing light commercial and residential area.

B. Streets around the site experience moderate to heavy traffic depending on time of day.

1.3 CONTRACTOR'S USE OF SITE

A. Contractor shall take photos of existing conditions before and after each Work session.

B. Contractor’s primary Laydown Area shall be on 3rd Street adjacent to Project Site. Obtain a Revocable Permit (R-Permit) from City of Los Angeles Department of Public Works, Bureau of Engineering, for occupying the public street and/or sidewalk with containers, fencing, or other equipment or materials.

C. Additional Contractor's storage may be available on second floor patio area. Coordinate with Engineer. Contractor's storage shall be located within Project Site limits as shown on Drawings. Security of storage shall be the responsibility of Contractor.

D. The building shall remain occupied and operational during construction. Work shall be staged to maintain the existing central air conditioning system operational during Business Days. The existing HVAC system shall be operational at the end of each Work session.

E. Equipment replacement in the refrigeration plant, fan walls, boiler plant, and built-up air handler shall occur during a weekend shut down.

F. Upon completion of Work, remove temporary facilities and utility installations, equipment, tools, excess materials, and debris from Project Site and leave Project Site in clean condition. Clean grease and oil spills and concrete waste in conformance with REGULATORY REQUIREMENTS Section.

G. Upon completion of Work session, repair, patch, paint, and replace surfaces, ceiling tiles, and other structures damaged by Work to match existing conditions, finishes, make and surfaces.

H. After a Work session, leave Project Site, elevator, and offices affected by Work in clean condition including but not limited to vacuuming carpet, sweeping floors, and cleaning debris. Use drop cloths or plastic to protect work surfaces and structures from damage, debris and stains.

I. Complete installation and testing of replacement ductwork after each Work session.

1.4 ON-SITE TRAFFIC CONTROL

A. Obtain approval from Engineer for Contractor’s equipment and vehicle traffic within and around Project Site.

B. Obtain approval from Engineer for Contractor’s crane location, crane lift procedure, and lift schedule. Obtain required City permits for crane lift including traffic control plan.

C. Obtain approval from Department for Contractor's usage of the alley on the West side of the Harbor Admininstration Building.

D. Work with Engineer to obtain permit for container storage space on 3rd Street (adjacent to the building) if necessary.

1.5 LOADS ON EXISTING STRUCTURE

A. Remove existing equipment from fifth floor and penthouse mechanical rooms before placing new equipment in these areas.

B. The loading capacity of each elevator shall not exceed 2,000 pounds. Protect elevator from damages resulting from Contractor's activities. Refer to Article 1.3 of this Section for protection and cleaning guidelines.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Notification and coordination requirements:

1. Coordination with owner

B. Project meetings

1.2 NOTIFICATION AND COORDINATION REQUIREMENTS

A. Coordinate Work with other contractors and City workers who may be working in or are adjacent to Project Site and any Laydown Area(s).

B. Coordinate installation and location of temporary utilities with Engineer.

C. Representatives of the following agencies and companies shall be notified in writing 10 working days before Work is started in areas affecting them, unless Engineer directs otherwise:

1. South Coast Air Quality Management District (SCAQMD) Toxics Section, 909-396-2327 phone, 909-396-3342 fax.

2. Port of Los Angeles (POLA) Construction and Maintenance Division: Wayne Mukogawa, Senior Building Operating Engineer, 310-984-4667.

D. Department Emergency Contacts:

1. Port Police, Watch Commander 310-732-3491, Emergencies 310-732-3515.

2. POLA Construction and Maintenance Division: Wayne Mukogawa, Senior Building Operating Engineer, 310-984-4667.

E. Instructions or orders received by Contractor from regulatory agencies, utility or pipeline owners that are in conflict with this Section shall be brought to the immediate attention of Engineer.

F. Coordinate construction activities with adjacent contractors and Department Construction and Maintenance (C&M) crews through Engineer as shown on Drawings and described in this Section.

G. For electrical power shut down, contact Department's C&M Division by contacting Engineer 4 working days before shut-down is needed.

H. Other contractors, and C&M crews shall be working at irregular time intervals within Project Site and any Laydown Area(s) limits concurrent with Contractor's Work.

1. There shall be no additional charge resulting solely from the presence of other entities authorized by Engineer to Work within Project Site and any Laydown Area(s) limits.

1.3 PROJECT MEETINGS

A. Preconstruction Meeting: Attend preconstruction meeting scheduled by Engineer. Meeting activities:

1. Contractor shall introduce Project team and present a preliminary schedule, activity coding plan, and work force requirements.

2. Engineer shall review administrative procedures with Contractor.

3. A representative of City of Los Angeles Office of Contract Compliance shall present labor compliance requirements.

4. Other Project stakeholers may also attend preconstruction conference, including owner at Project Site and any Laydown Area(s) and neighbors adjacent to Project Site and any Laydown Area(s).

B. Attend weekly Project meetings as scheduled by Engineer to discuss construction progress and other issues affecting Work.

1. Construction progress meeting shall be held during Business Days or as scheduled by Engineer.

1.4 COORDINATION WITH OWNER

A. The building’s operations shall continue uninterrupted. Coordinate construction activities with Engineer to avoid interference with office operations.

1. In the event of a conflict, owner requirements shall have priority over Contractor’s requirements in areas of active operations.

2. Contractor's personnel shall fill out Identification Card Application to obtain red colored POLA I.D. badge. Engineer shall manage approval and coordinate the processing with POLA.

3. Contractor's personnel shall sign in at front desk of main lobby and wear POLA I.D. badge all times while on POLA property and at each and every building entry. Badge shall be easily visible and displayed below the neck and above the waist on your outermost garment.

4. Contractor shall relinquish POLA I.D. badge at the end of Contract to Engineer.

5. Contractor's vehicles shall have plaques or markings identifying company.

B. Owner may be working at irregular time intervals within Project Site limits concurrent with Contractor’s Work.

1. There shall be no additional charge resulting solely from the presence of owner and other entities authorized by Engineer to work within Project Site limits.

C. Occupied portions of Floors 1 through 5 shall be worked on, including transporting material/equipment, in conformance with Working Hours Subsection of GENERAL CONDITIONS Section. The penthouse may be worked on during normal Business Days provided Work does not generate noise, vibration, and interruption in the occupied portions of the building, otherwise, the working hours are the same as previously noted for Floors 1 through 5.

D. Contractor shall prepare plans to provide own restroom since Department does not provide restroom for Contractor's use.

E. A designated elevator shall be provided to Contractor. Refer to SITE CONDITIONS for loading capacity and house cleaning requirements.

F. Second floor IT area of Harbor Administration Building (HAB) requires escort by POLA staff.

G. Provide tempory air conditioning units to HAB during construction and have contingency plan in the event the building HVAC system cannot be brought back to operation as scheduled.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Computer system requirements to use an Internet-based project management system.

1.2 INTERNET-BASED PROJECT MANAGEMENT SYSTEM

A. Project shall use an Internet-based project management system, PMWeb, to submit and process for approval the following including, but not limited to:

1. Requests for Information (RFIs) and RFI responses.
2. Shop drawings and shop drawings responses.
3. Change Request Forms Time and Materials (T & M)
4. Contractor Daily Reports

B. Shop drawings shall also be submitted in conformance with Subsection 01000.21 of GENERAL CONDITIONS Section.

C. Department shall provide Contractor access to the system at no charge.

D. Department shall provide Contractor training on how to use the system. Contractor's personnel shall have basic working knowledge of computers (i.e., mouse operation, using a browser) to effectively learn the system during the training session.

1.3 USER ACCESS

A. Department shall control Contractor’s access to the system and assign user profiles to a maximum of 4 authorized Contractor personnel. User profiles shall define levels of access, determine function-based authorizations, and determine user privileges. Contractor’s access to the system shall be sufficient to perform Work required in this Section.

B. Contractor shall generate (including the use of a scanner where electronic files are not available) and send electronic files for the correspondence listed in Paragraph A of Internet-Based Project Management System Article of this Section.

C. Subcontractors and suppliers shall not be given direct access to the system. Information exchanged between Contractor, subcontractors, and suppliers shall be the responsibility of Contractor. Direct communication through the system shall only occur between Engineer and Contractor.

D. Any correspondence or information entered into the system shall become an official document and shall be included in Project file.

E. Comments made by Engineer on Contractor-submitted correspondence shall not relieve Contractor from compliance with requirements of Contract Documents.

1.4 COMPUTER SYSTEM REQUIREMENTS

A. Contractor shall have access to the Internet, using the latest version of any of the following browsers:

1. Google Chrome
2. Apple Safari
3. Microsoft Edge

1.5 CONTRACTOR RESPONSIBILITY

A. Contractor shall be responsible for maintenance of Contractor's hardware, software, and connectivity to the Internet. Department shall not be responsible for any delays associated from the use of the system including, but not limited to, hardware or software problems, slow response times, downtime periods, connection problems or loss of information. Under no circumstances shall the use of the system be grounds for a time extension or cost adjustment to Contract.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section modifies Construction Schedule and Extension of Time and Compensable Delays Subsections of GENERAL CONDITIONS Section. Work includes but is not limited to:

1. Provide scheduler.

2. Prepare, submit, update, and revise Construction Schedules and reports.

3. Attend meetings.

B. This Section provides technical requirements for preparation and reporting of the construction schedule.

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Include cost of the scheduler, office, materials, supplies, and other necessary expenses as a line item in the Schedule of Values for the Lump Sum Construction bid item of Bid Proposal Line Items. Include line items for Baseline Schedule, Monthly Updates, and Weekly Schedules. Monthly Updates shall have a minimum value of $10,000 per month for the duration of Project on Schedule of Values.

2. If the schedules and reports are not prepared, submitted, and updated as specified in any particular month, City shall withhold payment of the scheduling line item for that month.

1.3 ABBREVIATIONS AND DEFINITIONS

A. Refer to Abbreviations and Definitions Subsection of GENERAL CONDITIONS Section for definitions for Calendar Day; Changes in Work; City; Contract; Contract Documents; Contractor; Contract Time; days; Drawings; Engineer; Notice of Award; Notice to Proceed; Project; Specifications; Superintendent; and Work.

B. Abbreviations:

1. CPM: Critical path method

2. NTP: Notice to Proceed

C. Definitions:

1. Activity: A portion of Work which requires time and resources (labor, equipment, and/or material) to complete.

2. Baseline: The approved as submitted Preliminary Baseline which addresses Engineer's comments and contains corrections to previous submittals.

3. Construction Schedule(s): The detailed Activity level plans required by this Section.

4. Current Revised Baseline: The present replacement schedule for the Baseline or a previously revised Baseline, which was revised in conformance with the Schedule Revisions Article of this Section.

5. Days: Consecutive Calendar Days.

6. Milestone: A start or completion date defined or inferred by Contract or Drawings as calculated from NTP, start/end of phase, or Contract completion. The time base for Milestones shall be in conformance with GENERAL CONDITIONS Section.

7. 90-Day Schedule: Contractor's detailed activity level schedule for the first 90 Calendar Days of Contract, which addresses comments, and contains requested corrections to previous submittals.

8. Preliminary Baseline: Contractor's initially submitted detailed Activity level plan for constructing Project.

9. Weekly Schedule: A schedule showing the actual and the planned Activities, including changed Work, of the week before and the 2 weeks succeeding the date of the weekly meeting.

1.4 SUBMITTALS

A. Submit the name, qualifications, education, and experience (including references and lists of prior projects) of the scheduler, and a detailed description of the scheduling system to be used no later than 14 Calendar Days after Notice of Award.

B. Submit the documents listed in Table 1 at the end of this Section prior to the time and at the frequency required.

C. Present Weekly Schedule at each weekly meeting.

1.5 QUALITY ASSURANCE

A. Qualifications: Scheduler shall have a minimum of 5 years experience in preparing and maintaining CPM schedules and reports in Primavera P6 for projects of similar size, value, type, and nature. Scheduler shall be on Project Site a minimum of 25 hours per week to attend weekly meetings and to monitor, revise, and update the schedules, curves, and reports for the duration of Contract.

1.6 MEETINGS

A. Pre-Construction Scheduling Conference: Present and discuss proposed scheduling system and scheduling method, the sequence of operation, proposed Activity coding, cost, labor, and equipment loading, procedures for updating and revising schedules, and required submittals. Engineer shall schedule and conduct pre-construction scheduling conference with Contractor's project manager, Superintendent, and scheduler prior to pre-construction meeting. Activity code breakdown structure shall be discussed and agreed to at this meeting.

B. Weekly Meetings: Meet with Engineer to assess progress of Work once each week, on a day established by Engineer.

C. Preliminary Baseline Conflict Resolution Meetings: Attend meetings with Engineer, major subcontractors, and suppliers to resolve any conflicts between Preliminary Baseline and the intent of Contract. Engineer shall schedule meeting.

D. Monthly Schedule Update Meetings: On a monthly basis, meet with Engineer for the purpose of updating the schedule and reports. Schedule the meeting at least 7 Calendar Days prior to the required date for submittal of the updated schedule and reports. This meeting shall also include a discussion of schedule revisions that are proposed to be included in the monthly schedule update.

1.7 METHOD OF SCHEDULING

A. Prepare and maintain Construction Schedules, which represent the plan to complete Work within Contract Time. Construction Schedule shall provide Engineer with a basis to monitor progress of Work.

B. Use CPM and show schedule in time-scaled precedence diagramming format. Time-scale the schedules in Calendar Days from NTP. Show Milestones and Activities on the schedule.

C. Use a scheduling software and a computer hardware system commensurate with the size of Project. The scheduling software shall be Primavera P6 version 8.2 or later.

D. Float is a resource available to both parties and is not for the exclusive benefit or use of either Contractor or City. Float created during Project through the actions of either party remains for the benefit of either party unless expressly agreed in advance by both parties in writing to be for the sole benefit of one party. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, imposed dates, and extended Activity durations are prohibited and are cause for rejection of the schedule.

E. A Baseline showing early completion of Contract shall not be accepted by City. Schedule updates showing early completion of Contract may be accepted by City. If schedule updates show early completion of Contract, the updated schedules shall show the time between early finish and Contract Time as Project float. City shall not move liquidated damages to the early completion date. City shall not pay for extended overhead for schedule changes or additional Work that does not increase Contract Time.

F. The schedule shall contain Activities for Milestones and for Contract Work, which includes Bid Item Work, Contingency Bid Item Work, and once authorized, any Allowance Bid Item Work. Work shall be broken down into Activities. Activity details shall assure the schedule provides an appropriate basis for monitoring and evaluating the progress of Work.

1. No Work activity, except submittals required to comply with Construction General Stormwater Permit and Stormwater Pollution Prevention Plan (SWPPP) Article of REGULATORY REQUIREMENTS Section, can start before Notice to Proceed unless specifically authorized in advance by Engineer.

2. No Work activity can exceed 28 Calendar Days (20 Work days) in duration unless specifically authorized in advance by Engineer.

3. Only Activity Types “Start Milestone”, "Finish Milestone”, and “Task” can be used unless specifically authorized in advance by Engineer. Level of Effort (LOE) activities may be used to summarize Work as needed to produce Summary Level Schedules for presentation purposes.

4. Time base for Activities of Contractor shall be in conformance with the GENERAL CONDITIONS Section.

5. Activities shall have both Predecessor and Successor Logic Ties that accurately represent the sequence and interdependence of activities; except the first Start Milestones which does not have predecessor ties and the last Finish Milestones which does not have successor ties.

    a. FS 0 (zero) logic ties are preferred.

    b. If SS successor logic ties are used, then there shall also be an FF or an FS logic tie in order for the backward pass to calculate correctly.

    c. If the lag values are not equal to zero (0), a written justification of each non zero lag shall be submitted with the first submittal of the Construction Schedule. (There shall be no exceptions to this requirement). Negative lags may not be used.

    d. SF – Start to Finish logic ties are not acceptable

6. Provide the following minimum information for each Activity:

    a. Identification Number: Each activity shall have a unique Activity Identification Number (P6 default allows 20 characters):

        1) The first 2 digits shall be the last 2 numbers of Project Specification Number.

        2) The remaining digits are for Contractor’s numbering sequence. Department requires that the last digit always be a zero (0) in case that the activity needs to be subdivided in the future.

b. Description: Each Work activity shall have a unique Activity Name. This activity description shall tell:

1) What type of Work is being performed: i.e. drive, install, excavate, and the like.

2) What is being Worked on: i.e. piles, electrical conduit, and the like.

3) Where Work is being performed: e.g. Bent #18-Compressed Air Building, and the like.

4) Examples: Drive Piles - Bent #18 or Install Electrical Conduit - Compressed Air Building

c. Calendar: Two standard Global calendars shall be defined in addition to the calendars used by Contractor for their Work activities for Department and shall be named “POLA Calendar 1”, “POLA Calendar 2”.

1) "POLA Calendar 1” shall be a 365 / 366 Calendar Day calendar with a 7 day Work week and no holidays. This calendar shall be used for milestones, approval activities, and third party activities.

2) "POLA Calendar 2” shall be a 5 day per week single shift Work day calendar with holidays.

Note: The union holidays currently recognized by Department are:

New Year’s Day - 01 January

Memorial Day - Last Monday of May

Independence Day - 04 July

Labor Day - First Monday of September

Veterans Day - 11 November

Thanksgiving Day - Fourth Thursday of November

Day after Thanksgiving - Day after Thanksgiving Day

Christmas Day - 25 December

3) Contractor may, with the prior concurrence of Department, add other holidays and/or other calendars for special Work shifts such as 6 day single shift, 5 day double shift, and the like. Additional calendars shall be defined as PROJECT CALENDARS and shall be named with the 4-digit Project Specification number to associate it with the specific project to which it applies.

4) The calendars assigned in the schedule shall have consistent Work periods (i.e. 0800h to 1700h with a non-Work period from 1200h to 1300h).

d. Original Duration: The minimum unit of time is 1 day. Activities shall have a duration of no less than 1 and no more than 28 Calendar Days for on-site operations.

1) Denote Activities that require unusual shift Work, such as, 2 shift days, 6-day weeks, or so forth, by a different calendar code for each type of shift.

2) Activities of others shall be in Calendar Days.

3) Upon approval of the baseline schedule the original duration shall remain unchanged. Changes of duration shall be reflected in adjustment of remaining duration.

4) No fractional durations for activity durations, total float values, nor lags shall be allowed in the schedule.

5) No fractional dates shall be allowed in the schedule.

6) Presence of fractional durations or dates shall be cause for rejection of the schedule without additional review.

e. Code Activities and Milestones: Each activity shall have activity coding.

1) Activity code fields shall be defined as “global type” activity code fields.

a) The first 4 characters of the activity field name shall be Project Specification Number [SPEC].

b) “EPS type” activity codes shall not be used.

2) As a minimum, the following code fields shall be included:

a) [SPEC] BIDI – POLA Bid Item Number.

b) [SPEC] RESP – Responsibility – which entity: Contractor, subcontractor, supplier, Department, and the like, is responsible for the activity.

c) [SPEC] PHAS – Phases – a breakdown of Work into the following contractually definable phases:

1 General Conditions

2 General Requirements

3 Contract Work

4 Contract Close Out

d) [SPEC] AREA – Locations – a further breakdown of Phase Code into sub-Phases such as Contract Milestones, Permits / Prepare and Submit, Review and Approve, Procure and Deliver Materials / Geographical Contract Work Areas.

e) [SPEC] STEP – Steps – a further breakdown of Area Codes for Geographical Contract Work into Sub-Areas.

f) [SPEC] ITEM – Specification Section Number – POLA Specification Number for Work being performed.

g) [SPEC] CONO – Change Order Number – PCO No., CO No., or AFA No. Assign base activities the value “000”.

3) Note: Contractor’s plan for Phase, Area, and Step Codes to be utilized in the schedule as well as a Map or Drawing showing the exact location of Area and Step codes which are “geographical in nature” shall be submitted at Pre-Construction Meeting, and shall be approved by Engineer prior to Engineer’s review of the first Baseline Construction Schedule. There shall be no exceptions to this requirement unless approved in writing by Engineer.

7. Activities shall be resource and cost-loaded to generate the reports and curves specified in Construction Curves and Reports Article of this Section.

a. Any required resource-loading and cost-loading shall be performed using the "Resources” feature in Primavera P6.

b. "Expense" feature shall not be used to perform cost-loading in the schedule.

c. Contractor shall include an explanation of the cost-loading methodology and resource-loading methodology in the schedule narrative.

G. Activities shall include, but not be limited to, the following:

1. Work represented by bid items on Bid Proposal Line Items, including contingency bid items and allowance bid items shall be included after authorized by Engineer.

2. Prepare and Submit and Review and Approve Activities for required shop drawing and material samples.

3. Procure, including order, manufacture, test, and deliver critical material and major components, including material to be furnished by City as set forth in Contract.

4. Obtain permits.

5. Mobilize and move-in.

6. Construct temporary installations and support facilities.

7. Demolish and remove existing improvements.

8. Coordinate with other contractors under separate contract with City, tenants, utilities, and Work by others adjacent to Work.

9. Excavation, backfill, and other earthwork.

10. Construct other items.

11. Construct items by subcontracting.

12. Required inspections by other City departments or third parties and inspect/correct/pass.

13. Perform required tests and return results.

14. Obtain approval from and issue notices required by, regulatory agencies or other third party.

15. Correct punch list and obtain acceptance of Work, including commissioning, start-up, and testing.

16. Final clean-up and demobilize.

17. Perform Changes in Work upon issuance of directive by Engineer.

18. Activities required to complete Work comprised in Construction Schedule.

H. Show Milestones on the schedules and shall be identified, described, and coded similar to Activities.

I. Define the sequence of Work by assigning predecessor/successor logic relationships to Activities and Milestones.

J. Use the same Activity and Milestone identification numbers, descriptions, and codes in Construction Schedules.

K. Present submittals in the forms required by Table 1 at the end of this Section.

1. Export the native P6 schedule in .XER file format and submit Construction Schedule in electronic file format as specified in Paragraph 1.7C of this Section.

2. Plot Construction Schedules and curves on standard size cut paper sheets not larger than 22 inches by 34 inches. Each sheet shall have a title block on the lower right-hand corner and a timeline. Plots shall be time scaled to show a continuous flow of information from left to right. Identify the critical path clearly on each sheet.

3. Reports shall be on 8 1/2 inch by 11 inch paper.

1.8 CONSTRUCTION SCHEDULES

A. Prepare Construction Schedules as detailed in Method of Scheduling Article of this Section and as detailed in this Article.

1. Schedules shall be calculated using “Schedule Options” which is found in Primavera P6 under Tools – Schedule - Options:

a. Ignore relationships to and from other projects - On

b. Automatic scheduling and leveling - Off

c. When scheduling activities apply - Retained logic

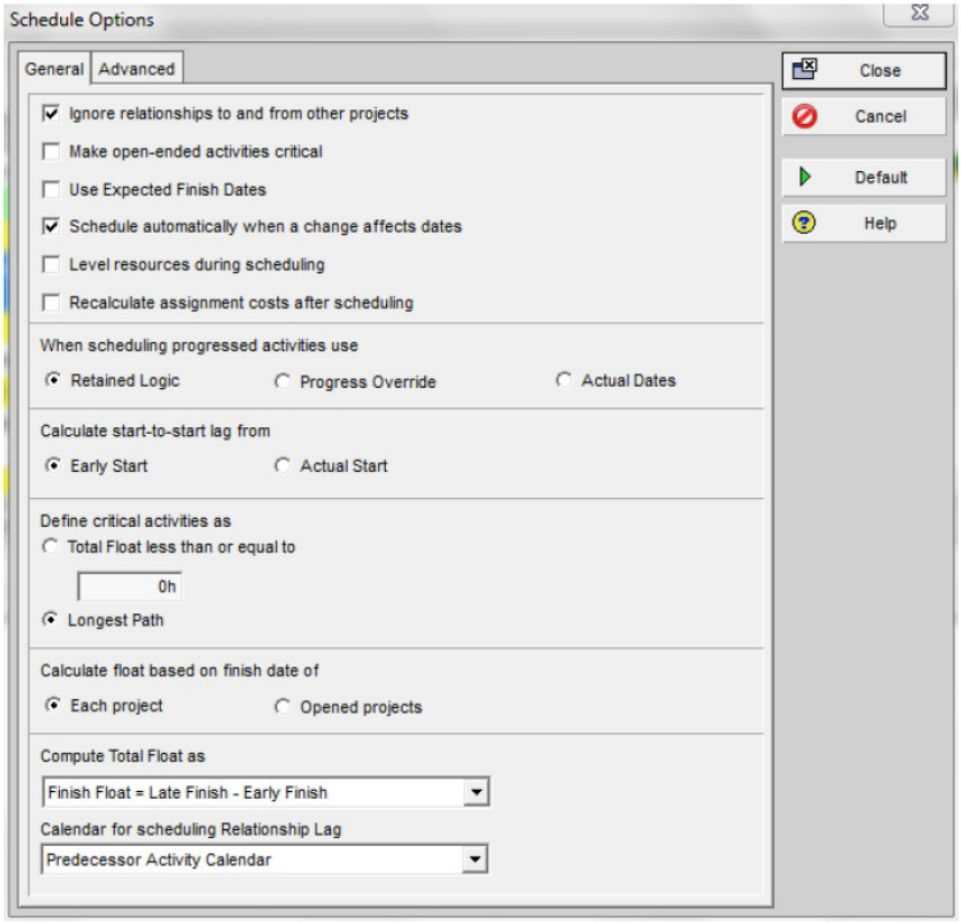
d. Calculate start to start lag from - Early start

e. Schedule interruptions - Interruptible

f. Show open ends as - Non critical

g. Calculate total float as - Finish float

P6 Schedule Options shall be set as follows:



2. Calculate/plot Critical Paths using “Longest Path Option” which is found under Tools – Schedule… [F9] - Options – Define critical activities as Longest Path (click on the radial button).

3. Data Date for Monthly Updates of Construction Schedule shall be the first Calendar Day of the following month (i.e. the Data Date of the July Update shall be 01 August). Note: When statusing Prepare and Submit, Review and Approve, or Procure Activities in Monthly Updates, add Submittal Number to Activity Description.

4. Construction Schedules (Baseline, Monthly Updates, Recovery, and the like) submitted shall have a unique four character Project ID. The first 2 characters shall be the last 2 digits of Project Specification Number. The last 2 characters can be either numbers or letters, but the schedules shall "sort" in the order in which they are submitted, with no duplication of names. Department suggests that the numbering start with SNA1. (SN=Spec No.) For example, if Project Specification Number is 2711, then Project ID would start with 11.

5. Construction Schedule submittals (Baseline, Monthly Update, Revision, Recovery, and the like) shall have a unique PROJECT NAME that includes the project title and a clear description of the schedule version (e.g.: May 2012-2 [2nd submittal of the May Update].) Note: When assigning baselines for schedule comparison, only Project name is available to identify which version is assigned.

6. Default P6 system settings may be used with the following provisions:

    a. Admin Preferences (found under Admin – Admin Preferences) – Earned Value settings shall reflect:

        1) Technique for computing performance percent complete as Activity percent Complete.

        2) Technique for computing Estimate to Complete (ETC) as ETC= remaining cost for activity.

        3) Earned Value Calculation – When calculating earned value from a baseline use Budgeted values with current dates.

    b. Financial Periods (found under Admin – Financial Periods) for Department are defined as monthly with the 1st as the start of a period and the last day of the month as the end. For stored period performance the project data date shall be indicated as the date on which to store data.

    c. User Preferences, (found under EDIT – User Preferences) - Resource Analysis shall reflect:

        1) Time Distributed Data shall be displayed based on Remaining Early Dates.

        2) Interval for time distributed resource calculations shall be Month or Week as approved by Engineer.

7. Export P6 Data to provide backup files for submittal. Each schedule submittal shall include:

    a. The data backup exported in either Primavera PM / MM – (XER) (version 8.2 or later) or Primavera PM – (XML) file format.

    b. Schedule layout definition files exported from Open Layout (found under View – Layout – Open Layout) files shall be named “layout_name.PLF”.

    c. If layouts are based on specific project data filters, ensure applicable filters are saved as a layout prior to exporting Project for transfer.

    d. Layouts may be defined as either “all users” or “project layouts”.

8. Schedule report definition files used to create submitted reports as exported from Reports (found under Tools – Reports – Reports) files are named “report_name.ERP”. [Remember to save any included filters as layouts prior to exporting the report definition file].

B. Weekly Schedule shall be in bar chart format, or any other format that is acceptable to Engineer. For the report period, show the actual start and finish dates for completed Activities, the actual start date and remaining duration of Activities in progress and the forecast start date and original duration for planned Activities. Show the percent complete of Activities. Activities may be subdivided in Weekly Schedule to more accurately monitor progress. Each activity in Weekly Schedule shall have a reference to an activity in approved Baseline Schedule. Weekly Schedule shall detail construction activities to be performed during the 1 week immediately before, and the 2 weeks immediately following the weekly construction progress meeting date. Weekly Schedule shall also include the major long lead procurement and submittal activities.

C. 90-Day Schedule shall show Activities forecasted to occur within the first 90 Calendar Days of Contract, and any Activity that shall or may affect completion dates. These Activities include, but are not limited to planning, mobilizing, submitting key shop drawings and samples, fabricating and delivering key and long-lead procurement elements. In addition, identify and show Activities that shall or may affect, or be affected by, activities of City, other City contractors, utilities, tenants, and/or other third parties. Activities and logic of 90-Day Schedule shall be the basis of the first 90 days of Preliminary Baseline.

D. Baseline Schedule shall show Activities included in 90-Day Schedule as well as Activities required to complete Work.

E. The monthly update shall be a statused submittal of 90 Day Schedule, Baseline, Current Revised Baseline, or the last approved update. The data date shall be the first day of the month following the month of the update. The information supplied in Weekly Schedule or other approved sources, shall be the basis of the actual start and finish dates or remaining duration of Activities, that were worked on or completed during the month.

1. Contractor's project manager, scheduler, and representatives of major subcontractors shall jointly review and approve the schedules, updates, and computer tabulations for accuracy prior to submittal.

2. Submit the as-built update prior to submittal of the affidavit of completion but after correction of punch list items and final cleanup. Show actual start and finish dates for Activities. Submittal of the as-built update is a condition precedent to acceptance of Work by City.

3. Engineer shall review and respond to the schedule portion of the update within 14 Calendar Days of receipt.

F. The submittal of schedules defined in Paragraphs A, B, and C of this Article, shall include a statement signed by the approved scheduler certifying that scheduler has prepared and reviewed the schedules to ensure conformance with the requirements of this Section.

1.9 CONSTRUCTION REPORTS

A. Narrative Report:

1. Narrative report shall describe differences between Baseline or Current Revised Baseline, or previous month’s update as approved, and the current update including reasons for the differences. Include an explanation of potential delays and/or problems, estimated impact on performance and the overall Project completion date, and planned corrective action.

B. Variance Report:

1. Variance report shall compare Baseline, Current Revised Baseline, or most recently approved update with the current update, and shall list Activities, which have been delayed 20 or more working days, and Activities with 10 days or less total float which have incurred any delay.

The report shall include:

a. Activity identification number and description.

b. Early start/finish dates shown on Baseline or Current Revised Baseline.

c. Current early start/finish dates.

d. Working days remaining to complete Activity.

e. Percent completion of Activity.

f. Reason for the delay in "Remarks" column.

1.10 SCHEDULE REVISIONS

A. Revisions to the schedule may become necessary when:

1. Conditions such as weather, material availability, labor availability, field conditions, Engineer direction, or other factors differ from the conditions assumed in the schedule;

2. Changes in Work occur; or

3. Progress falls behind schedule for reasons attributable to Contractor.

B. When necessary, make revisions as provided in this Article in lieu of the provisions in GENERAL CONDITIONS Section. Request time extensions in conformance with Contract Time Extensions Article of this Section.

C. Schedule Revisions may be included in the monthly schedule update submittals. The changes shall be consistent with the changes discussed at Monthly Schedule Update Meetings, referenced in Paragraph 1.6D of this Section. Provide a written narrative that lists the changes to the schedule update along with an explanation of the changes made in the schedule update, such as:

1. Justification for the revision,

2. Evidence supporting such revision as allowable, and

3. A detailed precedence analysis schedule report of Activities changed or affected by the proposed revision.

D. Provide a detailed precedence analysis for Activities changed or affected when Engineer directs a schedule revision.

E. Contractor initiated schedule revision shall not increase the original or current Contract Time.

F. When the request is approved by Engineer, reflect the changes in the most recently approved schedule update which shall become Current Revised Baseline.

1.11 CONTRACT TIME EXTENSIONS

A. Request time extensions in conformance with Extensions of Time and Compensable Delays Subsection of GENERAL CONDITIONS Section by submitting:

1. A notice of delay or request of an extension of time shall be submitted to Engineer within the time stipulated in Extension of Time and Compensable Delays Subsection, Paragraph i of GENERAL CONDITIONS Section;

2. A time impact analysis reporting the cause of and responsibility for the delay; and

3. A detailed precedence analysis schedule report of the fragnet quantifying the delay.

B. A fragnet is a sequence of new and/or revised Activities and logic that ties a delay into the construction sequence, and mathematically demonstrates the impact of the delay on the end date of Work.

C. If the time impact analysis and fragnet are approved, the fragnet shall be analyzed as follows:

1. If approved before or while the delay is occurring, the fragnet shall be analyzed in the approved monthly update of the month before the time impact analysis was approved.

2. If approved after the delay is complete, analyze the fragnet in the approved monthly update of the month before the delay was completed.

D. Insert the approved fragnet in the update defined above and succeeding updates to and including the current monthly update. The modified schedule shall become Current Revised Baseline.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

Table 1 - Submittal and Frequency Due Date

Submittal Name	Form of Submittal	Submittal Due	Frequency
1. Scheduler and Scheduling System	Written Report	14 Calendar Days (CD) after Notice of Award	Until approved
2. 90-Day Schedule	Electronic	21 CD after NTP	Until approved and monthly thereafter until Baseline approved*
3. Preliminary Baseline Schedule	Electronic	45 CD after NTP	Once until approved*
4. Baseline Schedule	Plot and electronic	7 CD after acceptance of Preliminary Baseline	Once until approved*
5. Monthly Updates/ Schedule Revisions a. Schedule b. Narrative Report c. Variance Report	a. Plot and electronic b. Written Report c. Written Report	7 CD after the end of the update month	Monthly after Baseline established*
6. Weekly Schedules	Bar Chart	At weekly meeting	Weekly*

7. Time Impact Analysis	Plot and electronic [supporting evidence, precedence analysis]	14 CD after approval of request or direction	As needed*
8. As-built Update Schedule	Plot and electronic	After Work is completed and prior to Project closeout	Once until approved*
9. Resubmittal of rejected submittal	Plot and electronic	7 CD after receipt of comments	As needed*

1. *Resubmit rejected submittals as provided in Item 9 of Table 1

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Permit and fee requirements

B. Government agency notifications, fees, and license requirements required for Project

C. Submittal requirements for permits and notifications

D. Contractor shall pay costs of fines, including fines against Department, resulting from Contractor’s non-compliance with permit requirements or failure to procure appropriate permits.

1.2 CITY OF LOS ANGELES PERMITS

A. Contractor shall obtain and Department shall pay for City of Los Angeles permits required by Department of Building and Safety (LADBS), Fire Department, and Department of Public Works. Payment shall be made by an Interdepartmental Order (IDO) to these departments. Engineer shall obtain plan check unless specified otherwise.

1. City of Los Angeles Department of Building and Safety permit applicants are required to present the following prior to the issuance of permits:

a. Worker's Compensation Insurance Certificate.

b. Contractor's license.

c. City of Los Angeles Business Tax Identification Number.

2. Coordinate payment with Engineer. Permits required include but are not limited to the following:

a. Building Permit (Refer also to the Construction Stormwater Pollution Control and Construction General Stormwater Permit and Stormwater Pollution Prevention Plan (SWPPP) Articles of this Section)

b. Demolition Permit

c. Mechanical Permit

d. Electrical Permit

B. Obtain City of Los Angeles Department of Public Works, Bureau of Street Services Overload permit where hauled material dimensions exceed overlength, overwidth, or overheight criteria, or materials are subject to other permit requirements.

C. On-site inspection approval from Department shall be required for hot work. Secure a hot work permit for welding, cutting, burning, pitch heating, riveting, grinding, drilling, and other fire and spark producing operations from Port Police Office at (310) 732-3973 or (310) 732-3500 at 330 South Centre Street, San Pedro, California 90731 two working days prior to start of hot work. There is no fee for this permit.

1. Furnish safety devices, extinguisher, and fire watch as required by permit.

2. Exercise caution in welding and cutting operations to avoid fire.

1.3 CALIFORNIA AIR RESOURCES BOARD (CARB) REQUIREMENTS

A. On-road vehicles shall comply with CARB Clean Truck Check (Heavy Duty Inspection and Maintenance Regulation) and Advanced Clean Fleets Regulation

1. Prior to start of Work, submit to Engineer proof of compliance required by CARB for Contractor and subcontractors. Follow applicable regulatory requirements for retention of paperwork.

B. Off-road equipment shall comply with CARB off-road equipment regulations including but not limited to: In-Use Off-Road Diesel and Large Spark Ignition Regulations.

1. Prior to start of Work, submit to Engineer proof of compliance required by CARB for Contractor and subcontractors. Follow applicable regulatory requirements for retention of paperwork.

2. Prominently display appropriate signage in conformance with CARB In-Use Off-Road Diesel Regulation (https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation) on Project Site. Signage shall state the following:

   "Who does the In-Use Off-Road regulation apply to? The In-Use Off-Road Diesel-Fueled Fleets Regulation (Off-Road Regulation) applies to self-propelled off-road diesel vehicles 25 horsepower or greater and most two-engine vehicles (except onroad two-engine sweepers) owned or operated in California. This includes vehicles that are rented or leased (rental or leased fleets)."

1.4 SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) REQUIREMENTS

A. Obtain pertinent SCAQMD permits and comply with SCAQMD rules and permit requirements, including, but not limited to, the following:

1. Obtain and pay for SCAQMD permits under Rules 201, 203, 222, and/or 2202 for affected classes of equipment, including but not limited to, internal combustion engines greater than 50 brake horsepower which are not used as vehicle propulsion (air compressors, generators, winch motors, and the like).

   a. California Air Resources Board permits may be obtained for eligible portable engines in lieu of SCAQMD permits.

2. Comply with SCAQMD Rules 401, Visible Emissions and 402, Nuisance.

1.5 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), FIRE, AND OTHER SAFETY REQUIREMENTS

A. Comply with State of California Construction Safety Orders and General Industry Safety Orders issued by Department of Industrial Relations, Division of Occupational Safety and Health; and Safety and Health Regulations for Construction administered by United States Department of Labor, Occupational Safety and Health Administration (OSHA).

B. Hazardous Substances: Also known as hazardous materials, are defined in California Health and Safety Code 25501 (n). Hazardous substances include those shown in "Director's List" from Department of Industrial Relations pursuant to Hazardous Substances Information and Training Act, and those described in Part 172 of Title 49 of the Code of Federal Regulations (CFR), Department of Transportation Hazardous Materials List.

1. Examples of hazardous substances commonly used in construction projects include, but are not limited to, the following:
    a. Toxic materials (pesticides, herbicides, epoxies, curing compounds, and paints),
    b. Corrosive materials with pH of 2 or less (muriatic and other acids),
    c. Corrosive materials with pH of 12.5 or more (soda lye and lime),
    d. Ignitable materials (gasoline and diesel fuel, propane, and solvents),
    e. Reactive materials (chlorine), or
    f. Any other material for which a Safety Data Sheet (SDS) has been prepared.
2. Handle hazardous substances in conformance with applicable federal, state, and local regulations.
3. Make current and accurate copies of SDS available at Project Site for each hazardous substance to be used at Project Site.
    a. Train employees that handle hazardous substances and hazardous wastes in procedures for handling such materials. Refer also to Hazardous Waste Article of this Section.
4. Store hazardous substances in conformance with California Health and Safety Code and City of Los Angeles Fire Code requirements.
    a. Comply with California Health and Safety Code, Division 20, Chapter 6.95, Section 25500. Contractor shall file a Hazardous Materials Business Plan through California Environmental Reporting System (CERS) as implemented by City of Los Angeles Fire Department and associated Certified Unified Program Agency (CUPA) at http://fire.lacounty.gov/wp-content/uploads/2019/08/lacofd-CERS-User-Guide_Part3.pdf if on-site storage of hazardous substances exceeds the following quantities:
        1) Liquids: 55 gallons
        2) Gas: 200 cubic feet
        3) Solids: 55 pounds

b. On-site storage refers to the uninterrupted presence of hazardous substances at Project Site for 30 Calendar Days or more, including refills or replacement of stock.

5. Protect hazardous substance storage containers from wind and rain. Place secondary containment beneath containers or equipment to capture drips and spills.

6. Clean up spills immediately. Place absorbent material on residue from small spills and dispose of wastes in conformance with federal, state, and local regulations and with Hazardous Waste Article of this Section. Submit spill cleanup method to Engineer upon request.

1.6 HAZARDOUS WASTE

A. General: Hazardous waste is defined by Health and Safety Code 25117 and, California Code of Regulations, Title 22 Division 4.5, Chapter 11 Article 2, Section 66261.10 et. Seq. Notify Engineer of observances or occurrences of hazardous waste. Comply with federal, state, and local reporting requirements. Continued Work at the affected area of Project Site shall require the approval of Engineer.

1. Prior to performing any Work in affected areas, prepare a Project Site-specific Safety and Health Program pursuant to Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements in California Code of Regulations CCR Title 8 Section 5192. Upon generating hazardous waste, Contractor shall furnish Safety and Health Plan for Project Site and submit to Engineer within 2 Calendar Days of generation.

2. Workers shall be trained in conformance with CCR Title 8 Section 5192.

3. Dispose of hazardous wastes at licensed facility that is permitted to receive hazardous waste (recycling and disposal) as approved by Engineer.

4. Submit copies of documents to Engineer, including hazardous waste manifests indicating the amount, nature, and disposition of the hazardous waste within 10 Calendar Days of disposal, as required by law and regulations.

B. Pre-Existing Hazardous Wastes: City shall retain title to pre-existing hazardous waste removed from Project.

1. Store and manage hazardous wastes discovered on-site during the course of construction and resulting from construction activities in conformance with California Health and Safety Code. Protect hazardous waste storage containers from wind and rain in conformance with applicable laws and regulations. Place secondary containment beneath receptacles to capture drips and spills.

2. In handling City's materials, City acknowledges that for the purposes of Contract, it retains generator status and shall be the primary or designated generator, shall obtain the necessary United States Environmental Protection Agency (U.S. EPA) identification number, and sign the transportation manifests as owner of the material.

3. Pay fees required for the disposal of hazardous waste.

C. Contractor-Generated Hazardous Wastes: Contractor shall retain title to hazardous waste generated from supplies and equipment brought on Project Site and any Laydown Area(s).

1. Contractor shall bear costs, including disposal fees and taxes, for managing and disposing of hazardous waste generated from supplies and equipment brought on Project Site and any Laydown Area(s).

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedures for ensuring optimal diversion of construction and demolition waste generated by Project and documentation procedures for tracking waste generation and diversion.

1. Project shall promote City's sustainable building efforts by creating a resource-efficient and environmentally sensitive Project and maintaining optimum control of Construction and Demolition (C&D) waste generated during Project.

2. Project shall use products with post-consumer recycled content to the greatest extent feasible. Refer to California Department of Resources Recycling and Recovery's (CalRecycle's) website for information about recycled content construction products.

1.2 ABBREVIATIONS

A. CalMAX: California Materials Exchange

B. CalRecycle: California Department of Resources Recycling and Recovery

C. C&D: Construction and Demolition

D. CCR: California Code of Regulations

E. CDRG: Construction and Demolition Recycling Guide

F. LEA: Local Enforcement Agency

G. SWDD Report: Solid Waste Diversion and Disposal Report

H. WMP: Waste Management Plan

1.3 DEFINITIONS

A. Certified C&D Waste Processing Facility or Certified C&D Waste Processor: A solid waste processing facility that accepts loads of C&D waste for the purpose of recovering re-usable and recyclable materials and disposing of the non-recyclable residual material. A Certified C&D Waste Processing Facility has been certified by City of Los Angeles (City) Bureau of Sanitation to have a facility specific recycling rate for C&D waste. For information on becoming a certified C&D waste processor, refer to: https://www.lacitysan.org/san/faces/home/portal/s-lsh-wwd/s-lsh-wwd-s/s-lsh-wwd-s-r/s-lsh-wwd-s-r-cdr?_adf.ctrl-state=1d5d9u35ny_1&_afrLoop=4798033367694392&_afrWindowMode=0&_afrWindowId=null#!%40%40%3F_afrWindowId%3Dnull%26_afrLoop%3D4798033367694392%26_afrWindowMode%3D0%26_adf.ctrl-state%3D1d5d9u35ny_5. See CDRG for information on the current list of certified processors and recycling facilities.

B. Class III Landfill: A landfill that accepts non-hazardous solid waste such as household, commercial, and industrial solid waste. A Class III landfill is regulated by LEA and shall have a CalRecycle solid waste facilities permit.

C. Construction and Demolition Recycling Guide (CDRG): A publication by City of Los Angeles Department of Public Works, Bureau of Sanitation, Solid Resources Citywide Recycling Division. CDRG can be found at: https://www.lacitysan.org/cs/groups/pressrelease/documents/document/y250/mdgy/~edisp/cnt082545.pdf.

D. C&D Waste or Mixed C&D Waste or C&D Debris or Mixed C&D Debris: Solid waste and recyclable materials, and building materials from construction, deconstruction, remodeling, repair, or demolition of buildings and other structures, do not contain hazardous waste (as defined in CCR Title 22, Section 66261.3, et seq.), and contain no more than 1 percent putrescible wastes by volume, calculated on a monthly basis. C&D waste includes, but is not limited to: asphalt, concrete, Portland cement, brick, lumber, drywall, roofing material, ceramic tile, pipe, glass, carpet, and associated packaging.

E. Deconstruction: The process of taking apart a structure with the primary goal of preserving the value of useful building materials, so that they may be reused or recycled.

F. Disposal: Acceptance of solid waste at a legally operating facility for the purpose of landfilling.

G. Diversion: Activities that result in reducing the amount of solid waste disposed at a landfill. This can include source reduction activities, composting, recycling, and reuse.

H. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert debris is taken for the purpose of filling an excavation, shoring, or another soils engineering operation.

I. Inert Debris: Solid waste and recyclable materials that are source separated or separated for reuse and do not contain hazardous waste (as defined in CCR, Title 22, Section 66261.3 et seq.) or soluble pollutants at concentrations in excess of applicable water quality. Inert debris may not contain any putrescible wastes. Inert debris includes but is not limited to concrete, asphalt, crushed glass, fiberglass, asphalt or fiberglass roofing shingles, brick, slag, ceramics, plaster, clay, and clay products.

J. Inert Debris Engineered Fill Operation (IDEFO): An activity exceeding 1 year in duration in which only the following inert debris may be used: fully cured asphalt, uncontaminated concrete (including steel reinforcing rods embedded in the concrete), crushed glass, brick, ceramics, clay and clay products, which may be mixed with rock and soil. Those materials are spread on land in lifts and compacted under controlled conditions to achieve a uniform and dense mass which is capable of supporting structural loading, as necessary, or supporting other uses such as recreation, agriculture, and open space in order to provide land that is appropriate for an end use consistent with approved local general and specific plans (e.g. roads, building sites, or other improvements) where an engineered fill is required to facilitate productive use(s) of the land.

K. Non-Permitted Solid Waste Hauler: A company that does not possess a valid and current solid waste from individuals or businesses in City of Los Angeles.

L. Permitted Solid Waste Hauler: A company that possesses a valid and current solid waste hauler permit from City of Los Angeles to collect and transport solid waste from individuals or businesses in City of Los Angeles. Refer to: https://www.lacitysan.org/san/faces/wcnav_externalId/s-lsh-wwd-s-c-whp?_adf.ctrl-state=jir2v5wty_2037&_afrLoop=14808459037152891&_afrWindowMode=0&_afrWindowId=null#!%40%40%3F_afrWindowId%3Dnull%26_afrLoop%3D14808459037152891%26_afrWindowMode%3D0%26_adf.ctrl-state%3Djir2v5wty_2041.

M. Recycling: The process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new, reused, or reconstituted products that meet the quality standards necessary to be used in the marketplace.

1. On-site Recycling: Materials that are sorted and processed for use in an altered form in Project, (e.g. concrete is crushed for use as base for a parking lot on Project Site).

2. Off-site Recycling: Source-separated materials hauled to another location and used in an altered form in the manufacture of a new product.

N. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a Solid Waste Facilities permit from CalRecycle or be regulated by LEA.

O. Reuse: Materials that are recovered for use in the same form. This includes materials that are reused on-site or off-site.

P. Salvage: Materials recovered for reuse or sale or donation to a third party.

Q. Source Reduction: Any action causing a net reduction in the generation of solid waste. Source reduction includes, but is not limited to, reducing the use of non-recyclable materials, replacing disposable materials and products with reusable materials and products, reducing packaging, and reducing the amount of yard waste generated.

R. Source-Separated Materials (Construction and Demolition Waste): Material that is sorted at the site of generation by individual material type for the purpose of reuse or recycling, i.e., loads of concrete that are source-separated for delivery to an inert debris recycling facility to be crushed into road base material. Note: Contractor may be able to save money on collection fees for source-separated material. Source-separated material is not subject to City's 10 percent AB 939 fee.

S. Solid Waste: Shall mean waste that CalRecycle has deemed acceptable for disposal at a Class III Landfill and shall not include source-separated material.

T. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal or recovering some materials for reuse or recycling. Transfer stations shall be permitted by CalRecycle and regulated by LEA.

U. Solid Waste Hauler or Waste Hauler: Shall mean any person engaged in the business of providing or responsible for the collection, removal, or transportation of Solid Waste, Construction and Demolition Waste, Source-Separated Materials.

V. Solid Waste Hauler Permit, Waste Hauler Permit, or AB 939 Compliance Permit: Persons who collect, remove, or transport Solid Waste, including Construction and Demolition Waste, Source-Separated Materials or co-mingled recyclables, generated with City, shall obtain, in addition to other required permits, and AB 939 Compliance Permit from City of Los Angeles, Department of Public Works Bureau of Sanitation.

1.4 DIVERSION REQUIREMENTS

A. Each construction or demolition Project shall reuse or recycle a minimum of 80 percent of the inert debris and 65 percent of the remaining construction and demolition waste generated by Project.

B. Each construction or demolition Project shall dispose of construction and demolition waste generated from Project in conformance with City's C&D Waste Recycling Ordinance (Ordinance No. 181519). Los Angeles Municipal Code requires that mixed C&D waste generated within City of Los Angeles be taken to a City Certified C&D Waste Processing Facility and source separated C&D waste be taken to a recycling facility or City Certified C&D Waste Processing Facility. Further, C&D waste can only be legally collected, removed, or transported by City of Los Angeles Permitted Solid Waste Haulers. If Contractor plans on collecting, removing, or transporting its own waste, Contractor shall first apply for and obtain a Solid Waste Hauler Permit from Solid Resources Citywide Recycling Division (SRCRD) of the Bureau of Sanitation.

C. Failure to meet the C&D waste recycling requirements as detailed in Paragraphs 1.4 A and B of this Article shall result in the assessment of penalties up to $5,000 per each load of mixed C&D waste not taken to City Certified C&D Waste Processing Facility. Further, collecting, removing, or transporting C&D waste within City without a valid Solid Waste Hauler Permit is a criminal misdemeanor subject to fines and/or imprisonment.

1.5 SUBMITTALS

A. Waste Management Plan (WMP): Conduct a Project Site assessment and estimate the types and quantities of materials, generated during Project, that are anticipated for on-site or off-site processing, recycling, or reuse.

1. Not more than 10 working days after Notice to Proceed, submit to Engineer a written WMP, Attachment A, based on forms in Appendix "B" of Specifications. The plan shall show a minimum 80 percent recycling for inert debris expected from Project and 65 percent recycling for the remaining C&D waste expected from Project. Submit the plan in the format as shown on Attachment A provided in Appendix "B" of Specifications. Instructions for filling out the form are in Attachment A, Instruction Sheet for Waste Management Plan included in Appendix "B" of Specifications. Work shall not begin until Engineer approves WMP for Project.

2. If Contractor expects a circumstance that Contractor believes makes it infeasible to comply with the Diversion Requirement, Contractor may submit a written request for an exemption at the time WMP is submitted. If the exemption request is not approved by Engineer, revise and resubmit a WMP.

3. if City determines that it is infeasible for Contractor to meet Diversion Requirement due to unique circumstances, City shall determine the maximum feasible diversion rate for each material and shall indicate this rate on WMP submitted by Contractor. City shall return a copy of WMP to Contractor marked "Approved for Infeasible Exemption". Contractor shall be required to meet the maximum feasible diversion rates as approved by City. If Contractor fails to meet revised rates, Contractor shall be subject to the stipulated penalties. Exempt Projects are required to keep and submit documentation for Project. This includes receipts, WMP, SWDD Reports, and supporting documentation as required in this Section.

4. City's approval of Contractor's WMP shall not otherwise relieve Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.

B. Solid Waste Diversion and Disposal Report (SWDD Report): One week prior to the first of every month, and prior to Engineer's monthly progress estimate for payment, Contractor shall prepare and submit to Engineer a written SWDD Report quantifying material generated, diverted, and disposed in Project during the time period covered by SWDD Report and progress payment. Part 3 of each SWDD Report is a cumulative history of the diversion and disposal for Project. Submit the report in the format provided in Attachment B included in Appendix "B" of Specifications. Failure to submit the report and the supporting documentation shall render the application for progress payment incomplete and delay payment until the proper documentation is submitted. The supporting documentation includes manifests, weight tickets, receipts, reports, invoices, and other supporting documents specifically identifying the projects, the recyclables and solid waste generated by Project, and where the material was sent. Instructions for filling out the forms are in Attachment B, Instruction Sheet for Solid Waste Diversion & Disposal Report included in Appendix "B" of Specifications. Together, all of the SWDD Reports shall cover the complete time period of Project. The final SWDD Report and supporting documentation shall be submitted within 30 Calendar Days of substantial completion of Project but before Affidavits of Completion are submitted.

C. Substitutions: Should Contractor desire to use materials, equipment, or products that meet the requirements of these specifications but are more environmentally responsive, Contractor shall submit these substitutions in conformance with Proprietary Names and Substitutions Subsection of GENERAL CONDITIONS Section.

1.6 PENALTY

A. If the diversion requirement has not been met, a per ton penalty shall be applied to the disposed material over that allowed in approved WMP.

B. The penalty shall be calculated as follows: Tons over that allowed in the approved WMP times the per-ton penalty in effect at the time Contract was awarded. The penalty may not exceed the total payment retention for Project.

C. Tons of mixed C&D waste either not hauled to City Certified C&D Waste Processing Facilities or hauled by non-permitted waste haulers shall be assessed a per-ton penalty. The penalty may not exceed the total payment retention for Project.

D. The penalty is $100 per ton.

E. The recommended penalty shall be determined by Bureau of Contract Administration and Bureau of Sanitation and shall be considered by Board of Harbor Commissioners at the time of Project closeout.

1.7 WASTE MANAGEMENT PLAN SUBMITTAL MEETING

A. On or about 5 working days after Notice to Proceed, Engineer shall schedule and attend a meeting with Contractor to discuss the proposed WMP submittal. This meeting shall be held to allow Department and Contractor an opportunity to develop a mutual understanding regarding the recycling and reuse requirements and programs.

1.8 REUSE, SALVAGE, AND RECYCLING OPTIONS

A. Construction projects shall make use of as many reuse and salvage options as is feasible. One option is CalMAX, a free program sponsored by CalRecycle. The most recent issues of CDRG, contains contact information for non-profit organizations, salvage facilities, and other reuse organizations.

B. Recycling shall include both on-site and off-site recycling of source-separated materials, as well as mixed C&D waste recycling efforts.

C. On-site recycling programs shall produce a quality product to meet Specifications identified in Contract Documents, subject to approval. Estimate the amount of material to be used in Project and include a program for off-site recycling of any excess material that cannot be used in Project.

D. Develop and implement a program to include source separation of solid waste, to the greatest extent feasible, of the following types:

1. Asphalt

2. Concrete, concrete block, slump stone (decorative concrete block)

3. Rock

4. Wood (lumber)

5. Green material (i.e. tree trimmings)

6. Other materials, as appropriate, such as red clay brick, building fixtures, architectural details, drywall, carpet, carpet padding, and corrugated cardboard.

E. Mixed C&D Waste Recycling: Develop and implement a program to transport commingled construction and demolition materials that cannot be feasibly source-separated to Certified C&D Waste Processing Facility.

F. Certified C&D Waste Processing Facility: These facilities have facility recycling rates, established by City of Los Angeles for mixed C&D waste. Mixed C&D waste taken to these facilities are considered to have been recycled at the rate of the certified processing facility. For example, 100 tons of material taken to a facility with an 80 percent recycling rate results in 80 tons of recycling and 20 tons of disposal for Project. A list of these facilities and their recycling rates is in the most recent issue of CDRG.

G. Recycling, Reuse, Mixed C&D Waste Processing, and Salvage Facilities: CDRG is incorporated in this Section by reference and contains information about processing, recycling, reuse, and salvage facilities.

H. Revenue: Revenue or savings obtained from recycled, reused, or salvaged materials shall accrue to Contractor unless otherwise noted in Contract Documents. Note: Contractor may be able to save money on collection fees for source-separated material. Source-separated material is not subject to City's 10 percent AB 939 fee.

I. AB 939 Fee: AB 939 fee is assessed on solid waste hauled within City of Los Angeles in conformance with Section 66.32 of Los Angeles Municipal Code.

1. Solid waste haulers hauling material from City of Los Angeles locations must be permitted in conformance with Section 66.32 of City of Los Angeles Municipal Code.

2. Source-separated material is not assessed this fee.

1.9 HAULING AND DISPOSAL OPERATIONS

A. Hauling: Arrange the collection and hauling of C&D waste by a solid waste hauler that is permitted by City of Los Angeles in conformance with Section 66.32 of Los Angeles Municipal Code.

B. Recycling and Processing Facilities: Transport C&D waste to recycling or processing facilities. Contractor shall be familiar with the requirements for acceptance of C&D waste at the recycling and processing facilities before the material is delivered. The most recent issue of CDRG, includes a partial list of these facilities. Always call facilities in advance.

C. Disposal Facilities: Transport C&D waste that cannot be accepted at a recycling or processing facility, to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal. A load of C&D waste may be taken to a disposal facility only after it has been rejected by 2 different certified processing facilities and the driver is in possession of both rejection slips. The rejection slips and the weight ticket from the final destination shall be kept together and submitted to Contractor and copy furnished to Engineer.

D. Project Site Disposal: Do not burn, bury, or otherwise dispose of solid waste on the Project Site.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedures and requirements for preparation and submittal of "As-Built" set of Record Documents including, but not limited to, Drawings and Specifications utilizing Bluebeam Revu Complete Annual Subscriptions and AutoCAD.

1.2 PRICE AND PAYMENT PROCEDURES

A. A $5,000 per month minimum shall be included as a line item in the Schedule of Values of the Lump Sum Construction bid item of Bid Proposal Line Items for project record documents. Project Record Documents are considered complete when approved by Engineer.

1.3 SUBMITTALS

A. Engineer's approval of the up-to-date status of Record Documents is a prerequisite for the approval of requests for progress payments.

B. Submit the final Record Documents, consisting of marked up Drawings, Specifications, and additional drawings, to Engineer in digital and paper formats for approval upon completion of Project and prior to submitting Affidavit of Completion.

C. Project Record Documents shall be updated daily for review and approval and shall consist of marked up Drawings and Specifications utilizing Bluebeam. Submit the final Record Documents, consisting of marked up Drawings, Specifications, and additional drawings to Engineer in Bluebeam and AutoCAD for approval upon completion of Project and prior to submitting Affidavit of Completion.

1.4 DESCRIPTION - PROJECT SET RECORD DOCUMENTS

A. Following Award of Contract, secure from Engineer (at no charge) 1 complete set of “As Bid” Drawings and conformed Specifications to be the basis of Project Set Record Documents.

B. Provide 3 Bluebeam Revu Complete Annual Subscriptions for Department for the duration of Contract Time and for an additional 6 months.

C. Engineer shall create and manage a Bluebeam Revu Studio Session. Contractor shall make entries to project record documents within the Bluebeam Revu Studio Session. Contractor shall coordinate with Engineer for a list of Revu attendees.

D. Following Award of Contract, Engineer shall provide a complete set of "As Bid" Drawings and conformed Specifications in digital portable document format (PDF) via Bluebeam Revu Studio Session and full size hard-copy format to be the basis of Project Set Project Record Documents.

E. Project Set Record Documents shall be identified with the title "RECORD DOCUMENTS - PROJECT SET". Project Set shall be used for no purpose other than the entry of data and review by Engineer.

1.5 ENTRIES ON JOB SET

A. The following entries shall be made on Bluebeam:

1. Enter changes on Drawings and Specifications, as applicable.

2. Describe and date changes by note and graphic line. Emphasize entry by a "cloud" around the affected area or areas. In the event of overlapping changes, different colors may be used for each change.

3. Include changes clearly marked on Drawings from sources, including responses to Requests for Information (RFIs), product substitutions, and delta revision changes transmitted from Engineer.

4. Note authority and reason for each change.

5. Reference change on any other affected sheets.

6. Enter make and model of equipment installed in the Project.

7. Maintain record documents "as-current" continually and available for examination by Engineer, upon request.

B. The following entries shall be made on AutoCAD and shall include hard-copy and electronic AutoCAD files of "As-Builts":

1. Note actual location (dimension, elevations, depths, stations) of substructures constructed (including pile tip elevation, sewer wyes and laterals, utility stubouts, and Work shown schematically) and existing substructures encountered during construction. Call for survey to determine as-built alignment and elevation as required before concealing Work.

1.6 CONVERSION OF SCHEMATIC LAYOUTS TO AS-BUILT DRAWINGS

A. Where Work is shown on Drawings by use of a schematic diagram, supplement the diagram or provide a new drawing, in a manner approved by Engineer, to show the actual dimensioned locations, elevations, and details of Work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Specific measures and practices to protect the environment, be socially responsible, provide for the economic development of Port of Los Angeles and include air quality, materials management, energy use, health and safety, and labor sustainability measures.

1.2 REFERENCES

A. FGC Division 4 Part 2 Chapter 1 - Birds and Mammals.

1.3 SUBMITTALS

A. Provide a list of equipment prior to entering Project Site.

B. Submit backup documentation monthly demonstrating compliance with the environmental measures, including but not limited to project conditions, as applicable and, in particular, as indicated in the Environmental Compliance Tracking (ECT) Form (refer to sample form in Appendix "C" of Specifications and fill in form in PMWeb), including the California Air Resources Board Executive Order, Engine Model Summary Template, vehicle registration card, photos of equipment with equipment identification number, and the like, and monitoring logs and reports.

1.4 DEPARTMENT DIESEL FUEL REQUIREMENTS

A. Project shall require diesel-fueled harbor craft and off-road equipment to use renewable diesel in conformance with CARB regulations.

B. When possible, use renewable diesel instead of conventional diesel for on-road diesel vehicles.

1.5 DEPARTMENT EQUIPMENT REQUIREMENTS

A. On-Road Trucks:

1. On-road trucks, including import haulers, used during the construction phase of the proposed Project shall meet or exceed CARB on-road vehicle emission requirements unless Contractor is able to provide proof that any of these circumstances exist:

a. On-road truck used in the proposed Project has received an exemption from CARB.

b. On-road truck is not subject to current CARB regulatory requirements.

2. Trucks hauling materials such as debris or fill materials shall be fully covered to prevent unintentional discharge of materials onto roads, highways, streets, and the like while operating off Department property.

3. Idling shall be restricted to a maximum of 5 minutes when not in use.

4. A copy of each unit's certified EPA rating, BACT documentation, and CARB or South Coast Air Quality Management District (SCAQMD) operating permit and/or compliance certification to applicable regulations shall be provided at the time of mobilization of each applicable unit of equipment.

5. For duration of Project, report trucks subject to CARB truck reporting requirements as part of Contractor's fleet of vehicles, not as part of Department's fleet of vehicles.

B. Diesel Powered Off-Road Construction Equipment:

1. Diesel powered off-road construction equipment is defined as any self-propelled land vehicle used for construction purposes, including earth movers, using diesel fuel, having a manufacturer's maximum gross vehicle weight rating of 6,000 pounds (2,721.5 kg) or more, with a power rating greater than or equal to 25 horsepower (hp).

2. Shut down engines on construction equipment when not in use for more than 5 minutes.

3. Construction equipment shall incorporate, where feasible, emissions-savings technology such as alternative fuels, hybrid drives, and specific fuel economy standards.

4. Equipment Engine Specifications:

a. Off-road diesel-powered construction equipment greater than or equal to 25 hp shall meet Tier-4 off-road emission standards and/or CARB requirements. Use the emission standard that has the least amount of allowable emissions for this type of equipment.

5. The above Equipment Engine Specifications measures shall be met, unless one of the following circumstances exists, and Contractor is able to provide proof that any of these circumstances exist:

a. A piece of specialized equipment is unavailable within 200 miles of Port of Los Angeles, including through a leasing agreement.

   1) If this circumstance exists, the equipment must comply with one of the options contained in the Step-Down Schedule as shown in Table A of this Section. At no time shall equipment meet less than the current CARB requirements.

b. Reassess the availability of construction equipment on an annual basis. For example, if a piece of equipment is not available prior to December 31, 2018, Contractor shall reassess this availability on January 1, 2019.

Table A: Compliance Step-Down Schedule

Compliance Alternative	Engine Standard	CARB-Verified DECS	PM Emissions* g/bhp-hr	NOx-Emissions g/bhp-hr
1	Tier 4	N/A	0.01	0.3
2	Tier 3	Level 3	0.02	2.9
3	Tier 2	Level 3	0.02	4.47
Equipment less than Tier 2 or lower than current CARB requirements is not permitted.				

*Stated emission levels are for engine horsepower ratings of 176 bhp and above. Emission levels for engine bhp ratings below 176 hp are marginally higher. (0.02-0.08 g/bhp-hr depending on hp, Tier and VDEC level)

6. Provide a copy of each unit's certified EPA rating, Verified Diesel Emission Control Strategy (VDECS), proof of use of renewable fuels, and CARB or SCAQMD operating permits and compliance certificates to applicable regulations at time of mobilization of each applicable unit of equipment.

7. Show proof of compliance with the In-Use Off-Road Diesel Regulation for Contractor and subcontractor off-road diesel-powered fleet prior to commencing Work.

8. For duration of Project, report off-road diesel-powered equipment subject to CARB reporting requirements as part of Contractor’s fleet of vehicles, not as part of Department’s fleet of vehicles.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Commissioning consists of a specific delivery process that provides Engineer with a higher level of assurance that systems and equipment have been installed in the prescribed manner and shall perform conforming to design intent. The commissioning process shall encompass and coordinate the separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing, and training.

B. Engineer shall contract the Commissioning Authority (CxA) firm directly.

C. Commissioning of selected equipment and systems during the construction and acceptance phases is intended to achieve the following objectives:

1. Verify and document that equipment is installed and started in conformance with manufacturer’s written recommendations and to industry accepted minimum standards.

2. Verify and document that equipment and systems receive complete operational checkout by installing contractors.

3. Verify and document equipment and system performance.

4. Verify the completeness of operations and maintenance materials.

5. Ensure Engineer operating personnel are adequately trained on the central plant system operation and maintenance.

D. The commissioning process does not take away from or reduce the responsibility of system designers or Contractor to provide a finished and fully functioning product.

1.2 RELATED SECTIONS

A. Section 23 08 00 - Commissioning of HVAC

1.3 SYSTEMS TO BE COMMISSIONED

A. The following systems and equipment shall be commissioned:

1. HVAC systems including:

a. Built-up air handling unit and associated zone terminal units.

b. Exhaust fans

c. Refrigerant plant

d. Fan coils

e. Computer room unit

f. Boiler plant

g. Chiller plant

h. Control system

i. Fan walls

1.4 COORDINATION

A. Commissioning Team: Members of commissioning team consist of Engineer, Commissioning Authority (CxA), Contractor, Engineer of Record (Architects and Engineers, or A/E), mechanical subcontractor (MC), electrical subcontractor (EC), Test and Balance (TAB) subcontractor, controls subcontractor (CC), and any other installing subcontractors or suppliers of equipment. (Please note: contractors other than Contractor may be referred to as subcontractor in this Section.)

B. Management: The CxA directs and coordinates the commissioning activities and reports to Engineer. Members work together to fulfill their contracted responsibilities and meet the objectives of Contract Documents.

C. Scheduling: The CxA shall work with Engineer and Contractor to schedule the commissioning activities. CxA shall provide sufficient notice to Engineer and Contractor for scheduling commissioning activities. Contractor shall integrate commissioning activities into the master schedule. Parties shall address scheduling problems and make necessary notifications in a timely manner in order to expedite commissioning process.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan: The commissioning plan provides guidance in the execution of the commissioning process. The Specifications shall take precedence over the commissioning plan.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a kickoff meeting conducted by CxA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings may be required throughout construction and shall be scheduled by the CxA in coordination with Engineer and Contractor.
3. Equipment documentation is submitted to CxA during normal submittals, including detailed start-up procedures.
4. The Commissioning Authority provides the subcontractors with pre-functional checklists (PFC) to be completed, during the start-up process.
5. In general, checkout and performance verification proceeds from simple to complex and from component level to equipment to systems and intersystem levels with pre-functional checklists being completed before functional testing is undertaken.
6. Subcontractors, under their own direction, execute and document the pre-functional checklists and perform start-up and initial checkout. CxA documents that the checklists and start-up were completed.
7. The CxA develops specific equipment and system functional performance test procedures. Contractor and subcontractors shall have the opportunity to review and comment on the procedures.
8. The procedures are executed by the subcontractors, under the direction of, and documented by the CxA.
9. Items of noncompliance in material, installation or setup are corrected and the system retested at Contractor's sole cost and expense.
10. The CxA reviews the Operations and Maintenance (O&M) documentation for completeness.
11. Commissioning is to be scheduled and completed before Substantial Completion.
12. The CxA reviews and coordinates training provided by subcontractors and verifies that it was completed.
13. Deferred testing is conducted, as required.

1.6 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this Section. The responsibilities of Mechanical subcontractor, TAB subcontractor and controls subcontractor are also in COMMISSIONING OF HVAC Section. It is noted that the services for Engineer, Engineer of Record, and Commissioning Authority are furnished by the Department.

B. Parties shall attend the commissioning kickoff meeting and other scheduled commissioning meetings.

C. Commissioning Authority (CxA):

1. CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management.

2. CxA may assist with problemsolving non-conformance or deficiencies, but ultimately that responsibility resides with Contractor and Engineer of Record.

3. The primary role of CxA is to develop and coordinate the execution of a testing plan, observe and document that systems are functioning in conformance with the design intent.

4. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner.

5. Coordinate the commissioning Work with Contractor and Engineer so that commissioning activities are being scheduled into the master schedule.

6. Plan and conduct a commissioning kickoff meeting and other commissioning meetings.

7. Request and review additional information required to perform commissioning tasks, including O&M materials, Contractor start-up and checkout procedures.

8. Before start-up, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.

9. Review Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with Engineer of Record reviews.
10. Write and distribute pre-functional checklists (PFC).
11. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
12. Review HVAC and plumbing piping test and flushing procedure and ductwork testing and cleaning procedures sufficient to be confident that proper procedures were followed. Include the documentation in O&M manuals. Notify Engineer of any deficiencies in the procedures.
13. Verify PFC completion by reviewing checklists, reports and by selected site observation and spot checking.
14. Verify systems start-up by reviewing start-up reports and by selected site observation.
15. Verify air and water systems balancing by reviewing completed reports.
16. Write the functional performance test procedures for equipment and systems. This shall include manual functional testing and energy management control system trending.
17. Analyze any functional performance trend logs and monitoring data to verify performance.
18. Coordinate and witness functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
19. Maintain a master deficiency and resolution log (aka, Issues Log) and a separate testing record.
20. Review Contractor’s systems training plan.
21. Compile and maintain a commissioning record.
22. Review the preparation of the O&M manuals.
23. Provide a final commissioning report.
24. Coordinate and supervise required deferred testing and deficiency corrections.

D. Engineer:

1. Manage the CxA, Engineer of Record and Contractor.
2. Facilitate the coordination of the commissioning Work by CxA. Assist in ensuring that commissioning activities are being scheduled into the master schedule.
3. Review and approve the final commissioning plan.
4. Attend a commissioning kickoff meeting and other commissioning team meetings.
5. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions.
6. Furnish a copy of aconstruction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the Commissioning Authority.
7. Review and approve the functional performance test procedures submitted by the CxA, prior to testing.
8. When necessary, observe and witness pre-functional checklists, start-up and functional testing of selected equipment.
9. Review commissioning progress and deficiency reports.
10. Coordinate the resolution of noncompliance and design deficiencies identified in phases of commissioning.
11. Finalize approval on individual commissioning tests as completed and passing.
12. Assist the Contractor in coordinating the training of Department personnel.
13. Assist the CxA as necessary in the deferred testing and deficiency corrections required by the Specifications.
14. Provide final approval for the completion of the commissioning Work.

E. Mechanical, Electrical Designers/Engineers (A/E):

1. Perform normal submittal review, construction observation, as-built drawing preparation, and the like, as contracted.

2. Provide any design narrative and sequences documentation requested by CxA. The designers shall assist in clarifying the operation and control of commissioned equipment in areas where the Specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

3. Attend commissioning kickoff meetings and other selected commissioning team meetings, as contracted.

4. Participate in the resolution of system deficiencies identified during commissioning.

5. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the operation and maintenance manuals. Review and approve the operation and maintenance manuals.

6. From the Contractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for commissioned equipment, as contracted.

F. Contractor: Contractor and their subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Facilitate the coordination of the commissioning with Contractor and CxA to ensure that commissioning activities are being scheduled into the master schedule.

2. Provide detailed start-up procedures from subcontractors.

3. Include the cost of commissioning in the total Contract price.

4. In each purchase order or subcontract written, include requirements for submittal data, operation and maintenance data, commissioning tasks and training.

5. Provide copies of submittals including changes thereto.

6. Review, accept, and distribute construction checklists provided by CxA to the trades.

7. Ensure that subcontractors execute their commissioning responsibilities according to the Contract Documents and schedule.

8. A representative shall attend a commissioning kickoff meeting and other necessary meetings scheduled by the CxA to facilitate the commissioning process.

9. No later than 60 days prior to start-up of the first piece of major equipment, meet with commissioning team to finalize the detailed commissioning procedures/schedule.

10. Coordinate commissioning process test procedures.

11. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.

12. Cooperate with CxA for resolution of issues recorded in the Issues Log.

13. Coordinate the training of Department personnel.

14. Prepare operation and maintenance manuals, according to the Contract Documents and CxA checklist, including clarifying and updating the original sequences of operation to as-built conditions.

15. Ensure that subcontractors provide assistance for seasonal or deferred performance testing, performed by CxA.

16. Ensure that subcontractors correct deficiencies and make necessary adjustments to operation and maintenance system manuals and as-built drawings for applicable issues identified in any seasonal testing.

17. Perform guarantee Work for materials furnished under Contract for the time specified in Contract, including warranties and curing latent defects within the time period provided in Contract.

G. Equipment Suppliers:

1. Provide requested submittal data, including detailed start-up procedures and specific responsibilities of Engineer to keep warranties in force.

2. Assist in equipment testing in conformance with agreements with subcontractors.

3. Include special tools and instruments required for testing equipment according to Contract Documents in the base bid price to Contractor.

4. Supply products to contractors, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for Project's scope and budget.

5. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

6. Review test procedures for equipment installed by factory representatives.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Testing equipment required to perform start-up and initial checkout and required functional performance testing shall be provided by Contractor for equipment being tested.

B. Testing equipment shall be of sufficient quality and accuracy to test or measure system performance as required by Specifications. Accuracy of test instruments may be determined by National Institute of Standards and Technology standard calibration confirmed by calibration stickers or certificates issued by agency.

C. Any additional retesting necessary for equipment to funtion properly shall be conducted at no additional cost to the Port.

PART 3 - EXECUTION

3.1 MEETINGS

A. Commissioning Kickoff Meeting:

1. Within 90 days of commencement of construction but no later than 60 days prior to utility services readiness, CxA shall schedule, plan and conduct a commissioning kickoff meeting with entire commissioning team in attendance.

2. Meeting minutes shall be distributed to parties by CxA.

B. Miscellaneous Meetings:

1. Additional meeting as required shall be scheduled during course of the commissioning process.

3.2 REPORTING

A. CxA shall regularly communicate with members of commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, and the like.

B. CxA shall prepare and submit the commissioning record to Engineer within 1 month after the completion of commissioning process.

3.3 SUBMITTALS

A. CxA shall provide 1 review of submittals related to the commissioned equipment for conformance to Contract Documents as it relates to commissioning process, to functional performance of equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. CxA shall notify Engineer, or Engineer of Record as requested, of items missing or areas that are not in conformance with Contract Documents and which requires resubmission.

B. CxA may request additional design narrative from Engineer of Record and controls subcontractor, depending on the completeness of the design intent documentation and sequences provided with Specifications.

3.4 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Commissioning Authority Review: Prior to Substantial Completion, CxA and Engineer of Record shall review the O&M manuals, documentation and redline as-builts for systems that were commissioned to verify compliance with Specifications. The CxA shall communicate deficiencies in the manuals to the Engineer. CxA also reviews each equipment warranty and verifies that requirements to keep the warranty valid are clearly stated. This Work does not supersede Engineer of Record’s review of the O&M.

B. System O&M Manual Requirements: In addition to documentation that may be specified elsewhere, the controls subcontractor shall compile and organize at minimum the following data on control system in labeled 3-ring binders with indexed tabs.

1. Provide 5 hard copies and 1 electronic copy in pdf format of the system manual. Copies shall be in lieu of those required in other Sections of Specifications.

2. Operation and Maintenance Manuals:

    a. Organize by equipment type, in functional groups including the equipment, controls and accessories, such as: AHU, CHW system, RTU, and the like.

    b. Specific instructions on how to perform and apply functions, features, modes, and the like, mentioned in the controls training Sections of this Specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included.

    c. The detailed technical manual for programming and customizing control loops and algorithms shall be included with controls system.

    d. Full as-built set of control drawings applicable to each type of equipment, including points listing(s), and as-built sequence of operations for each piece of equipment.

    e. Full print out of schedules and set points after testing and acceptance of the system.

    f. Electronic copy on compact disk (CD) of the entire program for this facility.

    g. Marking of system sensors and thermostat locations on as-built controls drawing and mechanical drawings with their control system designations.

    h. Maintenance instructions, including maintenance materials, tools, sensor calibration requirements, methods by device type, and the like.

    i. Control equipment component submittals, parts lists, and the like.

    j. Warranty requirements, including company names and contact information.

    k. Copies of checkout, including start-up reports, and calibrations performed by Contractor (not commissioning tests).

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:

    a. Sequences of operation

    b. Control drawings

c. Points lists

d. Controller / module data

e. Thermostats and timers

f. Sensors and DP switches

g. Valves and valve actuators

h. Dampers and damper actuators

i. Program setups (software program printouts)

4. Field checkout sheets and trend logs shall be provided to the Commissioning Authority for inclusion in the Commissioning Record Book.

C. Review and Approvals: Review of the commissioning related sections of O&M system manuals shall be made by Commissioning Authority.

3.5 START-UP AND PREFUNCTIONAL CHECKLISTS

A. The following procedures apply to equipment to be commissioned:

1. General: Pre-functional checklists (PFC) are important to ensure that equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. The pre-functional testing for a given system shall be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

B. Manufacturer’s Field Checkout Sheets:

1. Contractor is responsible for obtaining manufacturers’ field checkout sheets for equipment that is being furnished, completing the checkout sheets in their entirety and providing to CxA for review and comment.

C. Sensor and Actuator Calibration:

1. Field-installed temperature, relative humidity, and pressure sensors and gages, and actuators (dampers and valves) on equipment shall be calibrated using the following methods:

a. Test instruments shall have had a certified calibration within last 12 months, shown by sticker or certificate from calibration agency.

b. Sensors installed in equipment at the factory with calibration certification provided need not be field calibrated, unless shown to be out of tolerance with other outboard sensors.

D. Sensor Calibration Methods:

1. Sensors: Verify that asensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2 degree Fahrenheit of each other for temperature and within a tolerance equal to 2 percent of the reading, of each other, for pressure. Tolerances are listed in INSTRUMENTATION AND CONTROLS FOR HVAC Section.

2. Sensors Without Transmitters-Standard Application: Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that sensor reading (via the permanent thermostat, gage or building automation system (BAS) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

3. Sensors With Transmitters-Standard Application. Disconnect sensor: Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and Proportional/Iintegral reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

4. Critical Applications: For critical applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

5. Tolerances, Standard Applications, if not listed elsewhere in the Specifications:

Sensor	Required Tolerance (plus or minus)
Cooling coil, chilled and condenser water temperature	0.5 degree Fahrenheit
Air handling unit temperature sensors	1.0 degree Fahrenheit
Hot water temperature sensors	0.5 degree Fahrenheit
Outside air, space temperature and duct air temperature	0.4 degree Fahrenheit
Watthour, voltage and temperature	1.0 percent of design
Pressure, air, water and gas	0.5 percent of scale
Flow rates for air	2.0 percent of scale
Flow rates for water	0.5 percent of scale
Relative humidity	2.0 percent of scale
Carbon dioxide (CO_2) sensors	75 parts per million (ppm)
Gas flowmeter	1.0 percent of scale

E. Valve and Damper Stroke Setup and Check:

1. Energy Management System Readout:

   a. For avalve and damper actuator positions checked, verify the actual position against the BAS readout.

   b. After equipment start-up, set pumps or fans to normal operating mode.

   c. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required.

   d. Command valve or damper open, verify position is full open and adjust output signal as required.

   e. Command the valve or damper to a few intermediate positions.

   f. If actual valve or damper position doesn’t reasonably correspond, replace actuator.

F. Execution of Pre-functional Checklists and Startup:

1. Four weeks prior to startup, subcontractors and vendors shall schedule startup and checkout with Engineer, Contractor, and CxA. The performance of the pre-functional checklists, start-up, and checkout are directed and executed by the subcontractor or vendor. When checking off pre-functional checklists, signatures may be required of other subcontractors for verification of completion of their Work.

2. The subcontractors and vendors shall execute startup and provide CxA with a signed and dated copy of the completed start-up and pre-functional tests and checklists.

3. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

G. Deficiencies, Non-Conformance and Approval in Checklists and Start-up.

1. Subcontractors shall clearly list any outstanding items of initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to CxA within 2 days of test completion.

2. The CxA reviews the report and submits either a noncompliance report or an approval form to the subcontractor or Engineer. The installing subcontractors or vendors shall correct areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the CxA recommends approval of execution of checklists and startup of each system to Engineer using a standard form.

3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to responsible party.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. The following procedures apply to equipment to be commissioned. This Article applies to commissioning functional performance testing for Divisions.

B. Objectives and Scope:

1. The objective of functional performance testing is to demonstrate that each system is operating conforming to Construction Documents.

2. Functional performance testing comprises a full range of tests to verify that components, equipment, systems, and interfaces between systems operate correctly.

3. This includes operating modes, interlocks, control sequences, and responses to emergency conditions.

C. Development of Test Procedures:

1. CxA develops specific test procedures and forms to verify and document proper operation of equipment and systems to be commissioned.

2. Prior to execution, CxA provides the test procedures to Engineer and Contractor for review and comments to ensure parties agree to test plans.

D. Execution of Functional Performance Tests:

1. Test Methods:

a. Functional performance testing and verification may be achieved by direct manipulation of system inputs (i.e. heating or cooling sensors), manipulation of system inputs with the building automation system (i.e. software override of sensor inputs), and trend logs of system inputs and outputs using the building automation system.

b. A combination of methods may be required to completely test the complete sequence of operations.

2. Setup:

a. Each test procedure is performed under conditions that simulate normal operating conditions as closely as possible.

b. Contractor executing the test provides necessary system modifications to produce specified conditions (flows, pressures, temperatures, and the like), necessary to execute the test.

c. At completion of the test, Contractor returns affected building equipment and systems to their pre-test conditions.

E. Coordination and Scheduling:

1. Contractor shall provide a minimum of 5 Working Days advance notice to CxA regarding their completion schedule for the pre-functional checklists and startup of equipment and systems. Contractor schedules and executes the functional tests. Contractor shall inform tCxA of the schedule for execution of Functional Performance Tests at least 2 weeks prior to execution of any tests. The following sequential priorities are followed:

a. Equipment shall not be temporarily started (for heating or cooling), until pre-start checklist items and manufacturer pre-start procedures are completed and moisture, dust and other environmental and building integrity issues have been addressed.

b. Functional performance testing does not begin until pre-functional, start-up, TAB, and controls point-to-point checkout is completed for a given system.

F. Problem Solving:

1. CxA may recommend solutions to deficiencies identified during functional testing. However, the burden of responsibility to solve, correct and retest deficiencies is with the construction and design teams.

3.7 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

A. Documentation:

1. CxA shall witness and document the results of functional performance tests using the specific procedural forms developed for that purpose.

2. CxA shall include the filled out forms in the commissioning report.

B. Nonconformance:

1. CxA shall record the results of the functional test on the procedure or test form. Deficiencies or non-conformance issues shall be noted and reported to Engineer on a standard noncompliance form, such as an Issues Log.

2. Corrections of minor deficiencies identified may be made during the tests at the discretion of CxA. In such cases the deficiency and resolution shall be documented on the procedure form.

3. Subcontractors shall expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, CxA shall not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of Engineer.

4. As tests progress and deficiencies are identified, CxA discusses the issue with the executing subcontractor.

    a. When there is no dispute on the deficiency and the subcontractor accepts responsibility to correct it:

        1) CxA documents the deficiency and the subcontractor's response and intentions and they go on to another test or sequence. The subcontractor corrects the deficiency, CxA verifies.

        2) CxA reschedules the test and the test is repeated.

    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

        1) The deficiency shall be documented on the Issues Log with the subcontractor's response and a copy given to Engineer and to the subcontractor representative assumed to be responsible.

        2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with Engineer of Record. Final acceptance authority is with Engineer.

        3) CxA documents the resolution process.

        4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies CxA through channels. CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting:

    a. Contractor shall be responsible for cost to subcontractor to retest a pre-functional or functional test, if contractor is responsible for the deficiency. If contractor is not responsible, any cost recovery for retesting shall be negotiated with Engineer and Contractor.

b. For a deficiency identified, not related to any pre-functional checklist or start-up fault, the following shall apply: CxA and Engineer shall direct the retesting of the equipment once at no charge to Contractor for their time. However, CxA's and Engineer's time for a second or more retests shall be charged to Contractor, who may choose to recover costs from the responsible subcontractor.

c. The time for CxA and Engineer to direct any retesting required because a specific pre-functional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, shall be back charged to Contractor, who may choose to recover costs from the party responsible for executing the faulty pre-functional test.

d. Any required retesting by any subcontractor shall not be considered a justified reason for a claim of delay or for a time extension by Contractor.

C. Approval: CxA makes formal approval of the functional performance test after review. CxA recommends acceptance of each test to Engineer. Engineer gives final approval on each test.

3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests: If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of Engineer. These tests shall be conducted as soon as possible. Services of necessary parties, including CxA shall be negotiated, if circumstances warrant it.

3.9 TRAINING OF DEPARTMENT PERSONNEL

A. Contractor shall be responsible for training coordination and scheduling and ultimately to ensure that training is completed.

B. CxA shall be responsible for reviewing the content and adequacy of the training of Department personnel for commissioned equipment.

C. Contractor shall video tape POLA staff training sessions and provide a copy in video file and CD formats to Engineer.

D. The mechanical subcontractor shall have the following training responsibilities:

1. Provide CxA and Engineeer of Record with a training plan at least 4 weeks in advance of the planned training. Include the controls subcontractor's scope.

2. Provide designated Department staff with comprehensive orientation and training in the understanding of the systems including the operation and maintenance of each piece of HVAC or mechanical equipment.

3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment, conforming to Department personnel’s specific needs.

4. During any demonstration, should the system fail to perform in conformance with the requirements of the operation and maintenance manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.

5. The appropriate trade subcontractor or manufacturer's authorized representative shall provide the instructions on each major piece of equipment.

6. The controls subcontractor shall attend sessions other than the controls training, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

7. Training shall include:

   a. Use of the printed installation, operation and maintenance instruction material included in the operation and maintenance manuals.

   b. A review of the written operation and maintenance instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed, and spare parts inventory suggestions.

   c. The training shall include hands-on start-up, operation in modes possible, shut-down, seasonal changeover and any emergency procedures.

   d. Discussion of relevant health and safety issues and concerns.

   e. Discussion of warranties and guarantees.

f. Common troubleshooting problems and solutions.

g. Explanatory information included in the operation and maintenance manuals and the location of plans and manuals in the facility.

h. Discussion of any peculiarities of equipment installation or operation.

i. Classroom sessions shall include the use of overhead projections, slides, PowerPoint style presentations or video/audio-taped material as might be appropriate to facilitate operator training.

8. Mechanical subcontractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not operated or controlled by the central control system including any manual override or shutdown functions.

9. Training shall occur after functional testing is complete, unless approved otherwise by Engineer.

E. Controls subcontractor shall have the following training responsibilities:

1. Provide mechanical subcontractor or Engineer and CxA with a training plan 4 weeks before the planned training session(s).

2. The controls subcontractor shall provide designated Department staff training on the control system in this facility. The intent is to clearly and completely instruct the Department personnel on the capabilities of the control system.

3. The standard operating manual for the system and any special training manuals shall be provided for each trainee. In addition, copies of the system technical manual shall be covered during training. Manuals shall be approved by CxA. Copies of any audio/visual materials shall be delivered to Engineer.

4. Training shall be tailored to the needs and skill level of the trainees.

5. Trainers shall be knowledgeable on the system and its use in buildings.

6. During any demonstration, should the system fail to perform in conformance with requirements of the operation and maintenance manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated.

7. Controls subcontractor shall attend sessions other than the controls training, as requested, to discuss the interaction of controls system as it relates to the equipment being discussed.

8. The control system shall be broken into 2 training sessions:

    a. Training I - Control System: The first training shall consist of 8 hours (or as required) of classroom training. This training may be held on-site or in the supplier’s facility. If held off-site, the training may occur prior to final completion of the system installation. Upon completion, each trainee, using appropriate documentation, shall be able to perform elementary operations and describe general hardware and functionality of system.

    b. Training II - Specific Systems: The second session shall be held on-site for a period of 8 hours of actual hands-on training after the completion of system commissioning. The session shall include instruction on:

        1) Specific hardware configuration of installed systems in this building and specific instruction for operating installed system.

        2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing set-points and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that, if changed, would adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, and the like.

        3) Trending and monitoring features (values, change of state, totalization, and the like) including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Trainees shall actually set-up trends in the presence of t trainer.

        4) Every screen shall be completely discussed, allowing time for questions.

        5) Use of keypad or plug-in laptop computer at the zone level shall be demonstrated.

6) Use of remote access to the system via phone lines or networks shall be demonstrated, where applicable.

7) Setting up and changing a terminal unit controller, such as: VAV, FCU, split A/C unit, and the like.

8) Graphics generation, modification and screen to screen operations

9) Point database entry and modifications

10) Understanding DDC field panel operating programming (where applicable), including tools for same.

F. The TAB subcontractor shall have the following training responsibilities:

1. TAB shall meet with facility staff after completion of TAB as a part of approved training program to instruct them on the following:

a. Go over the final TAB report, explaining the layout and meanings of data by type.

b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

c. Identify and discuss any terminal units, duct runs, diffusers, coils, or fans that are not meeting their design capacity.

d. Discuss any temporary settings and the steps to finalize them for any areas that are not finished or in need of further adjustment.

e. Other salient information that may be useful for facility operations, relative to TAB.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic site materials, methods, and requirements to locate, protect, repair, remove, replace, and dispose of existing surface and subsurface conditions and improvements at Project Site, including existing utilities, structures, and substructures.

B. Basic materials and methods common to new Project Site construction.

1.2 RELATED SECTIONS

A. Section 01 74 20 - Construction and Demolition Waste Management

B. Section 02 41 13 - Selective Site Demolition

C. Section 31 23 33 - Trenching and Backfilling

D. Section 32 13 14 - Concrete for Exterior Improvements

1.3 REFERENCES

A. Reference Specifications (RS):

Section 201 - Concrete, Mortar, and Related Materials

Section 306 - Open Trench Conduit Construction

Subsection 306-3.3 - Removal and Abandonment of Existing Conduits and Structures

Section 401 - Removal

Subsection 401-3.1 - Concrete Pavement

1.4 EXISTING SUBSURFACE CONDITIONS

A. Locations of existing pipelines, utilities, and substructures shown on Drawings are approximate only.

B. Keep existing services and facilities in operation except when Engineer permits shutdown in writing, and then only after temporary services have been provided.

C. Refer to SITE CONDITIONS Section for additional requirements.

PART 2 - PRODUCTS

2.1 CEMENTITIOUS SLURRY MATERIAL

A. Cement-Sand Slurry: Class 100-E-100 in conformance with RS Subsection 201-1.1.2, Table 201-1.1.2.

PART 3 – EXECUTION

3.1 VERIFICATION OF SITE CONDITIONS

A. Notify Underground Service Alert 2 working days prior to commencing demolition, excavating, trenching, drilling, or similar underground Work.

B. Contact owners of existing lines and substructures that may interfere with Work.

C. Determine and mark locations of substructures not marked by owners. In addition to the substructure information shown on Drawings, maps and reference drawings showing record locations of substructures are available for review in the office of Engineer. Refer to CONTRACT DOCUMENTS Section for reference drawing numbers. Department neither belongs to Underground Service Alert nor participates in its activities. Department does not mark substructures in the field.

D. Hand-dig excavations to design depths where alignments shown on Drawings occur within 5 feet radially of existing utilities. Hand-dig until the existing utility is located.

3.2 PROTECTION OF EXISTING FACILITIES

A. Protect existing facilities adjacent to Work to avoid damage. Repair or replace existing structures and improvements located above or below ground which are damaged or removed as a result of Contractor's operations wherever such existing improvements are not specifically designated to be permanently removed. Structures to protect and repair include, but are not limited to, asphalt concrete and concrete pavement, pipelines, wires, cables, electrical pull boxes, conduits, vaults, and maintenance holes. Repairs and replacements shall be made at Contractor’s sole cost and expense and shall be equal to existing improvements and shall match existing in finish and dimension.

1. Damaged Pipelines:

    a. Replace damaged pipeline section(s) up to and including the joints at the end of the damaged section(s).

    b. Replace damaged joint materials.

B. Place barricades and install warning lights around excavations.

C. Exercise extreme caution when working in the vicinity of existing power poles and light poles designated to remain. Support Department of Water and Power and other utilities' poles and guy wires as occur adjacent to excavations in conformance with the requirements of the utility owning the pole.

3.3 BASIC PAVEMENT REMOVAL METHODS

A. Concrete pavement removal shall conform to RS Subsections 401-3.1, except that the saw cut shall be made to a depth of 3 inches. Assume that concrete slabs are reinforced.

B. Removal Work performed beyond the lines and grades shown on Drawings, or beyond limits described in excavation and demolition submittal approved by Engineer, shall be considered to be unauthorized and at the sole cost and expense of Contractor. Engineer may order Contractor to restore such removals in conformance with Protection of Existing Facilities Article of this Section.

3.4 INTERFERING SUBSTRUCTURES

A. Consult Engineer immediately for directions whenever substructures not shown on Drawings interfere with or affect Work. Contractor shall propose means and methods to Engineer to deal with the interferences. Engineer shall make final decision on method of correction or protection to be used.

1. If interfering substructures must be removed, the following shall be done before removing or cutting the substructures:

    a. Tap the line and determine if the line contains any kind of liquid or gaseous material.

    b. If storm drain or sewer lines are empty or filled with concrete or mud slurry, lines may be cut, removed, and capped or plugged, in conformance with RS Subsection 306-3.3.

c. Test conductors in conduits appearing to be abandoned and verify that conductors are de-energized. Remove de-energized conductors. Report energized conductors to Engineer and cease removal Work until Engineer authorizes Work to resume.

d. Consult Engineer for methods of handling other substructures.

e. Notify Engineer to identify contents of unknown line if it is found to contain liquid or gaseous material. Remove contents and dispose in conformance with applicable regulations. Such Work shall be considered a Change in Work and payment shall be determined in conformance with GENERAL CONDITIONS Section.

f. Test pipeline coatings for asbestos-containing materials (ACM) or other toxic substances. Remove, handle, and dispose of hazardous pipeline coatings in conformance with applicable regulations. Such Work shall be considered a Change in Work and payment shall be determined in conformance with GENERAL CONDITIONS Section. A description of Work shall be submitted to Engineer when Work is complete.

2. Evacuated lines or remaining portions of abandoned lines shall be capped or removed as described in this Article for empty lines.

3.5 OWNERSHIP AND DISPOSAL

A. Materials to be removed other than those shown on Drawings to remain or be salvaged, or listed in Salvage Article of SELECTIVE SITE DEMOLITION Section, shall become the property of Contractor and shall be disposed of off Department property in conformance with Contractor’s Waste Management Plan.

3.6 MAINTENANCE AND REPAIR

A. Maintain continuity and integrity of permanent fences and temporary construction fences. Immediately replace fence sections damaged or missing during construction prior to close of the regular working day upon which damage occurred.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Selective demolition and removal Work including disposal but not limited to the following:

1. Demolition and removal of existing HVAC equipment foundation and related appurtenances shown on Drawings.

2. Remove excess material from Project Site upon completion of Work.

3. Concrete demolition and removals.

B. Develop waste management plan in conformance with CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT Section.

1.2 RELATED SECTIONS

A. Section 02 00 01 - Basic Site Materials and Methods

B. Section 23 01 45 - Mechanical Demolition

C. Section 32 13 14 - Concrete for Exterior Improvements

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under Structural Demolition bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. 29 CFR 1926.200 - Accident prevention signs and tags.

B. ANSI Z535.5 - Safety Tags and Barricade Tapes (for Temporary Hazards).

C. Reference Specifications (RS):

Section 306 - Open Trench Conduit Construction

1.5 SUBMITTALS

A. Procedures, equipment to be used, and operational sequences.

B. Submit prior to start of Work photographs of existing damage to structures adjacent to but not a part of Work where such damage could be misconstrued as caused by Contractor.

1.6 SALVAGE

A. No on-site sale of salvage shall be allowed. No removals shall be made from Project Site by any person other than Contractor or employees of Contractor.

B. Refer also to CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT Section for other requirements.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Refer to REGULATORY REQUIREMENTS and COORDINATION Sections for South Coast Air Quality Management District (SCAQMD) notification and permit requirements.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 DEMOLITION AND REMOVALS

A. Removal Work shall not exceed the limits shown on Drawings.

B. Control dust in conformance with REGULATORY REQUIREMENTS Section.

C. Items not shown on Drawings or mentioned in Specifications, which are encountered during Contractor's operations shall be brought to the attention of Engineer. Engineer shall determine the disposition of the items.

D. Perform demolition and removals under Engineer's inspection in conformance with applicable safety standards and requirements.

E. Repair or replace surface and subsurface improvements removed or damaged as a result of Contractor’s operations in conformance with BASIC SITE MATERIALS AND METHODS Section.

F. Refer to MECHANICAL DEMOLITION Section for requirements for mechanical equipment.

3.2 SAFETY AND PROTECTION

A. Protect existing buildings, substructures, and other improvements within and adjacent to Project Site in conformance with BASIC SITE MATERIALS AND METHODS and EXCAVATION SAFETY REQUIREMENTS Sections.

B. Protect offices, office equipment, furniture, and mechanical equipment within the Harbor Administration Building.

C. Provide, erect, and maintain barriers, barricades, lighting, and guard rails as required to protect general public, workers, and adjoining properties.

D. Cease operation and notify Engineer immediately if demolition appears to endanger life, facilities, or property. Do not resume operations until safe conditions have been restored.

E. Post hazard warning signage compliant with requirements of 29 CFR 1926.200 and recommendations of ANSI Z535.5 at perimeter fence. Promptly remove signage after Engineer verifies that demolition hazards no longer exist.

F. Refer to REGULATORY REQUIREMENTS Section for additional requirements in the event that hazardous wastes are discovered.

3.3 OWNERSHIP AND DISPOSAL

A. Refer to BASIC SITE MATERIALS AND METHODS Section for requirements concerning ownership and disposal criteria for demolished materials.

3.4 BACKFILL EXCAVATIONS

A. Mechanically backfill voids in subgrade areas in conformance with BASIC SITE MATERIALS AND METHODS Section.

3.5 CONDUIT AND SUBSTRUCTURE ABANDONMENT

A. Interfering conduits and substructures not shown on Drawings shall be handled in conformance with BASIC SITE MATERIALS AND METHODS Section.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Insurance, permits, notifications, incidentals, and other miscellaneous requirements necessary to perform asbestos abatement and disposal of asbestos containing materials (ACM) and asbestos containing waste located within Project Site limits including its removal, transportation, and disposal as required by federal, state, and local requirements and statutes.

1.2 RELATED SECTIONS

A. Section 02 41 13 - Selective Site Demolition

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Unforeseen Asbestos Abatement Remediation allowance bid item of Bid Proposal Line Items.

1.4 REFERENCE STANDARDS

A. It is the responsibility of Contractor to know the current regulations controlling Work and to perform Project related Work in conformance with such regulations that provide for worker and public safety against asbestos exposure.

B. Regulations, Standards, and Codes (General):

1. General applicability of federal, state, and local regulations, standards, and codes governing asbestos abatement, transport, and disposal, except to the extent that more explicit or more stringent requirements are written directly into Contract Documents, applicable regulations, standards, and codes have the same force and effect and are made a part of Contract Documents as if copied directly into Contract Documents, or as if published copies are bound herewith.

2. Contractor shall perform Work in compliance with applicable federal, state, and local regulations, standards, and codes governing asbestos abatement, transport, and disposal of asbestos containing/contaminated materials.

3. Requirements include obtaining permits, licenses, inspections, releases, and similar documentation, as well as payments, statements, and similar requirements associated with codes, regulations, and standards.

4. The most recent edition of any relevant regulation, standard, document, or code shall be in effect.

C. The references listed below form a part of this Section to the extent referenced. The current issue of each document shall govern. Where conflict among requirements with these Specifications exists, the more stringent requirements shall apply. The publications are referenced in the text by basic designation only.

1.5 REFERENCES

A. 8 CCR 1529 - Asbestos.

B. 8 CCR 3203 - Injury and Illness Prevention Program.

C. 8 CCR 3220 - Emergency Action Plan.

D. 8 CCR 3221 - Fire Prevention Plan.

E. 8 CCR 5208 - Asbestos.

F. 29 CFR 1926.1101 - Asbestos.

G. 40 CFR 61.152 - Air-cleaning.

H. ANSI/ASSP Z9.2 - Fundamentals Governing the Design and Operation of Local exhaust Ventilation Systems.

I. ANSI/ISEA Z87.1 - American National Standard Occupational and Educational Personal Eye and Face Protection Devices.

J. ANSI/ISEA Z89.1 - American National Standard for Industrial Head Protection.

K. ASTM F2412 - Standard Test Methods for Foot Protection.

L. ASTM F2413 - Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear.

M. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

N. UL 586 - High Efficiency, Particulate, Air Filter Units.

1.6 DEFINITIONS

Abatement: Procedures to control fiber release from asbestos-containing material. Includes removal, encapsulation, enclosure, repair, demolition, and renovation activities.

Abatement Activities: Activities from the initiation of Project Site preparation through certification by Asbestos Management Consultant (AMC) that the area is clean, based on visual inspection and air clearance criteria.

Abatement Area: An area where asbestos removal or other abatement procedures are being performed; an abatement area is considered a contaminated area between the time preparation begins to the time the area meets the clearance air monitoring standards.

Air Lock: A system for permitting ingress and egress with minimum air movement between a contaminated area and an uncontaminated area.

Air Monitoring: The process of measuring the asbestos fiber content of a specific volume of air collected during a stated period of time. The procedure utilized for this Project follows National Institute For Occupational Safety And Health (NIOSH) Standard Analytical Method for Asbestos in Air, Method 400 and AHERA standards. Pre-abatement sample analysis will be performed using Phase Contrast Microscopy.

Air Sampling Professional: The professional contracted or employed to supervise air monitoring and analysis schemes. This individual is also responsible for recognition of technical deficiencies in worker protection equipment and procedures during both planning and on-site phases of an abatement project. Acceptable air sampling professionals include industrial hygienists, environmental engineers, and environmental scientists with equivalent experience in asbestos air monitoring and worker protection. Air sampling professionals working in State of California must be certified by Division of Occupational Safety and Health.

Ambient Air Monitoring: Measurement or determination of airborne asbestos fiber concentrations outside the abatement area, but in the general vicinity of Project Site.

Amended Water: Water to which a surfactant has been added.

Asbestos: To include chrysotile, amosite, crocidolite, fibrous tremolite, fibrous anthophylite, and actinolite.

Asbestos-Containing Material(s) (ACM): U.S. Environmental Protection Agency (US EPA) definition: Material composed of asbestos of any type in an amount greater than 1 percent and by weight, either alone or mixed with other fibrous or non-fibrous materials. Occupational Safety and Health Administration (OSHA) definition: Material composed of asbestos of any type in an amount greater than 0.1 percent by weight, either alone or mixed with other fibrous or non-fibrous materials.

Asbestos-Containing Waste Material: Asbestos-containing material or asbestos-contaminated objects requiring disposal.

Asbestos-Contaminated Objects: Any objects that have more than 1/10 of 1 percent asbestos on external or internal surfaces.

Asbestos Management Consultant (AMC): AMC shall act as agent for Department as final authority concerning technical matters of asbestos abatement requirements.

Authorized Visitor: A person approved by AMC, representatives of Engineer, or representatives of any regulatory or other agency having jurisdiction over Project.

Baseline Monitoring: A measurement or determination of airborne asbestos fiber concentrations for Project Site prior to the start of abatement activities.

City: Refer to GENERAL CONDITIONS Section for definition.

Clean or Decontaminate: To make a surface free of fibers by thoroughly HEPA-vacuuming or wet cleaning with sponges or mops.

Clean Room: A non-contaminated area or room that is a part of the worker decontamination enclosure system with provisions for storage of workers' street clothes and clean protective equipment.

Construction Barrier: A fixed or movable barrier that is 8'-0" in height consisting of 3-5/8 inch metal studs 26 gauge framed at 16 inches on center with 5/8 inch Type X gypsum board screwed on exterior side. Tape and spackle 1 coat sharp edges. Brace as necessary.

Contained Work Area: Work Area which has been isolated, plasticized, and equipped with a decontamination enclosure system.

Contractor: Refer to GENERAL CONDITIONS Section for definition.

Curtained Doorway: A portal that allows ingress or egress from 1 room to another while permitting minimal air movement between the 2 rooms. It is typically constructed by placing 2 overlapping sheets of plastic over an existing or temporarily framed doorway, securing the vertical edge of one sheet along one vertical side of the doorway and securing the vertical edge of the other sheet along the opposite vertical side of the doorway. Other effective designs shall be permissible on approval by AMC.

Department: Refer to GENERAL CONDITIONS Section for definition.

Disturb: To alter, change, or stir ACM during activities such as, but not limited to, removal, encapsulation, enclosure, or repair.

Encapsulant (Sealant): Liquid material that can be applied to other solid material to reduce the possible release of fibers from the solid material, either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the solid material and binding its components together (penetrating encapsulant).

Encapsulation: A procedure to coat or saturate material with an encapsulant to control the possible release of fibers into the ambient air.

Engineer: Refer to GENERAL CONDITIONS Section for definition.

Equipment Room: A room that is part of the worker decontamination enclosure system with provisions for storage of contaminated clothing and equipment.

Fixed Items: Walls, ceilings, floors, equipment, furniture, or other objects that cannot be removed from the abatement area.

HEPA Filter: A high-efficiency particulate air (HEPA) filter capable of trapping and retaining 99.97 percent of particles greater than 0.3 micron in size and meeting requirements of UL 586.

HEPA-Filtered Vacuum: A vacuum cleaner designed for and equipped with a HEPA filter.

Isolation: The sealing of openings into a Work Area with critical barriers, isolation barriers, and plasticizing.

Isolation Barrier: The containing of a Work Area by installing 2 layers of 6 mil. plastic sheeting, mechanically supported, totally isolating Work Area from adjacent non-Work Areas. Openings into Work Area larger than 32 square feet with any one dimension greater than 4 feet shall be framed 16 inches on center with nominal 2 inch by 4 inch wood studs or 3-5/8 inch 26 gauge metal studs.

Log: An official record of activities that occurred during Project. It shall identify AMC, Contractor, and workers and shall contain other pertinent information as required by law or requested by ACM.

Movable Object: A piece of equipment or furniture in Work Area that can be removed from Work Area.

Outside Air: The air outside buildings and structures.

Plasticize: To cover floors, walls, and other structural elements of a Work Area with 6 mil. plastic sheeting as herein specified with seams securely taped.

Pressure Differential System: A portable exhaust system equipped with HEPA filtration. The system shall be capable of maintaining a minimum pressure differential of minus 0.05 inch of water gage in a Work Area relative to adjacent areas and make 1 complete air filtration every 15 minutes in Work Area.

Removal: The stripping of any ACM from surfaces of components of a facility.

Replacement Material: Any material that does not contain asbestos and that is used to replace ACM.

Shower Room: A room between the clean room and the equipment room in the worker decontamination enclosure having hot and cold or warm running water controllable at the tap and suitably arranged for complete showering during decontamination.

Surface Barriers or Protective Coverings: The placement of sheet plastic on the walls, floors, and other fixed objects within the abatement area to prevent contamination from subsequent Work.

Surfactant: A chemical agent added to water to improve penetration into ACM and thereby reduce the generation of airborne asbestos fibers.

Water Filtration System: A local water-filtering system capable of trapping and retaining 99.9 percent of asbestos fibers greater than 3 microns in size.

Wet Cleaning: The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, or other cleaning tools that have been dampened with water and afterwards disposing of the cleaning tools as asbestos contaminated waste.

Work Area: A location in which ACM has been designated for abatement under Contract.

Worker Decontamination Enclosure System: A decontamination system consisting of a clean room, a shower room, and an equipment room separated from each other and from Work Area by curtained doorways. It is used for worker exits from Work Area and for equipment and materials leaving Work Area.

1.7 NOTIFICATIONS AND PERMITS

A. Contractor shall make required written notifications to regulatory agencies including the following:

1. South Coast Air Quality Management District 21865 East Copley Drive Diamond Bar, CA 91765

   Notification shall meet the requirements of South Coast Air Quality Management District (SCAQMD) Rule 1403.

2. California Division of Occupational Safety and Health Asbestos Project-Site Notification 2100 East Katella Ave., Room 125 Anaheim, CA 92806

   Notification shall be in conformance with Section 341.9 of Title 8 of California Code of Regulations.

B. Contractor shall obtain and pay for permits required for Work of this Section.

1.8 SUBMITTALS

A. Prior to commencement of asbestos abatement Work, submit to Engineer 5 copies (3 ring bound) of the following documentation:

1. Written notification to the following regulatory agencies:

   a. SCAQMD

   b. California Division of Occupational Safety and Health

2. Proof that required permits, site location, and arrangements for transport and disposal of asbestos containing waste materials have been made. Submit copies of waste haulers Hazardous Waste Transporter Registration and Environmental Protection Agency Acknowledgement of Notification of Hazardous Waste Activity.

3. Written asbestos abatement Work plan identifying removal procedures, non-asbestos debris handling procedures, and asbestos containing/contaminated debris cleanup and disposal procedures.

4. Shop drawings of negative pressure air filtration exhaust manifold.

5. Shop drawings of worker decontamination enclosure system.

6. Proof of legal right to use patented equipment or processes.

7. Manufacturer's certification that HEPA vacuums, differential pressure air filtration devices, and other local exhaust ventilation equipment conform to ANSI/ASSP Z9.2.

8. Bar chart construction schedule indicating mobilization, Work Area preparation, asbestos removal, final clearance air monitoring, and demobilization dates for each task.

9. Documentation that Contractor's employees, including foreperson, supervisor, and any other company personnel or agents who may be exposed to airborne asbestos fibers or who may be responsible for any aspects of abatement activities, have received training as required by 29 CFR 1926.1101 and 8 CCR 1529.

10. Documentation from physician that employees or agents who may be exposed to airborne asbestos fibers in excess of background levels have received medical monitoring to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health effects. Contractor shall be aware of and provide information to the examining physician about unusual conditions in the workplace environment (e.g. high temperatures, humidity, chemical contaminants) that may impact on the employee's ability to perform Work activities. Medical monitoring shall be performed in conformance with the requirements of 8 CCR 1529 .

11. Documentation of respirator fit-testing for Contractor employees and agents who must enter Work Area. This fit-testing shall be in conformance with qualitative procedures as required by OSHA regulations or be quantitative in nature.

12. Documented NIOSH approvals for respiratory protective devices used on site, including manufacturer's certification of HEPA filtration capabilities for cartridges and filters.

13. Emergency preparedness plan as required by Emergency Planning Article of this Section.

14. Contractor's site specific Fire Prevention Plan that complies with 8 CCR 3221 and City of Los Angeles Fire Department Requirement No. 68.

15. Contractor's Injury Illness Prevention program that complies with 8 CCR 3203.

B. During abatement activities submit to AMC documentation that includes, without limitation, the following:

1. Work Area entry/exit log book. Log book shall record name, affiliation, time in, and time out for each entry into Project Site.

2. Logs documenting filter changes on respirators, HEPA vacuums, differential pressure air filtration devices, water filtration device, and other engineering controls.

3. Safety Data Sheets (SDS) for solvents, encapsulants, wetting agents, and replacement materials, as necessary.

4. Required OSHA air monitoring results. Results shall be available prior to the start of the following shift and within 24 hours of completion of the last shift.

5. Accident or incident reports where injury or damage has occurred on or to Department's property.

6. Transport manifests, trip tickets, and disposal receipts for asbestos waste materials removed from Work Area within 24 hours of the transport. Send to: Port of Los Angeles Engineering Division P.O. Box 151 San Pedro, California 90733-0151 Attention: Mr. Chris Ackopiantz

1.9 QUALITY ASSURANCE

A. Contractor shall be licensed by State of California, Contractors State License Board, and be registered to perform asbestos related Work with Division of Occupational Safety and Health, Department of Industrial Relations. At a minimum contractor shall hold the following license classifications:

1. ASB - Asbestos Certification Supplement

B. Transportation of Friable and Non-Friable ACM: Contractor shall itself be, or have a subcontractor that is, a registered hazardous waste transporter with State of California, Department of Toxic Substances Control (DTSC).

C. Work shall be supervised by experienced persons trained, knowledgeable, and qualified in the techniques of asbestos abatement, removal, and subsequent cleaning of contaminated areas, transportation, and disposal of asbestos-containing waste and asbestos-contaminated materials.

1.10 RESTRICTED HOURS OF WORK AND ACCESS

A. Work Hours: Asbestos abatement and related Work activities shall be performed Monday through Friday between the hours of 8 p.m. and 5 a.m. unless otherwise approved by Engineer.

1.11 EMERGENCY PLANNING

A. Develop emergency planning and procedures in conformance with 8 CCR 3220.

B. Emergency procedures shall be in written form and prominently posted. Contractor shall ensure that persons entering Work Area read these procedures and understand Project Site layout, location of emergency exits, and emergency procedures.

C. Emergency planning shall include considerations of fire, explosion, electrical hazards, slips, trips and falls, confined spaces, and heat related injury. Written procedures shall be developed and employee training in procedures shall be provided by Contractor.

D. Employees shall be trained in evacuation procedures in the event of Work place emergencies.

1. For non-life-threatening situations, employees injured or otherwise incapacitated shall decontaminate following normal procedures with assistance from fellow workers, if necessary, before exiting Work place to obtain proper medical treatment.

2. For life-threatening injury or illness, worker decontamination shall take least priority. After measures to stabilize the injured worker, remove the injured worker from Work place and secure proper medical treatment.

3. Telephone numbers of emergency response personnel shall be prominently posted in the clean and equipment rooms.

1.12 ASBESTOS MANAGEMENT CONSULTANT (AMC) SERVICES

A. Department shall contract with an independent, third party AMC to perform the services as specified in this Section. AMC shall handle technical matters relating to asbestos abatement requirements. AMC's responsibilities shall include but not be limited to:

1. Participate in pre-Project and weekly progress meetings.

2. Review and recommend to Engineer for approval, Contractor submittals, proposed methods for establishing Contained Work Areas, Decontamination Enclosure System, and Differential Pressure System as well as equipment to be used.

3. Review, and recommend to Engineer for approval, proposed methods and procedures for abatement Work.

4. Discuss, and report to Engineer, potential problems arising from the use of methods and procedures agreed upon or not at pre-Project meeting.

5. Visually observe the progress of Work activities, including but not necessarily limited to:

a. Verify warning signs and warning barriers are posted in appropriate locations.

b. Verify daily that Contractor's employees have met training requirements; disallow entry for workers who do not meet or cannot prove qualifications.

c. Verify contained Work Area and decontamination enclosure system are installed in accordance with approved design.

d. Verify agreed upon abatement methods and procedures are being followed.

e. Report to Engineer daily and notify Contractor of unacceptable methods and procedures or unacceptable results of Contractor.

f. Report to Engineer if Contractor fails to correct unacceptable methods and procedures or unacceptable results.

g. Conduct periodic reviews of isolation and critical barriers to determine if they are complying with Specifications.

h. Report to Engineer if Contractor varies from agreed upon or specified scope of Work, schedule, and personnel.

i. Verify that damages caused during the performance of Work are acceptably repaired.

j. Verify materials delivered to Project Site are those approved or specified for use on Work.

k. Verify that Contractor performs OSHA required personnel air monitoring.

6. For purposes of Project, "unacceptable methods and procedures, and unacceptable results" is to mean methods and results other than:

a. Those recommended by the manufacturer of the approved products and materials.

b. Those required by pertinent regulations of governmental agencies having jurisdiction.

c. Those required by this Section and those agreed upon at pre-Project meeting.

7. Failure of AMC to notice unacceptable methods and procedures or unacceptable results during the progress of Work shall not absolve Contractor from responsibility to complete Work in conformance with the specified requirements and agreed methods.

8. Provide laboratory testing and ensure that the laboratory shall handle and analyze air samples in conformance with applicable standards.

    a. Contractor shall provide sufficient electrical power and connections (including supplying generators if necessary) to allow Project Environmental Consultant to collect air samples.

9. Perform pre-abatement environmental air monitoring prior to Work Area preparation to establish ambient air baseline fiber concentrations.

10. Perform environmental air monitoring throughout Project to ensure that Work is done in conformance with the following airborne fiber concentration limits:

    Outside Work Area 0.01 fibers/cc, Downwind negative air exhaust 0.01 fibers/cc, General Work Area (PAPR) 0.50 fibers/cc.

    If, at any time, the airborne fiber concentration level exceeds 0.01 fibers per cubic centimeter of air outside Work Area, Work shall immediately cease, except for corrective action, until airborne fiber concentration levels are established below the specified limit. If, at any time, the airborne fiber concentration level exceeds 0.50 fibers per cubic centimeter of air inside Work Area, Work shall immediately cease except for corrective action, until airborne fiber concentration levels are established below the specified limit.

11. Perform aggressive air monitoring following final cleanup to ensure that the final decontamination levels have been met. Containment barriers and negative pressure equipment shall remain in use until the final air clearance criteria (1,800 liter sample) of less than 0.01 fibers per cubic centimeter of air is obtained.

12. The following shall apply for air monitoring:

    a. Air tests shall use NIOSH Analytical Method 7400 (Phase Contrast Microscopy).

13. If, at any time, Engineer or AMC decides that Work practices are violating Specifications, or State, federal, or local regulations to the extent of potential endangerment of building users, workers, Department employees, or the public, Engineer shall immediately notify Contractor that operations shall cease until corrective actions are taken by Contractor. Written confirmation shall follow within 24 hours of the verbal notice. Contractor shall take such corrective actions before proceeding with Work. Loss or damage due to Stop Work Order(s) shall be Contractor's responsibility. A Stop Work Order, issued by Engineer or AMC shall become effective immediately. Abatement Work shall not recommence until authorized by Engineer.

14. Upon completion of the abatement portion of Project, AMC shall submit a comprehensive report (Job Book) covering activities performed under this Section.

1.13 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in the original packages, containers, or bundle bearing the name of the manufacturer, brand name (where applicable), and model. Polyethylene sheet in a roll size shall be delivered to Project Site with factory label indicating 6 mil.

B. Handle and store materials in conformance with manufacturer's written instructions.

C. Protect materials from moisture and extremes of hot and cold.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Damaged or deteriorated materials shall not be used and shall be promptly removed from the premises. Material that becomes contaminated with ACM shall be packaged and legally disposed of in an approved manner.

B. Materials and equipment shall comply with Specifications; relevant federal, state, and local codes; and industry standards.

1. Plastic, spray-on strippable coatings, and structural materials used shall be UL certified as fire retardant or non-combustible. SDS for fire retardant materials shall be submitted prior to use.

2. Wood shall be pressure impregnated and certified as fire retardant.

3. Polyethylene sheeting used for worker decontamination enclosure systems, Work Area preparation, and isolation barriers shall be opaque or black in color and shall be a minimum of 6 mil in thickness.

4. Duct tape shall be 2 inch or wider and capable of sealing joints of adjacent sheets of polyethylene, and attachment of polyethylene to finished or unfinished surfaces of dissimilar materials, and capable of adhering under both dry and wet conditions, including the use of amended water.

5. Disposal bags shall be of 6 mil polyethylene, pre-printed with labels as required by EPA regulation 40 CFR 61.152 (b) (I) (iv) or applicable Cal-OSHA requirements.

6. Disposal drums shall be metal, fiberglass, or plastic with locking ring tops.

7. Stick-on warning labels in conformance with US EPA or Cal-OSHA.

8. Use warning signs as required by Cal-OSHA.

C. Removal, Encapsulation, and Replacement:

1. Surfactant (wetting agent) shall be a 50/50 mixture of polyoxyethylene ether and polyoxyethylene ester, mixed in conformance with manufacturer's written instructions.

2. Encapsulating agent to be applied shall adhere to the substrate surfaces from which asbestos containing material has been stripped.

3. Encapsulants shall not be flammable and shall not be solvent based or use a vehicle consisting of hydrocarbon.

4. Encapsulating agents applied to areas to be re-sprayed with fireproofing shall neither affect the re-sprayed fireproofing ability to bond to the substrate, nor reduce UL rating of the fireproofing.

5. Solvents shall be non-toxic, non-noxious, nonflammable (flash point in excess of 200 degrees Fahrenheit), non-reactive with or damaging to materials it shall come in contact with and approved for indoor use by regulatory agencies. Provide ventilation of Work Area as required by manufacturer. Vent exhaust to the exterior of the building and in a manner that shall not result in adverse affects to other areas of the facility, adjacent facilities, or the general public. SDS shall be submitted prior to using any encapsulating agent.

2.2 EQUIPMENT

A. General:

1. Furnish a sufficient quantity of differential pressure air filtration devices equipped with HEPA filtration and operated in conformance with ANSI/ASSP Z9.2 (local exhaust ventilation requirements) and EPA guidance document EPA 560/5-83-002 Guidance for Controlling Friable Asbestos Containing Materials in Buildings. Differential air filtration devices shall be exhausted directly to the exterior of the building. To calculate total air flow requirement:

$$\text{Total ft3/min} = \frac{\text{Vol. of Work Area (in ft\^3)}}{\text{15 min}}$$

To calculate the number of units needed for the abatement:

$$\text{Number of units needed} = \frac{\text{[total ft\^3/min]}}{\text{[capacity of unit in ft\^3/min]}}$$

2. For small enclosures and glove bags, a HEPA filtered vacuum system shall be used to provide differential air pressure.

B. Use a manometer to monitor differential pressure 3 times each Work shift (i.e. beginning, middle, and end of each shift) within removal area to ensure that a minimum pressure drop 0.02 inches of water is maintained across critical or isolation barriers.

1. Furnish, at a minimum, full face HEPA equipped "Type B" powered air purifying respirators (PAPR) to abatement workers for use during friable asbestos containing or contaminated material removal/handling activities.

a. Half-face air purifying respirators equipped with HEPA filters may be used during Work Area preparation activities, flooring material removal, roofing removal, glove bag removal, and window putty removal.

b. Half-face air purifying respirators equipped with dual HEPA/organic cartridges shall be employed when conducting removal activities using any solvent-based mastic remover.

2. Furnish respirators to the abatement workers. The respirators shall have been tested and approved by NIOSH for use in asbestos-contaminated atmospheres.

3. Furnish full body disposable protective clothing, including head, body, and foot coverings to abatement workers and authorized visitors in sizes adequate to accommodate movement without tearing.

4. Furnish additional safety equipment (e.g. hard hats meeting the requirements of ANSI/ISEA Z89.1, eye protection meeting the requirements of ANSI/ISEA Z87.1, safety shoes meeting the requirements of ASTM F2412 and ASTM F2413, disposable gloves), as necessary, to abatement workers and authorized visitors.

5. Furnish non-skid foot wear to abatement workers and authorized visitors. Disposable clothing shall be adequately sealed to the footwear to prevent body contamination.

6. Furnish a sufficient supply of disposable mops, rags, and sponges for Work Area decontamination.

C. Removal:

1. Furnish a sufficient quantity of scaffolds, ladders, lifts and hand tools (e.g., scrapers, wire cutters, brushes, utility knives, wire saws, and the like).

a. Brushes used for removing loose asbestos containing material shall have nylon or fiber bristles, not metal.

2. Furnish rubber dustpans and rubber squeegees for Work Area cleanup.

3. Furnish a sufficient supply of HEPA filtered vacuum systems for Work Area cleanup.

D. Encapsulation:

1. Furnish amended water/encapsulant sprayers with pumps capable of providing 500 pounds per square inch (psi) at the nozzle tip at a flow rate of 2 gallons per minute.

PART 3 - EXECUTION

3.1 COMMENCEMENT OF WORK

A. Work shall not commence until the following items have been completed:

1. Enclosure systems have been constructed and tested.

2. At least one 3-stage decontamination unit with shower facility is operational.

3. Pressure differential systems are functioning adequately.

4. Pre-abatement submissions, notifications, and permits have been provided.

5. Equipment for abatement, cleanup, and disposal are on hand.

6. Worker training, medical examination, and respirator fit testing (and certification) is completed.

7. Contractor receives permission from Engineer to commence abatement.

3.2 NOTICES AND POSTINGS

A. Post in the clean room area of the worker decontamination enclosure a list containing the names, addresses, and telephone numbers of Contractor, asbestos abatement supervisor, Engineer, AMC, and emergency contact numbers.

B. Post at Project Site a list of persons authorized to enter Work Area.

C. Additional postings shall include:

1. Visitor entry and exit log.

2. Employee daily sign in/out log.

3. Work Area entry and exit procedures.

4. Emergency procedures.

5. One copy of Cal-OSHA and SCAQMD Rule 1403 regulations.

3.3 WORK AREA SECURITY

A. Work Area shall be restricted only to authorized, trained, and protected personnel, including Contractor, Contractor's employees, Engineer, AMC, State, and local inspectors.

B. Entry into Work Area by unauthorized individuals shall be reported immediately to Engineer.

C. Access to Work Area shall be through a worker decontamination system located at the designated entrance to Work Area. Other means of access shall be locked or blocked by the erection of drywall, plywood, or particle board barriers so as to prevent entry to or exit from Work Area, except for emergency exits which shall not be locked from the inside but shall be sealed with polyethylene sheeting and tape until needed.

D. Contractor shall be responsible for Project Site security during abatement operations in order to protect Work efforts and equipment.

3.4 FIRE PROTECTION

A. Prepare a site specific written Fire Prevention Program in conformance with 8 CCR 3221 and Los Angeles City Fire Department Requirement No. 68.

B. Plastic, spray-on strippable coatings, and structural materials used in the asbestos abatement process shall be UL approved and certified as fire retardant or noncombustible when tested in conformance with NFPA 701.

C. Combustible rubbish and debris, including properly bagged asbestos shall be properly disposed of at the end of each working day.

D. A minimum of one 4A/60BC dry-chemical extinguisher shall be maintained at each of the following locations:

1. At each corner of Work Area. Where no clear corners exist, 4 extinguishers shall be placed around the exterior wall of Work Area so that they are approximately 25 percent of the total distance apart.

    a. Exception: Where the total abatement containment area is less than 1,000 square feet, provide two 4A/60BC extinguishers. Extinguishers shall be clearly identified with red tape.

2. Contractor shall ensure that on site personnel are aware of the location and proper use of extinguishers and other fire and life safety equipment.

E. Maintain fire and life safety information in Project log.

F. A statement shall be prepared at the conclusion of each Work day, signed by Contractor, confirming that a survey of Project Site has been made and that any unsafe fire and life safety conditions have been rectified.

G. Any Work requiring open flame shall require a fire watch standing by with a 2A/60BC extinguisher until completion of said open flame Work.

H. Existing fire detection, alarm systems, connections, and standpipes shall remain in place, active, and unobstructed. Any alteration to this equipment shall be approved by Engineer.

I. Existing fire alarm manual pull boxes, fire department communication jacks, and signaling systems shall be maintained in place and active. The foregoing items shall be clearly marked with signs containing lettering which is a minimum of 3 inch by 2 inch wide on a contrasting background. If the foregoing items are covered by plastic, each device shall be surrounded by a square of red duct type tape. In addition, a cutting device, also surrounded by red tape, shall be kept immediately adjacent to the device.

J. Existing sprinkler systems shall remain active. Sprinkler heads may be covered with a thin, 0.003 inch or less, plastic bag during abatement only so as to avoid their contamination.

K. Fire rated partitions, doors, and other fire cutoffs shall not be temporarily or permanently modified without the approval of Engineer.

L. Provide a single switch or set of switches for the emergency shutdown of negative air equipment located in the containment area. This switch or set of switches shall be for emergency use by the fire department personnel. Locate the switches in a non-contaminated area near the clean exit of the decontamination station, and clearly identify using a sign with a minimum 3 inch by 2 inch lettering on a contrasting background. The sign shall read as follows: "NEGATIVE AIR MASTER SHUT OFF."

M. The asbestos abatement process shall not cause a building to have an amount of exiting less than that required for the existing occupant load. In cases where the required exiting must be obstructed, an alternate means of exiting shall be provided as approved by Engineer. Maintain a minimum of 2 clearly marked exits from each floor during the abatement process. The second exit from a containment area may be covered with plastic upon AMC's approval. If this occurs, the covered exit shall be outlined with red duct type tape, and a cutting device shall be kept immediately adjacent to the door in an obvious and readily accessible location. The cutting device shall also be surrounded by a square of red tape as described in Paragraph 3.4 I of this Article.

N. The following shall apply in containment areas greater than 1,000 square feet:

1. Provide 5 Tyvek type protective entry suits, rated for use in an asbestos containment area, for each containment site. Suits shall be extra large and shall be kept in a separate, clearly identified, readily accessible container near the clean exit from the decontamination area. These suits shall be for the exclusive use of emergency personnel.

3.5 ASBESTOS ABATEMENT PREPARATION PROCEDURES

A. General Work Area Preparation: Contractor shall perform the following general Work Area preparation procedures prior to commencement of abatement activities:

1. Danger signs meeting the specifications of 8 CCR 5208 shall be posted at any location and approaches to locations where airborne concentrations of asbestos may exceed ambient background levels. Signs shall be posted at a distance sufficiently far enough away from Work Area to permit an employee to read the sign and take the necessary protective measures to avoid exposure. Additional signs may need to be posted following construction of workplace enclosure barriers.

2. Asbestos handlers shall don personnel protective equipment as required in Equipment Article of this Section.

3. Contractor, in conjunction with Engineer, shall shut down and lock out electric power to Work Areas, where necessary, to provide a safe Work environment. Contractor shall provide temporary power source and equipment, including ground faulting, in compliance with applicable electrical code requirements and Cal-OSHA requirements for temporary electrical systems. Costs for electricity shall be at Contractor's sole cost and expense.

4. Heating, ventilating, and air-conditioning (HVAC) system components that are in supply or that pass through Work Area shall be shut down and locked out. After Work Area is isolated, HVAC system shall be decontaminated, if required by AMC. Intake and exhaust vents in Work Area shall be sealed with tape and 6 mil polyethylene sheeting. HVAC system filters shall be removed and placed in labeled 6 mil polyethylene bags for staging and eventual disposal as asbestos-contaminated waste.

5. Special precautions shall be taken when enclosing live electrical panels (e.g., fan rooms). A frame shall be built around the panels and covered with 6 mil polyethylene sheeting with a minimum of 6 inches of clearance. The framed enclosure shall be kept under positive pressure using a HEPA filtered vacuum to keep the panel cool and clean. Alternative methods to keep the panel cool and clean shall be approved by Engineer.

6. Surfaces and fixed objects in Work Area shall be pre-cleaned using HEPA-filtered vacuums or wet cleaning methods as appropriate. Methods that would raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters, shall not be used. ACM shall not be disturbed during the pre-cleaning phase.

7. Pre-clean movable objects within Work Area using a HEPA-filtered vacuum and/or wet cleaning method as appropriate. After cleaning, these objects shall be removed from Work Area and carefully stored in an uncontaminated location.

8. Windows, doorways, elevator openings, corridor entrances, drains, ducts, grilles, grates, diffusers, skylights, and any other opening between Work Area (including the outside of the building, tunnels, and crawlspaces) shall be sealed off with 6 mil plastic sheeting and tape. Fixed objects shall be enclosed in 6 mil polyethylene sheeting and sealed securely in place with tape.

9. Emergency and fire exits from Work Areas shall be maintained and adequately marked. Alternative exits shall be established that are satisfactory to Engineer and local fire regulations.

10. Contractor shall supply the necessary lighting to illuminate the entire Work Area during the working hours of Project and AMC inspections.

11. Contractor shall secure windows and access points to buildings, through which power cords are run, to prevent against break-ins and vandalism to the building.

12. Contractor shall construct and maintain at least one 3 stage decontamination unit. This decontamination unit shall be constructed in conformance with the requirements of Worker Decontamination Enclosure Systems Article of this Section.

B. Resilient Flooring and Mastic Removal Preparation:

1. Windows, doorways, elevator openings, corridor entrances, drains, ducts, grilles, grates, diffusers, skylights, and any other openings shall be sealed with 2 layers of 6 mil polyethylene sheeting and tape. Fixed objects shall be enclosed in 2 layers of 6 mil polyethylene sheeting and sealed securely in place with tape.

2. Carpeting covering resilient flooring shall be removed in a manner that shall not disturb the tile, and shall be disposed of as non-asbestos waste.

3. Carpeting covering resilient flooring that cannot be removed without disturbing the tile shall be removed under containment, and shall be disposed of as asbestos waste.

4. Wall surfaces shall be covered with 1 layer of 6 mil polyethylene sheeting sealed with tape. The polyethylene sheeting on the walls shall extend from the floor to the ceiling line or a minimum of 10 feet. The polyethylene sheeting shall be sized to minimize seams.

5. Entry and exit from Work Areas shall be through a 3 stage decontamination unit described in Worker Decontamination Enclosure Systems Article of this Section or as approved by AMC.

6. A pressure differential system shall be established that produces a minimum of 4 filtered air changes per hour in Work Area and maintains a pressure differential of 0.05-inch water gauge between the inside and outside of Work Area. The location and identification of each individual pressure differential ventilation unit shall be provided and approved by AMC for each Work Area. The pressure differential system shall not be exhausted into occupied areas of the building.

7. Contractor shall provide a manometer to monitor the pressure differential within Work Area. The manometer shall be placed at a location where it can be continuously monitored. The manometer shall be equipped with a strip chart recorder which runs continuously.

C. Drywall, Compound, and Tape Removal Preparation:

1. Windows, doorways, elevator openings, corridor entrances, drains, ducts, grilles, grates, diffusers, skylights, and any other openings shall be sealed with 2 layers of 6 mil polyethylene sheeting and tape. Fixed objects shall be enclosed in 2 layers of 6 mil polyethylene sheeting and sealed securely in place with tape.

2. Floor surfaces shall be covered with 2 layers of 6 mil polyethylene sheeting.

3. Wall surfaces not to be abated shall be covered with 2 layers of 6 mil polyethylene sheeting sealed with tape.

4. Entry and exit from Work Areas shall be through a 3 stage decontamination unit described in Worker Decontamination Enclosure Systems Article of this Section or as approved by AMC.

5. A pressure differential system shall be established that produces a minimum of 4 filtered air changes per hour in Work Area and maintains a pressure differential of 0.05 inch water gauge between the inside and outside of Work Area. The location and identification of each individual pressure differential ventilation unit shall be provided and approved by AMC for each Work Area. The pressure differential system shall not be exhausted into occupied areas of the building.

6. Contractor shall provide a manometer to monitor the pressure differential within Work Area. The manometer shall be placed at a location where it can be continuously monitored. The manometer shall be equipped with a strip chart recorder which runs continuously.

D. Roofing Material Removal Preparation:

1. Isolate the asbestos removal Work Area below with "ASBESTOS HAZARD" warning ribbon. In addition, signs meeting the specifications of Cal-OSHA General Industry Safety Order Section 1529 shall be posted at approaches to locations where airborne concentrations of asbestos may exceed ambient background levels.

2. Prior to the start of any Work on the roof, prepare the surrounding area below by clearing and cleaning debris and trash up to 15 feet from the exterior walls.

3. Seal duct Work intakes and exhaust vents within the regulated Work Area with 6 mil polyethylene sheeting and duct tape.

4. Place a layer of 6 mil, polyethylene sheeting drop cloth a the base of the wall below the roof to be removed. Extend the drop cloth out 15 feet from the exterior wall.

5. Entry and exit from Work Areas shall be through a 3 stage decontamination unit described in Worker Decontamination Enclosure Systems Article of this Section or as approved by AMC.

3.6 WORKER DECONTAMINATION ENCLOSURE SYSTEMS

A. Worker decontamination enclosure systems shall be provided where workers shall enter or exit the asbestos removal Work Areas, and shall be located inside the building.

B. Plans for construction, including materials and layout, shall be submitted and approved by AMC prior to Work initiation. Worker decontamination enclosure systems constructed at Project Site shall use 6 mil opaque black or white polyethylene sheeting or other acceptable materials for privacy. Detailed descriptions of portable, prefabricated units, if used, shall be submitted to AMC for approval. Plans shall include floor plans, with dimensions, materials, size, thickness, plumbing, and electrical utilities.

C. The worker decontamination enclosure system shall consist of at least a clean room, a shower room, and an equipment room, each separated from the other by curtained doorways.

D. Entry to and exit from decontamination enclosure system chambers shall be through curtained doorways consisting of 2 sheets of overlapping polyethylene sheeting. One sheet shall be secured at the top and left side, the other sheet at the top and right side. Both sheets shall have weights attached to the bottom to ensure that they hang straight and maintain a seal over the doorway when not in use. Doorway designs, providing equivalent protection and acceptable to AMC, may be used.

E. Pathways into (from clean to contaminated) and out of (contaminated to clean) Work Area shall be clearly designated.

F. The clean room shall be sized to adequately accommodate Work crew. The clean room shall also provide shelves for storing respirators and a location for posting notices.

G. The equipment room shall be used for storage of equipment and tools. A walk-off pan shall be located in Work Area just outside the equipment room for workers to clean off foot coverings after leaving Work Area and to prevent excessive contamination enclosure system. A drum lined with a labeled 6 mil polyethylene bag for collection of disposable clothing shall be located in this room. Contaminated footwear (e.g., rubber boots, other reusable footwear) shall be stored in this area for reuse the following workday.

3.7 EMERGENCY EXITS

A. Emergency exits shall be established and clearly marked with duct tape arrows or other effective designations to permit easy location from anywhere within Work Area. Secure emergency exits to prevent access from uncontaminated areas and still permit emergency exiting. Properly seal emergency exits with 6 mil polyethylene sheeting that can be cut to permit egress, if needed. These exits may be the worker decontamination enclosure, the waste pass-out airlock, and other alternative exits satisfactory and in compliance with local fire regulations. Where emergency exits are sealed, an instrument capable of cutting the polyethylene barrier shall be installed on both sides of the barrier, to allow for immediate exit from Work Area in the event of an emergency.

3.8 MAINTENANCE OF WORKPLACE BARRIERS

A. Following completion of the construction of polyethylene barriers and decontamination system enclosures, adequate settling time shall be required to ensure that barriers shall remain intact and secured to walls and fixtures before beginning actual abatement activities.

B. Visually inspect barriers at the beginning of each Work period or shift.

C. Repair damage and defects in the enclosure system immediately upon discovery.

D. At any time during the abatement activities after barriers have been erected, if visible material is observed outside of Work Area or if damage occurs to barriers, Work shall immediately stop, repairs made to barriers, and debris and residue cleaned up using appropriate HEPA-vacuuming and wet-mopping procedures.

3.9 WORKPLACE ENTRY AND EXIT PROCEDURES

A. General: The following procedures shall be followed prior to entrance into any regulated asbestos Work Area:

1. Personnel who enter Work Area shall sign the entry log upon entry and exit.

2. Personnel, before entering Work Area, shall read and be familiar with posted regulations, personal protection requirements (including Workplace entry and exit procedures), and emergency procedures.

3. Personnel shall wear appropriate respiratory protection and disposable coveralls, head covering, and foot covering. Hard hats, eye protection, and gloves shall also be used, as required. Provide clean respirator filter cartridges and protective clothing for use by each person for each separate entry into Work Area.

4. Personnel wearing designated personal protective equipment shall proceed to Work Area.

5. To exit Work Area personnel shall proceed to the equipment room where they shall remove protective equipment, except respirators, and deposit disposable clothing into appropriately labeled containers for disposal.

6. Clothing or footwear worn into a regulated Work Area shall not be permitted out of the regulated Work Area.

7. Store reusable and contaminated footwear in the equipment room when not in use in Work Area. Upon completion of abatement, footwear shall be disposed of as asbestos-contaminated waste. (Rubber boots may be decontaminated at the completion of the abatement for reuse).

B. Resilient Flooring, Mastic Removal Work Area Entry, and Exit Procedures:

1. Asbestos handlers involved in resilient flooring and mastic removal procedures shall wear 2 disposable Tyvek suits, including hood and footwear, and appropriate respiratory protective equipment. Hard hats, eye protection, and gloves shall also be used as required. Clean respirators and protective clothing shall be provided and used by each person for each separate entry into Work Area.

2. The double layer personal protective equipment shall be used throughout the procedure if a decontamination unit with a shower room is not contiguous to Work Area. Upon exiting Work Area and entering the change room, the worker shall HEPA vacuum and wet clean the outer suit and dispose of it as asbestos-contaminated waste. Workers shall then proceed to an operational 3 stage decontamination unit to remove and dispose of the second suit, shower, and change into street clothes.

C. Drywall, Compound, and Tape Removal Work Area Entry and Exit Procedures:

1. Asbestos handlers involved in drywall, compound, and tape removal procedures shall wear disposable Tyvek suits, including hood and footwear, and appropriate respiratory protective equipment. Hard hats, eye protection, and gloves shall also be used as required. Clean respirators and protective clothing shall be provided and used by each person for each separate entry into Work Area.

2. Upon exiting Work Area and entering the change room, the worker shall remove protective equipment except respirator and place disposable protective clothing in a proper waste bag. The worker shall then proceed to the shower where the respirator may be removed. Following proper showering, the worker shall proceed to the clean room and change into street clothes.

D. Roofing Material Removal Work Area Entry and Exit Procedures:

1. Asbestos handlers involved in roofing material removal procedures shall wear 2 disposable Tyvek suits, including hood and footwear, and appropriate respiratory protective equipment. Hard hats, eye protection, and gloves shall also be used as required. Clean respirators and protective clothing shall be provided and used by each person for each separate entry into Work Area.

2. The double layer personal protective equipment shall be used throughout the procedure if a decontamination unit with a shower room is not contiguous to Work Area. Upon exiting Work Area and entering the change room, the worker shall HEPA vacuum and wet clean the outer suit and dispose of it as asbestos-contaminated waste. Workers shall then proceed to an operational 3 stage decontamination unit to remove and dispose of the second suit, shower, and change into street clothes.

3.10 ASBESTOS REMOVAL PROCEDURES

A. Contractor shall coordinate Work activities with Engineer.

B. General:

1. Work Area shall be cleaned and isolated in conformance with the procedures specified in Asbestos Abatement Preparation Procedures Article of this Section.

2. Waste containers shall be sealed when full. Bags shall not be overfilled. Bags shall be securely sealed to prevent accidental opening and leakage by tying the tops of bags in an overhand knot or by taping in gooseneck fashion. Bags shall not be sealed with wire or cord.

3. Large components removed intact may be wrapped in 2 layers of 6 mil polyethylene sheeting secured with 2 inch wide duct tape for transport to a landfill.

4. Asbestos-containing or contaminated waste with sharp-edged components shall be placed into 55 gallon steel drums for disposal.

5. Waste bags shall be evacuated of air employing HEPA-filtered vacuums prior to double-bagging and disposal.

C. Resilient Flooring and Mastic Removal Procedures:

1. Asbestos-containing flooring materials shall be sprayed with amended water or chemical remover, as appropriate, using spray equipment capable of providing a low-pressure application. If chemical removers are used, follow manufacturer's written instructions. Solvent vapors shall be exhausted in a manner that does not create a fire hazard, health hazard or nuisance, and complies with applicable SCAQMD regulations.

2. The wetted asbestos flooring material shall be removed using methods to minimize the breakup of the material. As it is removed, the material shall be packed in polyethylene bags of 6 mil minimum thickness and placed in labeled containers for transport. Material shall not be allowed to dry out prior to placement into the container.

3. Contractor shall adhere to disposal authorities’ size and weight requirements for containers (bags or packages).

4. ACM or asbestos-contaminated material that has been bagged or wrapped in Work Area shall not be allowed to accumulate; bagged or wrapped material shall be removed from Project Site or placed in a Contractor supplied dumpster at the end of each Work day. The dumpster shall be marked with asbestos warning signs, and shall be secured continually when not in use.

5. Dispose of asbestos containing material in conformance with Disposal Procedures Article of this Section.

6. Cleanup shall proceed in conformance with Cleanup Procedures Article of this Section.

7. After Work Area surfaces have been rendered free of visible residues, a thin coat of an approved encapsulating agent shall be applied to seal in invisible residue.

D. Drywall, Compound, and Tape Removal Procedures:

1. Asbestos-containing drywall, compound and tape shall be sprayed with amended water using spray equipment capable of providing a low-pressure application.

2. The wetted drywall, compound, and tape shall be removed using methods to minimize the breakup of the material. As it is removed, the material shall be packed in polyethylene bags of 6 mil minimum thickness and placed in labeled containers for transport. Material shall not be allowed to dry out prior to placement into the container.

3. Contractor shall adhere to disposal authorities' size and weight requirements for containers (bags or packages).

4. ACM or asbestos-containing material that has been bagged or wrapped in Work Area shall not be allowed to accumulate; bagged or wrapped material shall be removed from Project Site or placed in a Contractor-supplied dumpster at the end of each Work day. The dumpster shall be marked with asbestos warning signs, and shall be secured continually when not in use.

5. Dispose of asbestos containing material in conformance with Disposal Procedures Article of this Section.

6. Cleanup shall proceed in conformance with Cleanup Procedures Article of this Section.

7. After Work Area surfaces have been rendered free of visible residues, a thin coat of an approved encapsulating agent shall be applied to seal in invisible residue.

E. Roofing Material Removal Procedures:

1. Roofing material shall be manually removed after spraying with amended water (unless wetting the material poses a slipping hazard). Material shall remain wet continually during removal operations. No visible emissions shall be allowed during removal.

2. The asbestos-containing material shall be removed in small sections. As it is removed, the material shall be encapsulated before packing in double polyethylene bags of 6 mil minimum thickness, and placed in labeled containers for transport. Material shall not be allowed to dry out prior to placement into the disposal container.

3. Contractor shall adhere to disposal authorities' size and weight requirements for containers (bags or packages).

4. No asbestos-containing material shall be allowed to drop or free-fall to the ground. Chutes for conveying asbestos-containing roofing material off the roof shall be sealed.

5. Dispose of asbestos containing material in conformance with Disposal Procedures Article of this Section.

6. Cleanup shall proceed in conformance with Cleanup Procedures Article of this Section.

7. After Work Area has been rendered free of visible residues and after passing visual inspection by AMC, a thin coat of an approved encapsulating agent shall be applied to seal in invisible residue.

F. Transite Pipe Materials Removal Procedures:

1. Workers removing transite pipes shall wear full Tyvek suits, half-face air purifying respirators equipped with N- or P-100 filters, hard hats, boots, eye protection, and gloves.

2. The transite pipes shall be removed intact and wrapped in 6-mil polyethylene sheeting.

3. Cleanup shall proceed in conformance with Cleanup Procedures Article of this Section.

4. Dispose of asbestos-containing/contaminated waste in conformance with Disposal Procedures Article of this Section.

3.11 WASTE CONTAINER PASS-OUT PROCEDURES

A. Waste container pass-out procedures shall use 2 teams of workers:

1. The inside team, wearing appropriate protective clothing and respirators for inside Work Area, shall clean the outside, including bottoms, of properly labeled containers (bags, drums, or wrapped components) using HEPA vacuums and wet-wiping techniques. No worker from the inside team shall exit Work Area through the waste container pass-out system.

2. Bagged asbestos waste materials shall be placed in a second 6 mil polyethylene waste disposal bag, or drum, respectively, as it is passed out of Work Area. External surfaces shall be clean and caution labels placed on the outside of the containers in conformance with 8 CCR 1529 and 29 CFR 1926.1101.

3. The outside person, wearing appropriate personal protection, shall transfer the waste containers to the disposal storage vehicle. The exit from this airlock shall be secured to prevent unauthorized entry.

4. AMC shall be notified in advance of waste container movement through the waste container pass-out system.

3.12 CLEANUP PROCEDURES

A. General:

1. Visible accumulations of ACM and asbestos-contaminated debris shall be removed and containerized using nonmetallic tools (squeegees, shovels, and the like.). Surfaces in Work Area shall then be wet cleaned. Equipment used in Work Area shall be included in the cleanup, and shall be removed from Work Areas via the decontamination enclosure system or waste load-out, at appropriate times in the cleaning sequence.

2. None of the procedures described in this Article relieve Contractor of the responsibility to meet the final clearance criteria as established by this Section.

B. Resilient Flooring and Mastic Cleanup Procedures:

1. Windows, doors, and HVAC vents shall remain sealed, and any HEPA-filtered pressure differential systems, waste load-out, and decontamination enclosure systems shall remain in service.

2. Work Area and any other contaminated areas shall be cleaned using HEPA-filtered vacuum equipment and wet-wiping techniques. After completion of the cleaning operation, a complete visual inspection of Work shall be conducted with AMC to ensure that Work Area is free of visible asbestos debris. A final check shall be made for asbestos debris, and further cleaning shall be conducted as necessary.

3. Upon completion of the cleaning operation, Contractor shall notify AMC that Work Area is ready for review and clearance air monitoring. Work Area shall be cleaned until it passes Clearance Air Monitoring Standard.

4. Upon notification from AMC that Work Area has passed the standard for clearance air monitoring, (if applicable) Contractor shall proceed with the demolition of Work Area.

C. Drywall, Compound, and Tape Cleanup Procedures:

1. Windows, doors, and HVAC vents shall remain sealed, and any HEPA-filtered pressure differential systems, waste load-out, and decontamination enclosure systems shall remain in service.

2. Work Area and any other contaminated areas shall be cleaned using HEPA-filtered vacuum equipment and wet-wiping techniques. After completion of the cleaning operation, a complete visual inspection of Work shall be conducted with AMC to ensure that Work Area is free of visible asbestos debris. A final check shall be made for asbestos debris, and further cleaning shall be conducted as necessary.

3. Upon completion of the cleaning operation, Contractor shall notify AMC that Work Area is ready for review and clearance air monitoring. Work Area shall be cleaned until it passes Clearance Air Monitoring Standard.

4. Upon notification from AMC that Work Area has passed the standard for clearance air monitoring, (if applicable) Contractor shall proceed with the demolition of Work Area.

D. Roofing Material Removal Cleanup Procedures:

1. Any polyethylene drop cloths or polyethylene sheeting used to seal air vents shall be wet-wiped to remove any visible roofing material debris. Each drop cloth shall then be rolled-up and placed within a 6 mil polyethylene waste disposal bag.

2. Work Area and any other contaminated areas shall be cleaned of visible debris with HEPA-filtered vacuum equipment. Any roofing mastics adhering to non-asbestos surfaces may be “touched-up” using a solvent-based mastic remover.

3. After completion of the cleaning operation, a complete visual inspection of Work Area shall be conducted with AMC to ensure that Work Area is free of visible asbestos debris. A final check shall be made for asbestos debris and further cleaning conducted as necessary.

4. Upon completion of the cleaning operation, Contractor shall notify AMC that Work Area is ready for review and clearance air monitoring. Work Area shall be cleaned until it passes Clearance Air Monitoring Standard.

5. Upon notification from AMC that Work Area has passed the standard for clearance air monitoring, (if applicable) Contractor shall proceed with the demolition of Work Area.

3.13 CLEARANCE AIR MONITORING

A. After completion of cleanup operations, Contractor shall notify AMC that Work Areas are ready for clearance air monitoring. Final clearance sampling shall be conducted only after the procedures specified in Cleanup Procedures Article of this Section have been completed, the area has been satisfactorily cleaned and encapsulated, and the abatement area has been thoroughly dried.

B. AMC shall conduct the final clearance air monitoring by collecting and analyzing air samples using the methods set forth in NIOSH Method 7400.

C. Clearance of Work Area shall be achieved when each sample taken within the contained Work Area indicates airborne fiber concentrations of less than 0.01 fibers per cubic centimeter, as determined by phase contrast microscopy.

D. Any abatement area not achieving clearance shall be re-cleaned using procedures specified in Cleanup Procedures Article of this Section, and retested until clearance is achieved. The cost of any additional samples, consultant air monitoring fees, and labor for recleaning Work Areas that fail final air clearances shall be paid for by Contractor.

3.14 DISPOSAL PROCEDURES

A. As Work progresses, to prevent exceeding available storage capacity on Project Site, sealed and labeled containers of asbestos-containing waste shall be removed and transported to the prearranged disposal location.

B. Unless other arrangements are made satisfactory to Engineer, bagged or wrapped material shall be removed from Work Areas and placed in a Contractor-supplied dumpster at a minimum every day. The dumpster shall be marked with asbestos warning signs and shall be locked continually when not in use. When a dumpster is full, it shall be removed from Department property by the end of the next business day.

C. Disposal shall occur at an authorized site, in conformance with regulatory requirements of National Emissions Standards for Hazardous Air Pollutants (NESHAP) and applicable state and local guidelines and regulations, including California State Department of Health Services, Toxic Substances Control Division.

D. Dump receipts, trip tickets, transportation manifests, or other documentation of disposal shall be delivered to Engineer and AMC for their records.

3.15 TRANSPORTATION TO THE LANDFILL

A. Once drums, bags, and wrapped components have been removed from Work Area, they shall be transported in an enclosed vehicle or container at sole cost and expense of Contractor.

B. The enclosed cargo area of the truck shall be free of debris and lined with 6 mil polyethylene sheeting to prevent any waste or contamination from leaking or spilled containers. Floor sheeting shall be installed first and extend up the sidewalls. Wall sheeting shall be overlapped and taped into place.

C. Drums shall be placed on level surfaces in the cargo area and packed tightly together to prevent shifting and tipping. Large structural components shall be secured to prevent shifting, with bags placed on top. Containers shall not be thrown into the truck cargo area.

D. Any debris or residue observed on containers or surfaces outside of Work Area resulting from cleanup or disposal activities shall be immediately cleaned up using HEPA-filtered vacuum equipment or wet methods as appropriate.

3.16 DISPOSAL AT THE LANDFILL

A. Bags, drums, and components shall be inspected as they are off-loaded at the disposal site. Material in damaged containers shall be repacked in empty drums or bags, as necessary.

B. Waste containers shall be placed on the ground at the disposal site, not pushed or thrown out of trucks (weight of wet material could rupture containers).

C. Following the removal of containerized waste, the truck cargo area shall be decontaminated using HEPA vacuums or wet methods to meet the no visible residue criteria. Polyethylene sheeting shall be removed and discarded, along with contaminated cleaning materials and protective clothing, in bags or drums at the disposal site.

3.17 ALTERNATIVE PROCEDURES

A. The procedures described in this Section shall be used continually.

B. If specified procedures cannot be used, a request shall be made in writing to Engineer providing details of the problem encountered and recommended alternatives.

C. Alternative procedures shall provide equivalent or greater protection than the procedures that they replace.

D. Any alternative procedure shall be approved in writing by Engineer prior to implementation.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Repair materials for damaged galvanizing.

B. Equipment to repair abraded, damaged, and field welded galvanized surfaces.

1.2 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications

B. Section 05 51 00 - Metal Stairs

C. Section 09 90 01 - Painting for Exterior Improvements

D. Section 23 61 23 - Rotary-Screw Refrigerant Compressors

E. Section 26 05 34 - Outlet, Junction, and Pull Boxes

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under each corresponding bid item of Bid Proposal Line Items that requires treating of damaged galvanize.

1.4 REFERENCES

A. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

B. South Coast Air Quality Management District (SCAQMD).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be zinc-based alloys, zinc-rich paints, or sprayed zinc in conformance with ASTM A780/A780M.

B. The following product is acceptable: Carbozinc 859 VOC manufactured by Carboline Company, (314) 644-1000 or (800) 848-4645.

C. Products shall be in compliance with South Coast Air Quality Management District (SCAQMD) regulations.

D. Materials shall comply with City of Los Angeles Green Building Code requirements.

1. Enter product data in VOC Content Verification Checklist form and provide product specification sheets. Make checklist and specifications available to City of Los Angeles Department of Building and Safety inspector through Engineer upon request. VOC Content Verification Checklist can be found here: https://www.ladbs.org/docs/default-source/forms/green-building-2023/grn_2_voc_content_verification_checklist-01.17.23.pdf?sfvrsn=19f4c153_10

PART 3 - EXECUTION

3.1 REPAIR

A. Repairs shall be in conformance with ASTM A780/A780M and manufacturer's latest material safety data sheet instructions.

B. Coating thickness shall be a minimum of 3.0 mils in dry film thickness.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated miscellaneous metal fabrications, steel, and aluminum items

B. Access ladders

C. Fasteners

D. Loose bearing and leveling plates

E. Miscellaneous framing and supports

F. Metal bar gratings

G. Loose steel lintels

H. Floor plates

I. Metal finishes

1.2 RELATED SECTIONS

A. Section 05 05 14 - Treating Damaged Galvanizing

B. Section 05 51 00 - Metal Stairs

C. Section 09 90 01 - Painting for Exterior Improvements

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under each corresponding bid item of Bid Proposal Line Items that requires metal fabrications.

1.4 REFERENCES

A. ASME B18.6.3 - Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).

B. ASME B18.21.1 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series).

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

G. ASTM A193/A193M - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.

H. ASTM A194/A194M - Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.

I. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

J. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes.

K. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

L. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

M. ASTM A435/A435M - Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates.

N. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

O. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

P. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

Q. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

R. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.

S. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings.

T. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

U. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

V. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

W. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

X. ASTM D962 - Standard Specification for Aluminum Powder and Paste Pigments for Paints.

Y. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

Z. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

AA. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

BB. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.

CC. AWS D1.1/D1.1M - Structural Welding Code - Steel.

DD. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

EE. FS TT-V-81 - Varnish: Mixing, for Aluminum Paint.

FF. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.

GG. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals.

HH. SSPC-SP 1 - Solvent Cleaning.

II. SSPC-SP 2 - Hand Tool Cleaning.

JJ. SSPC-SP 3 - Power Tool Cleaning.

KK. SSPC-SP 7 - Brush-Off Blast Cleaning.

1.5 SUBMITTALS

A. Submit mill test reports certifying that materials meet requirements of standards listed in References Article of this Section.

1. Heat and melt numbers and mill test report numbers.

2. Size.

3. Type and grade of material, identified by ASTM Standard Specification number.

4. Color coding for shop drawing requirements.

B. Submit the following to Engineer for review and approval:

1. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

a. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

b. Design fabrications to meet actual installation conditions verified at Project Site.

c. Detail minor connections and fastenings not shown or specified to meet required conditions. Include detailed sequence plan for shop and field welding that minimizes locked-in stresses and distortions.

d. No change shall be made on shop drawings after shop drawings have been approved, except by written consent or direction of Engineer.

e. Detail drawings shall show grade of steel, identification marks on members, dimensions, size, weight, orientation, and location of each member and setting elevation of base plates and bearing plates. Identify connections and welds, including welding sequences and types, sizes, and extent of weld.

f. The shop drawings shall show details of permitted options proposed, details of connections, direction of rolling plates, sequence of field and shop assembly, welding sequence and procedures, location and details of welds, and the location of temporary support used for assembly.

2. Welders' Certificates: Submit certification for welders employed on Project, verifying AWS qualification and City of Los Angeles Department of Building and Safety (LADBS) certification within the previous 12 months.

3. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

C. Submit manufacturer's literature and certification that paints and coatings meet South Coast Air Quality Management District (SCAQMD) Volatile Organic Compounds (VOC) requirements.

1. Refer to PAINTING FOR EXTERIOR IMPROVEMENTS Section for priming and painting requirements.

D. Submit name of independent test laboratory to perform inspection and testing.

E. Submit results of independent test laboratory’s inspections and tests.

F. Submit fabricator's test results of materials prior to using materials for fabrication.

1.6 QUALITY ASSURANCE

A. Inspection: Engineer reserves the right to inspect the manufacture or fabrication. Engineer's inspection of Work does not relieve Contractor of the responsibility for Work. Errors or faults that are discovered during fabrication shall be corrected by Contractor prior to installation.

B. Welders: Welders shall be qualified in conformance with AWS D1.1/D1.1M and AWS D1.3/D1.3M shall be City of Los Angeles Department of Building and Safety certified.

C. Mill Tests: Prepare mill tests for specified material.

D. Field welding shall be performed in presence of a City of Los Angeles Registered Deputy Inspector.

E. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

1.7 QUALITY ASSURANCE

A. Inspection: The Engineer reserves the right to inspect the manufacture or fabrication. The Engineer's inspection of work does not relieve the Contractor of the responsibility for work. Errors or faults that are discovered during fabrication shall be corrected by Contractor prior to installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from damage during shipping, handling, and storage on Project Site. Steel showing dents, creases, deformations, weathering, or other defects is not acceptable.

B. Store metals above ground on platforms, skids, or other supports, and keep free from dirt, grease, and other foreign material. Protect metals from corrosion while stored.

1. Store materials in a location and in a manner to avoid damage. Stacking shall be done in a way which shall prevent bending. Store metal components and materials in a clean, dry location. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that shall permit circulation of air inside the cover.

C. Deliver bolts, nuts, washers, and studs not part of an approved fabrication, to Project Site in the original labeled containers and do not transfer into unlabeled containers.

D. Units weighing more than 5,000 pounds shall have the mass marked on the steel unit.

PART 2 - PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M, unless shown otherwise on approved shop drawings or this Section. Plates shall be furnished to qualify for ultrasonic examination in conformance with ASTM A435/A435M.

B. Steel Tubing: ASTM A500/A500M, cold-formed, Grade B, Fy = 46 ksi or ASTM A501/A501M hot formed structural tubing. For exterior installations, provide tubing with hot-dip galvanized coating in conformance with ASTM A153/A153M.

C. Low to intermediate grade steel plates shall conform to ASTM A283/A283M.

D. Steel Pipe: ASTM A53/A53M, Grade as directed by Engineer Schedule 40, unless shown otherwise on Drawings.

E. Slotted Channel Framing: ASTM A1011, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Fasteners:

1. Bolts and nuts:

a. Bolts and nuts shall be American National coarse-thread series.

b. Unfinished bolts shall conform to ASTM A307.

2. Washers and Load Indicator Devices:

a. Plain washers shall conform to ASME B18.21.1.

b. Beveled washers shall be square, smooth, and sloped so that contact surfaces of bolt head and nut are parallel.

c. The diameter of hole of square-beveled washer shall be 1/16 inch greater than the bolt size for bolts larger than 1 inch.

d. Install washers on nut side of bolt for torquing as required.

3. Anchor Bolts: ASTM F1554, Grade 36.

4. Machine Screws: ASME B18.6.3.

5. High Strength Bolts: ASTM F3125/F3125M.

2.2 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221, 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.

D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.

E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.

F. Aluminum-Alloy Die Castings: ASTM B85/B85M.

G. Bolts, Nuts, and Washers: Stainless steel, Type 304 or 316 in conformance with ASTM F593.

H. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.3 MATERIALS - STAINLESS STEEL

A. Stainless Steel Plates: ASTM A276/A276M, Type 304 or 316 (for exterior and highly corrosive environment).

B. Anchor Bolts and Nuts: ASTM A193/A193M and ASTM A194/A194M

C. Pipe: ASTM A269/A269M

D. Finish: As noted on Drawings.

2.4 FABRICATION

A. General:

1. Metal items shall be fabricated and finished in accordance with Drawings and approved shop drawings. Verify measurements before fabrication.

2. Welding procedures and inspection shall be in conformance with AWS D1.1/D1.1M. Welding shall be continuous along the area of contact except where tack welding is called for on Drawings. Welds shall be ground smooth.

3. Galvanize fabricated ferrous items after fabrication.

4. Metal fabrications showing injurious defects, weak spots, imperfections in Work, or otherwise not conforming to Specifications or Drawings shall be rejected.

B. Fit and shop assemble items in largest practical sections, for delivery to Project Site.

C. Fabricate items with joints tightly fitted and secured.

D. Wire brush material, clean off loose mill scale and rust, and straighten by methods that shall not injure the steel prior to fabrication. Remove twists or bends after punching or working component parts of a member before the parts are assembled. Produce finished members free from twists, bends, or open joints when installed.

E. Shearing, flame cutting, and chipping shall be done accurately.

F. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation.

G. Parts not completely bolted in the shop shall be secured by temporary bolts, insofar as practicable, to prevent damage in shipment and handling.

H. Use of gas or plasma cutting torch is allowed where the metal being cut is not stressed during the operation, and provided stresses are not transmitted through a flame-cut surface. Make cuts with smooth regular contour. Deduct 1/8 inch from width of cut edges to determine effective width of members that are cut. Make radius of reentrant cuts as large as possible, but 1 inch minimum.

I. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

J. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.5 ACCESS LADDERS

A. Fabricate ladders for the location shown, with dimensions, spacings, details, and anchorages as indicated on Drawings. Comply with requirements of ANSI A14.3 and 29 CFR 1910.27; where conflicts occur, comply with the more stringent requirements.

B. Siderails: Continuous steel flat bars, with eased edges.

C. Bar Rungs: As indicated on Drawings.

D. Fit rungs in centerline of side rails, through drilled holes, weld and grind smooth on outer rail faces.

E. Size brackets to support design dead and live loads indicated on Drawings and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.

F. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose-neck the extended rails back to the structure to provide secure ladder access.

G. Provide non-slip surface on each rung, either by coating the rung with aluminum oxide granules set in epoxy resin adhesive, or by using a type of manufactured rung which is filled with aluminum oxide grout.

2.6 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required.

2.7 MISCELLANEOUS METAL ITEMS

A. Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated which are not a part of structural steel framework, as required to complete Work.

1. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2. Equip units with integrally welded anchors for casting into concrete or building into masonry. If units are installed after concrete is placed, furnish inserts. Unless otherwise indicated on Drawings, space anchors 24 inches on center and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch by 8 inches long.

B. Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown on Drawings. Unless otherwise indicated on Drawings, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination for assembly and installation with other Work.

2.8 SHELF AND LEDGER ANGLES

A. Fabricate shelf and ledger angles from steel angles of sizes indicated on Drawings and for attachment to concrete framing. Provide slotted holes to receive 3/4 inch bolts, spaced not more than 6 inches from ends and not more than 24 inches on center, unless otherwise indicated on Drawings.

B. For cavity walls, provide vertical channel brackets to support shelf/ledger angles from back-up masonry and concrete. Align expansion joints in angles with indicated expansion joints in cavity wall exterior wythe.

C. Furnish wedge-type concrete inserts, complete with fasteners, for attachment of shelf angles to cast-in-place concrete.

2.9 METAL BAR GRATINGS

A. General: Produce metal bar gratings of description indicated in conformance with National Association of Architectural Metal Manufacturers (NAAMM) marking system that complies with the following:

1. Metal Bar Grating Standard: Metal Bar Grating Manual published in NAAMM MBG 531.

2. Heavy Duty Metal Bar Grating Standard: Heavy Duty Metal Bar Grating Manual published in NAAMM MBG 532.

B. If gratings are located in walking surfaces, gratings shall have spaces no greater than 1/2 inch wide in one direction. If gratings have elongated openings, then they shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

C. Fabricate steel gratings to comply with requirements as indicated on Drawings.

D. Traffic Surface for Steel and Aluminum Bar Gratings: Plain, unless otherwise indicated on Drawings.

E. Steel Finish: shop prime paint applied in conformance with manufacturer’s standard practice.

F. Aluminum Finish: Mill (as fabricated), unless otherwise indicated on Drawings.

G. Fabricate removable gratings sections with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated, or if not indicated, as recommended by manufacturer, for attachment to supports.

1. Heavy Duty Grating: Provide not less than 4 anchors blocks, 1/4 minimum thickness, for each section of grating composed of bearing bars over 3/16 inch in thickness, with each block shop-welded to 2 bearing bars.

2. Non-Heavy Duty Grating: Provide not less than 4 saddle clips for each grating section composed of rectangular bearing bars 3/16 inch or less in thickness and spaced not less than 15/16 inch on center, with each clip designed and fabricated to fit over 2 bearing bars. Furnish threaded bolts with nuts and washers for each clip required, unless otherwise indicated on Drawings.

H. Attach toe plates to grating by welding, unless otherwise indicated on Drawings. Toe plate height: 4 inches, unless a greater height indicated on Drawings.

I. Fabricate cutouts in grating sections for penetrations indicated. Arrange layout of cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge band openings in grating that interrupt 4 or more bearing bars with bars of same size and material as bearing bars.

2. Do not notch bearing bars at supports to maintain elevation.

J. Manufacturers: Alabama Metal Industries Corp., Barnett/Bates Corp., and IKG Industries.

2.10 FLOOR PLATE

A. Fabricate raised pattern floor plates from rolled steel floor plate in conformance with ASTM A786/A786M of thickness and pattern indicated on Drawings. If not indicated, pattern as selected from manufacturer’s standard patterns.

B. Abrasive Surface Floor Plate: Manufacturer’s standard abrasive granules, rolled into surface of steel plate, where indicated on Drawings.

C. Include steel angle stiffeners and fixed and removable sections as indicated on Drawings. Provide 2 steel bar drop handles for lifting plates, 1 at each end of each removable section.

2.11 STEEL AND IRON FINISHES

A. General:

1. Steel, painted, and unpainted iron materials furnished shall be cleaned of rust, scale, and grease.

2. Remove oil, grease, and similar contaminants in conformance with SSPC-SP 1.

3. Remove loose rust, scale, spatter, slag, and other deleterious materials in conformance with SSPC-SP 2, SSPC-SP 3, or SSPC-SP 7.

4. Apply primer to give a dry film thickness of 2.5 mils, except as specified for zinc-rich coating option.

5. Paint after shop Work has been completed. Paint with brushes, entire surface to be covered smoothly, with paint worked into joints.

6. No material shall be loaded for shipment until primer is fully dry.

7. Materials arriving at Project Site with damaged primer or paint shall be cleaned and given an additional coat of paint before being assembled, except finish Work which shall be exposed to view shall be returned to shop for recleaning and repainting.

B. Painting: Immediately after surface preparation, apply structural steel primer paint in conformance with manufacturer's written instructions and at a rate to provide dry film thickness of not less than 3.0 mils. Use painting methods that result in full coverage of joints, corners, edges, and exposed surfaces. Apply 2 coats of paint to surfaces that are inaccessible after assembly or erection.

C. Where steel is scheduled to be painted, apply paint in conformance with PAINTING FOR EXTERIOR IMPROVEMENTS Section.

D. Steel surfaces in contact with aluminum shall receive an additional coat of paint consisting of 2 pounds of aluminum paste pigment (ASTM D962 Type II, Class B) per gallon of varnish meeting FS TT-V-81, Type II.

E. Galvanizing: For those items indicated for galvanizing, apply zinc-coating in compliance with the following requirements:

1. Ferrous metal Work, both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forced shapes, plates, bars, and strip 0.0299 inch thick and heavier shall be galvanized by hot-dip process, with larger items galvanized in conformance with ASTM A123/A123M and smaller hardware (that can be centrifuged) galvanized in conformance with ASTM A153/A153M. Required hot-dip galvanizing shall be done after fabrication, in largest sections possible.

2. Items too large for available dip tanks shall be sprayed by approved methods, with molten zinc to coating thickness of 0.003 inch to 0.004 inch. Weight of the zinc coating per square foot of actual surface shall average not less than 2 ounces; no individual specimen shall show less than 1.8 ounces.

3. Bolts and screws for attachment of galvanized items shall be galvanized, or of non-corrodible material.

2.12 ALUMINUM FINISH

A. Mill finish (as fabricated), unless otherwise indicated on Drawings.

2.13 SOURCE QUALITY CONTROL

A. Tests are waived for steel identified by heat number, accompanied by mill analyses and mill test reports, and properly tagged with an Identification certificate so as to be readily identified for conformance with applicable ASTM Standards.

1. Unidentified materials to be tested by independent test laboratory:

a. Yield strength less than or equal to 36,000 psi: 1 set of tension tests and 1 set of bend tests for each 20 tons or part thereof of each heat.

b. Yield strength greater than 36,000 psi: 1 set of tension tests and 1 set of bend tests for each piece.

c. Additional tests may be required by Engineer or City of Los Angeles Department of Building and Safety.

B. Shop inspections may be waived for manufacturer fabricated assemblies delivered to Contractor for installation as preassembled units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive Work.

B. Correct detrimental conditions before proceeding with installation.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where Project Site welding is required.

B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install metal fabrication items in accordance with Drawings and approved shop drawings.

B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project Site.

C. Install items plumb and level, accurately fitted, free from distortion or defects.

D. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

E. Field weld components as indicated on Drawings.

F. Perform field welding in conformance with AWS D1.1/D1.1M or appropriate AWS standard for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding Work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surfaces matches those adjacent.

G. Obtain approval from Engineer prior to Project Site cutting or making adjustments not scheduled.

3.4 ACCESS LADDERS

A. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet on centers by means of welded or bolted steel brackets.

1. Size brackets to hold centerline of ladder rungs clear of the wall surface.

3.5 SETTING LOOSE PLATES

A. Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

B. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 HOLES

A. Prepare required holes in steel members for attachment or passage of Work of other trades.

B. Hole burning to make or enlarge holes is allowed only with prior approval of Engineer. Enlarge holes only by reaming.

C. Cut, drill, or punch holes at right angles to the surface of the metal.

D. Holes shall be clean-cut without torn or ragged edges.

E. Remove outside burrs resulting from drilling or reaming operations with a tool making a 1/16 inch bevel.

F. Punch, drill, or ream holes for anchor bolts in base and bearing plates. Do not make or enlarge the holes by burning except for grouting holes in column bases.

G. Where the steel thickness is equal to or less than diameter of the bolt plus 1/8 inch, holes may be punched 1/16 inch larger than the nominal diameter of the bolt.

H. Where the steel is thicker than the diameter of the bolt plus 1/8 inch, the holes shall be drilled or sub-punched and reamed. Diameter of sub-punched holes, and the drill for sub-punched holes, shall be 1/16 inch smaller than the nominal diameter of bolt to be installed.

I. Precisely locate finished holes to ensure passage of bolts through steel assemblies without drifting. Poor matching of holes is cause for rejection.

3.7 BOLTING

A. General (Not Including High-Strength):

1. Drive bolts into the holes without damaging the thread. Protect bolt heads from damage during driving.

2. Bolt heads and nuts shall rest squarely against the metal.

3. Where bolts are to be used on beveled surface having slopes greater than 1 to 20 with a plane normal to the bolt axis, beveled washers shall be provided to give full bearing to the head or nut.

4. Upset bolt threads to prevent the nuts from backing off.

B. Unfinished Bolts:

1. Unfinished bolts shall be of the length that shall extend through but no more than 1/4 inch beyond the nuts.

2. Bolt heads and nuts shall be drawn tight against Work.

3. Bolt heads shall be tapped with a hammer while the nut is being tightened. After having been finally tightened, bolt threads shall be upset to prevent the nuts from backing off.

C. Bolted Field Connections at Supports:

1. Standard bolts shall be of a length that shall extend not less than 1/4 inch beyond the nuts. Enter bolts into holes without damaging the threads and bolt heads

2. Bolt heads and nuts shall rest squarely against the metal.

3. Where bolts are to be used on beveled surface having slopes greater than 1 to 20 with a plane normal to the bolt axis, beveled washers shall be provided to give full bearing to the head or nut.

4. Upset bolt threads to prevent the nuts from backing off.

5. Correct poor matching of holes by drilling to next larger size and use of larger size bolt. Obtain written approval from Engineer before proceeding with corrective Work.

3.8 WELDED CONNECTIONS

A. Do not begin welding until joint elements are bolted or tacked in intimate contact and adjusted to dimensions shown on Drawings, with allowance for weld shrinkage that is expected. Weld heavy sections and those having a high degree of restraint with low hydrogen type electrodes. No members shall be spliced without prior approval by Engineer.

B. Weld in conformance with AWS D1.1/D1.1M.

1. Welds exposed to view shall have as-welded surfaces that are continuous, smooth, and uniform. Radii shall be true and consistent from weld to weld. Finishing or grinding may be required where clearances or fit of other items may require.

C. Perform intermittent welding, continuous welding, and straightening of built-up sections to minimize internal stresses. Built-up sections assembled by welding shall be free of warpage. Each axis shall have true alignment.

D. Welds not specified shall be continuous fillet welds. Use minimum fillet in conformance with AWS requirements.

E. Clean surfaces to be welded of paint, grease, loose scale, and foreign matter. Clean welds each time electrode is changed or a new pass started. Chip clean burned or flame cut edges before depositing welds.

F. Same electrode may be used with various thicknesses of plates, but change current used and number of passes made proportionately.

G. After being deposited, brush welds with wire brushes. Welds shall exhibit uniform section, smoothness of welded metal, feather edges without undercuts or overlays, and freedom from porosity and clinkers. Visual inspection at edges and ends of fillets and butt joint welds shall indicate good fusion with penetration into base metal.

H. During assembling and welding keep parts straight and in close contact. Take precautions to minimize "lock-up" stress and distortion due to heat. Do not weld during windy conditions unless wind protection is provided. Cut-out and replace welds found to be defective.

I. The maximum space between pieces or members to be butt welded shall not exceed 1/4 inch. Bevel pieces or members up to 3/8 inch thickness to form single or double "Vee" before being welded. Bevel pieces over 3/8 inch thickness to form a double "Vee" whenever possible. Lay and size fillet welds as shown on Drawings. Measure only effective portion of fillet welds. Maximum space between pieces or members to be fillet welded shall not exceed 1/16 inch.

3.9 CORRECTIVE WORK

A. Members or assemblages of Work having fabrication errors, or which exceed permissible tolerances, or which have errors or deformations preventing assembly and fitting of parts, shall be reported immediately to Engineer before incorporation in the finished Work.

B. Such members or assemblages shall be corrected if permitted by Engineer, otherwise, they shall be replaced at Contractor’s sole cost and expense.

C. Submit drawings showing the corrections and obtain acceptance prior to performing any corrective Work.

3.10 REPAIR OF DAMAGED GALVANIZING

A. Repair damaged galvanizing in conformance with TREATING DAMAGED GALVANIZING Section.

3.11 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Tests and inspections by independent test laboratory shall include, but is not limited to, the following:

a. Shop and field welded connections shall be continuously visually inspected except for welding done in a City of Los Angeles Department of Building and Safety licensed shop.

b. Defects shall be corrected and a statement of final approval shall be received from Engineer before fabrications are installed.

3.12 CLEANING AND TOUCH-UP PAINTING

A. Touch-Up Painting of Steel Items: Immediately after erection, clean field welds, bolted connections, abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touch-up of field painted surfaces. Apply by brush or spray to provide a minimum dry film thickness of 3.0 mils.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnishing and installing:

1. Checkered steel plate stairs and landings.

2. Railings attached to steel stairs and landings.

1.2 RELATED SECTIONS

A. Section 05 05 14 - Treating Damaged Galvanizing

B. Section 05 50 00 - Metal Fabrications

C. Section 09 90 01 - Painting for Exterior Improvements

D. Section 32 13 14 - Concrete For Exterior Improvements

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid for under the Lump Sum Construction bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel.

1.5 QUALITY ASSURANCE

A. Welders shall be qualified in conformance with the requirements of AWS AWS D1.1/D1.1M and City of Los Angeles Department of Building and Safety(LADBS) certified.

B. Welders' Certificates: Submit certification for welders employed on Project verifying AWS qualification and LADBS certification withing the previous 12 months.

1.6 SUBMITTALS

A. For prefabricated stairs:

1. Submit large scale, dimensioned shop drawings indicating size, materials, methods of fabrication and assembly, finishes, installation, and attachment to abutting and supporting construction. Shop drawings shall be signed and sealed by a State of California registered structural engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stringers, headers, miscellaneous steel supports, and connectors shall be in conformance ASTM A36/A36M with ASTM A36/A36M and ASTM A283/A283M.

B. Railing shall be steel tubing complying with ASTM A501/A501M.

C. Steel sheet shall be in conformance ASTM A1011/A1011M , Grade A or ASTM A1008/A1008M, Grade A.

D. Checkered steel plate shall be medium pattern in Inland 4-Way plate by Ryerson, Sure-Foot Safety Plate by Lukens Steel, or Multi-Grip by USX Corporation.

E. Welding electrodes shall comply with AWS D1.1/D1.1M.

F. Bolts and fasteners shall be in conformance with ASTM A307, Grade A.

1. For anchorage to concrete and masonry, use self-drilling or non-drilling expansion types as manufactured by Phillips Drill Company or Rawlplug Company. Indicate the make, type, and capacity of each type of anchor on the shop drawings.

2. When used to assemble exterior assemblies, use hot-dip galvanized fasteners, unless galvanized after assembly.

2.2 FABRICATION

A. At Contractor's option, stair may be prefabricated assemblies made by American Stair Corporation or Metal Service Company, subject to Engineer's approval.

B. General:

1. Fabricate stairs from welded and bolted steel components in accordance with the approved shop drawings. Riser height shall not vary more than 1/16 inch for the entire run of each individual stair.

2. Form and fabricate work to meet installation conditions. Conform to standard specifications, rules and practice of the AISC Steel Construction Manual aisc 325.

3. Fit or miter joints with hairline contacts welded and ground flush and smooth with base metal.

4. Fabricate joints which will be exposed to the weather to exclude water, or provide weep holes where water may accumulate.

5. Close open ends of channel stringers with steel closure plates continuously welded and ground flush and smooth with parent metal.

C. Provide welded closures at ends of the handrails. Bend tubing without collapsing or deforming its walls to produce a smooth, uniform curved section and to maintain uniform sectional shapes.

D. Stairs and landings:

1. Treads and risers fabricated of steel sheets and plates formed to dimensions and profiles indicated and attached to steel channel stringers as detailed on approved shop drawings.

2. Use perforated steel sheets for risers on interior stairs as detailed on approved shop drawings.

3. Support intermediate landings on struts from floor below or suspend from construction above.

4. Provide abrasive, color contrasting nosing on treads and edge of landings at head and base of stair run.

2.3 FINISHING

A. Galvanize stair assemblies. Comply with the requirements of the METAL FABRICATIONS Section.

B. Painting shall be as specified in PAINTING FOR EXTERIOR IMPROVEMENTS Section.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify conditions and measurements affecting the work at Project Site. Make sure detrimental conditions are corrected before proceeding with installation.

3.2 INSTALLATION

A. Install stairs and railings plumb, square, true to line, and level. Frame and securely anchor to structure in accordance with the approved shop drawings.

B. Adjust railings prior to fastening in place to ensure match at butting joints and correct alignment throughout their length. Plumb posts in each direction. Maintain constant dimension between nosings and railings. Weld posts to stringers.

C. Install stairs so as not to induce torsion into supporting structural steel members.

3.3 TOUCH-UP

A. Clean field welds, bolted connections, and abraded areas and touch-up with same primer used for shop priming. Apply primer by brush or spray to provide a minimum dry film thickness of 2 mils.

B. Touch-up damaged galvanized surfaces as specified in TREATING DAMAGED GALVANIZING Section.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Asbestos-free, UL rated firestopping and smokestopping systems.

1.2 RELATED SECTIONS

A. Heating, Ventilation, and Air Conditioning (HVAC) Division 23

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under each corresponding bid item of Bid Proposal Line Items that requires firestopping and smokestopping.

1.4 REFERENCES

A. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

C. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C.

D. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

E. UL 1479 - Standard for Fire Tests of Penetration Firestops.

1.5 SUBMITTALS

A. Manufacturer's current specifications for materials, including UL system numbers and application procedures.

B. Test data and certificates of compliance with requirements of governing agencies having jurisdiction.

1. Submit manufacturer's letter of certification or certified test report that the material or combination of materials meet or exceed the requirements of ASTM E814 (UL 1479) and are so classified in UL's Fire Resistance Directory.

C. Manufacturer's training certification for personnel installing product.

D. Shop Drawings showing proposed materials, reinforcement, anchorage, fastenings, and method of installation. Construction details shall reflect actual Project conditions.

E. Maintenance data.

1.6 QUALITY ASSURANCE

A. Fire stops shall conform to the fire-resistive rating of the penetrated assembly, but shall provide not less than 1 hour fire protection.

B. Materials shall be listed by one of the following agencies: ICBO, California State Fire Marshal or have Los Angeles Research Report.

C. Use only applicators trained by manufacturer of firestopping products.

D. Provide firestopping materials manufactured by a single manufacturer.

E. Manufacturer shall submit evidence of having not less than 5 years successful production of UL classified Firestop Systems.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products in original unopened containers or packages bearing manufacturer's names, brand designations, product descriptions, and handling precautions statements.

B. Protect materials from physical damage and from becoming wet or soiled. Comply with manufacturer's written instructions for handling, storage, and protection during installation.

C. Do not use damaged materials.

D. Do not install materials whose shelf life date has expired. Remove these materials from Project Site.

1.8 EXTENDED GUARANTEE

A. Guarantee period specified in GENERAL CONDITIONS Section, shall be extended to 5 years for Work in this Section. Contractor shall provide written guarantee and file 5 copies of same with Engineer as a prerequisite for final acceptance of Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General:

1. 3M Company, Tel. No. (800) 325-2822.

2. Hilti, Inc., Tel. No. (800) 333-1150.

3. Dow Corning Corporation, Tel. No. (201) 691-1414.

2.2 MATERIALS

A. Materials and assemblies must maintain an effective seal to block flames, smoke, noxious gases and heat transmission.

1. Provide materials and assemblies with performance tested at minimum 40 years aging. Materials and assemblies at 40 years aging shall perform identical to new.

B. Materials and assemblies in place must allow re-entry for future retrofit Work without compromising the firestopping integrity of the sealing system.

C. Provide firestop materials which are paintable or which are capable of receiving finish materials in those areas which shall remain exposed to view and which are scheduled to receive finish materials.

D. Provide firestop materials that are flexible to allow for normal movement of building structure and penetrating items without affecting adhesion or integrity of system.

E. Provide firestopping and fire resistive penetration sealant systems complying with ASTM E814, UL 1479, listed by UL or other testing and inspecting agency, and having ICBO approval for 1 to 4 hour fire rating requirements. Provide systems that produce a durable seal against passage of fire, smoke, and water and that bonds with common building materials, including concrete, steel, aluminum, wood, plastic, gypsum, and masonry.

1. Use sealant as part of a through-penetration fire-stop system for filling openings around cables, conduit, pipes and similar penetrations through walls and floors, with fire-resistance rating indicated.

2. Moldable putty shall be one-part intumescent elastomer. Hand moldable.

3. Wrap strip shall be for use at plastic pipe, insulated pipe, and similar penetrations: Intumescent elastomer.

4. Composite sheet shall be for use in large openings: Intumescent.

5. Provide foaming, packing, and other accessory materials as required for a complete installation and in accordance with penetration sealant manufacturer's written instructions.

    a. Damming boards and materials shall be metal, plywood, plastic, backer rods, and insulation for retaining the materials and allowing easy removal.

    b. Primer shall be as required for adhesion to substrates, as recommended by system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces for condition which would adversely affect execution, permanence, and quality of Work.

B. Correct conditions not acceptable.

C. Do not commence Work until conditions are acceptable.

3.2 PREPARATION

A. Protect adjacent areas and surfaces from damage as a result of Work.

B. Remove dust, dirt, oil, and other foreign materials and contaminants from the application surfaces.

1. Remove dirt and dust by wire brushing, airblasting, or vacuum cleaning.

2. Remove oil substances with suitable solvents.

3. Wash alkaline seepage from fresh concrete.

4. Allow surfaces to dry thoroughly.

5. Verify concrete is fully cured and dried before priming.

C. Form dams as required to contain firestopping system during curing. Install in conformance with firestopping system manufacturer's written instructions.

3.3 INSTALLATION

A. Install in conformance with appropriate UL 1479 Fire Resistance Directory Assembly.

B. Comply with system manufacturer's written instructions for mixing, preparatory Work, priming, application life and procedure, and protection of system.

1. Install to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated.

    a. Completely seal the opening of each cable tray which passes through a fire wall and floor.

    b. Completely seal the openings between cable or piping through sleeves penetrating fire walls and floors.

2. Install moldable putty around electrical back-boxes in fire-rated walls.

3. Seal holes and voids created by construction and made by penetrations to ensure an effective fire and smoke barrier.

4. Where floor openings are 4 inches or more wide, and are subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

C. Prime as required before insertion of sealant backer or joint filler material. Allow primer to dry before application of sealant.

D. Finish level, straight, uniform, and neat.

E. Cure in conformance with sealant manufacturer's written instructions to obtain high early bond strength, internal cohesive strength and durability.

3.4 FIELD QUALITY CONTROL

A. Examine firestopped areas to ensure proper installation prior to concealing or enclosing fire stopped areas.

B. Areas of Work shall remain accessible until inspection by code authorities having jurisdiction.

C. Protect materials from damage on surfaces subject to traffic.

3.5 CLEAN-UP

A. Clean adjacent surfaces free from firestopping materials as the installation progresses, using cleaning agents recommended by the manufacturer of the firestopping materials used.

B. Remove damming materials after curing if made of other than fire resistant materials.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Exterior paint for:

1. Metal fabrications

2. Other elements shown on Drawings or listed in Specifications to receive painting or coating.

1.2 RELATED SECTIONS

A. Section 05 50 00 - Metal Fabrications

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under each corresponding bid item of Bid Proposal Line Items that requires painting for exterior improvements.

1.4 REFERENCES

A. 29 CFR 1910.134 - Respiratory protection.

B. 29 CFR 1910.1000 - Air Contaminants.

C. SSPC PA Guide 10 - Guide to Safety and Health Requirements for Industrial Painting Projects.

D. SSPC-SP 6 - Commercial Blast Cleaning.

E. Reference Specifications (RS):

Subsection 210-1 - Paint

1.5 SUBMITTALS

A. Samples of Painting:

1. Color swatches 8 1/2 inches by 11 inches shall be required for each type of paint material and color. Submit swatches to Engineer for approval not less than 10 days prior to start of painting.

B. Extra Stock Materials:

1. Provide two 1-gallon paint, in original and sealed containers bearing manufacturer's label, for each type and color used for finish coats. Identify each container by color and type.

1.6 QUALITY ASSURANCE

A. Paint products and applications shall comply with South Coast Air Quality Management District (SCAQMD) regulations. The product label and/or Safety Data Sheet (SDS) shall state that the product meets requirements or manufacturer shall furnish certificate of compliance.

1.7 ENVIRONMENTAL AND HEALTH REQUIREMENTS

A. Coating Hazards:

1. Comply with the requirements of SSPC PA Guide 10.

2. Specified coatings may have potential health hazards if ingested or improperly handled. The coating manufacturer's written safety precautions shall be followed throughout mixing, applying, and curing of the coatings. During cleaning, cleanup, surface preparation, and coating application phases, ensure that employees are protected from toxic and hazardous chemical agents which exceed concentrations in 29 CFR 1910.1000. Comply with respiratory protection requirements as required in 29 CFR 1910.134 .

3. Take care to prevent fire; open containers or inflammable materials only as needed; keep rubbing cloths and oily rags in tightly closed metal container, or remove from Project Site daily. Benzene, gasoline, and distillate shall not be permitted on Project Site.

4. Do not apply coatings in unheated space during foggy or rainy weather, or under the following surface temperature conditions:

a. Less than 5 degrees Fahrenheit (F) (4 degrees Celsius (C)) above the dew point; and

b. Below 40 degrees F (4 degrees C) for oil based paints, 10 degrees F (50 degrees C) for latex paints or over 95 degrees F (35 degrees C), unless approved in writing by manufacturer's representative and quality control manager.

c. Below 32 degrees F (0 degrees C) or over 120 degrees F (49 degrees C), unless approved in writing by manufacturer's representative and quality control manager.

5. Paints shall comply with City of Los Angeles Green Building Code requirements.

a. Enter pertinent product data in VOC Content Verification Checklist form and provide product specification sheets. Make checklist and specifications available to City of Los Angeles Department of Building and Safety inspector through Engineer upon request. VOC Content Verification Checklist form can be found here: https://www.ladbs.org/docs/default-source/forms/green-building-2023/grn_2_voc_content_verification_checklist-01.17.23.pdf?sfvrsn=19f4c153_10

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver in factory sealed containers with labels intact, in conformance with RS Subsection 210-1.

B. Store in conformance with manufacturer's written instructions for paint shelf life, including, but not limited to, protection from temperature extremes.

C. Obtain Engineer's approval of materials before containers are opened.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint products used in the coating systems shall be from the same manufacturer.

B. Paints shall comply with City of Los Angeles Green Building Code requirements.

C. The products listed are to be produced and supplied by Dunn-Edwards Paints.

1. Ungalvanized Ferrous Metals:

First Coat	BRPROO Bloc-Rust Primer
Second Coat	EVSH60 Evershield Gloss Enamel
Third Coat	EVSH60 Evershield Gloss Enamel

2. Galvanized Metals:

Pretreatment	Metal Clean & Etch by Krud Kutter/ Rust-Oleum
First Coat	ULGM00-WH Ultrashield Galvanized Metal Primer
Second Coat	EVSH60 Evershield Gloss Enamel
Third Coat	EVSH60 Evershield Gloss Enamel

3. Wood:

First Coat	EZPR00 EZ-Prime Premium
Second Coat	EVSH50 Evershield Semi-Gloss
Third Coat	EVSH50 Evershield Semi-Gloss

4. Concrete:

First Coat	ESSL00 EFF-STOP Select
Second Coat	ACHS10 ACRI-HUES Exterior Acrylic Flat
Third Coat	ACHS10 ACRI-HUES Exterior Acrylic Flat

PART 3 - EXECUTION

3.1 SURFACE PREPARATION-UNGALVANIZED METALS

A. Clean surfaces to be painted by No. 6 Commercial Blast Cleaning in conformance with SSPC-SP 6.

3.2 SURFACE PREPARATION-GALVANIZED METALS

A. Clean galvanized metals in conformance with written instructions of pretreatment wash manufacturer, then apply pretreatment wash.

B. Blast lightly with fine abrasive or organic media (walnut shells) at 45 degree angle (profile only, do not remove zinc coating).

3.3 APPLICATION

A. Surfaces to be painted shall be approved by Engineer prior to painting.

B. Do not use paints with coarse particles, skins, and indications of color instability.

C. Protect surfaces not designated to receive paint.

D. Apply paint in uniform thickness and Work into joints in conformance with manufacturer's written instructions.

E. Surfaces shall be dry during painting. No painting shall be done in damp weather unless surfaces to be painted are kept dry.

F. Paint shall be dry before applying succeeding coats.

G. Color schedule (if any) shall be in accordance with Drawings and applicable Specification Sections and shall be approved by Engineer prior to painting.

H. Paint showing signs of blistering, spotting, uneven coating, or sagging shall be rejected.

I. Steel items that are to be encased or partially encased in concrete shall be painted with complete coating system before being encased.

J. Do not apply second and third coats until previous coat has been approved by Engineer.

K. Electrical panels shall be touched-up in conformance with manufacturer's written instructions to match original color and type of paint.

3.4 COATING THICKNESSES

A. First Coat: (Prime coat): 1.5 to 2.5 mils in dry film thickness.

B. Second Coat: 1.5 to 2.0 mils in dry film thickness.

C. Third Coat: 1.5 to 2.0 mils in dry film thickness.

3.5 CLEANING AND PROTECTION

A. Cleaning: Remove from Project Site discarded paint materials, rubbish, cans, and rags at end of each day.

B. Upon completion of painting Work, clean overspray off of adjacent surfaces. Remove overspray by proper methods of washing and scraping, taking care not to scratch or otherwise damage adjacent finished surfaces.

C. Protection: Protect Work of other trades and existing adjacent surfaces,whether to be painted or not, against damage by painting and finishing Work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Engineer.

1. Place "Wet Paint" signs as required to warn passersby of newly-painted finishes.

2. Touch-up and restore damaged or defaced painted surfaces before final inspection.

3. Remove temporary protective wrappings for protection of adjacent Work after completion of painting operations.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe hangers and supports

B. Hanger rods

C. Inserts

D. Flashing

E. Metal framing systems

F. Fastener systems

G. PIP positioning systems

H. Equipment bases and supports

1.2 RELATED SECTIONS

A. Section 07 84 01 - Firestopping and Smokestopping

B. Section 22 11 00 - Facility Water Distribution

C. Section 22 13 00 - Facility Sanitary Sewerage

D. Section 22 16 00 - Facility Natural Gas Piping

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under each corresponding bid item of Bid Proposal Line Items that requires hangers and supports.

1.4 REFERENCES

A. ASME B31.9 - Building Services Piping.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel.

E. IAPMO PS 42 - Pipe Alignment and Secondary Support Systems.

F. MFMA-4 - Metal Framing Standards Publication.

1.5 SUBMITTALS

A. Submit to Engineer the following within 45 Calendar Days from Notice to Proceed (NTP):

1. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.

2. Product Data:

a. Hangers and Supports: Submit manufacturers catalog data including load capacity.

b. Firestopping: Submit data on product characteristics, performance and limitation criteria.

3. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

4. Manufacturer's Installation Instructions:

a. Hangers and Supports: Submit special procedures and assembly of components.

5. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in conformance with ASTM E84.

B. Perform Work in conformance with AWS D1.1/D1.1M for welding hanger and support attachments to building structure.

C. Perform Work in conformance with 2017 California Plumbing Code (CPC) Chapter 3.

D. Maintain 1 copy of each document at Project Site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3 years experience.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum 1 week prior to commencing Work of this Section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees Fahrenheit.

B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

C. Provide ventilation in areas to receive solvent cured materials.

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 WARRANTY

A. Furnish 5 year manufacturer warranty for pipe hangers and supports.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. B-Line.

2. Tolco.

3. PHD Manufacturing Inc.

B. Plumbing Piping - Drain Waste Vent:

1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 inch to 1-1/2 inches: Malleable iron, adjustable swivel, split ring.

3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.

6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.

7. Vertical Support: Steel riser clamp.

8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Copper Pipe Support: Copper-plated, carbon steel adjustable, ring.

C. Plumbing Piping - Water:

1. Conform to ASME B31.9.

2. Hangers for Pipe Sizes 1/2 inch to 1-1/2 inches: Malleable iron, adjustable swivel, split ring.

3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 2 inches to 4 inches: Carbon steel, adjustable, clevis.

5. Hangers for Hot Pipe Sizes 6 inches and Larger: Adjustable steel yoke, cast iron roll, double hanger.

6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 inches and Larger: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
9. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 inches and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes 4 inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 inches and Larger: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Copper-plated, Carbon steel ring.

2.2 HANGER RODS

A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

A. Manufacturers:

1. B-Line.
2. Tolco.
3. Hilti.

B. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

A. Metal Flashing: 26 gage thick galvanized steel or stainless steel.

B. Metal Counterflashing: 22 gage thick galvanized steel or stainless steel.

C. Lead Flashing:

1. Waterproofing: 5 pounds per square foot sheet lead.

2. Soundproofing: 1 pound per square foot sheet lead.

D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements or stainless steel.

2.5 METAL FRAMING SYSTEMS

A. Description: MFMA-4, shop or field fabricated pipe support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line.

2. Tolco.

3. Unistrut.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating jacket or liner.

2.6 FASTENER SYSTEMS

A. Mechanical Expansion Anchors: Insert wedge type zinc coated steel, for use in hardened portland cement concrete with pullout, tension and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line.

b. Hilti.

c. Power Fasteners.

2. Expansion Anchors.

a. Self-drilling internal plug expansion type anchors constructed of Americal Iron and Steel Institute (AISI) 12L14 steel and zinc plated in conformance with ASTM F1554.

b. Do not exceed 1/4 of average values for specific anchor size using 2,000 psig concrete only, for maximum working loads.

c. Locate spacing and install anchors in conformance with the manufacturer's written instructions.

B. Expansion anchors shall be Underwriters Laboratories, Incorporated (UL) listed.

2.7 PIP POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clip and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. Holdrite Corp; Hubbard Enterprise.

2. C&S Mfg. Corp.

3. Samco Stamping Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Administrative Requirements: Verification of existing conditions before starting work.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install damming materials to arrest liquid material leakage.

D. Obtain permission from Engineer before using powder actuated anchors.

E. Obtain permission from Engineer before drilling or cutting structural members.

3.3 INSERTS INSTALLATION

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through bolt with recessed square steel plate and nut above slab.

3.4 PIPE HANGERS AND SUPPORTS INSTALLATION

A. Install in conformance with ASME B31.9.

B. Support horizontal piping as scheduled.

C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inches minimum vertical adjustment.

F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

G. Support vertical piping at every other floor. Support vertical cast iron pipe at each floor at hub.

H. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

I. Support riser piping independently of connected horizontal piping.

J. Provide copper plated hangers and supports for copper piping.

K. Design hangers for pipe movement without disengagement of supported pipe.

L. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

M. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to PLUMBING INSULATION Section.

3.5 FLASHING INSTALLATION

A. Provide flexible flashing and metal counterflashing where piping penetrates weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked 1 inch minimum into hub, 8 inches minimum clear on sides with 24 inches by 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter flash, and seal.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 inches by 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal floor drains, floor sinks, watertight to adjacent materials.

1. Adjust storm collars tight to pipe with bolts; calk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 FIELD QUALITY CONTROL

A. Refer to COMMISSIONING section: field Inspecting, testing, adjusting, and balancing.

3.7 CLEANING

A. Refer to CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT Section.

3.8 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.9 SCHEDULES

Pipe Hanger Spacing		
Pipe Material	Maximum Hanger Spacing (feet)	Hanger Rod Diameter (inches)
Cast Iron (4 inches and smaller)	5	3/8
Cast iron (5 inches and larger) with 10 foot length of pipe	10	1/2
Copper Tube, 4 inches and smaller	6	3/8
Copper Tube, 5 inches and larger	10	1/2
Steel, 4 inches and smaller	12	3/8
Steel, larger than 4 inches	12	1/2

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Plumbing piping insulation, jackets, and accessories

1.2 RELATED SECTIONS

A. Section 07 84 01 - Firestopping and Smokestopping

B. Section 22 13 00 - Facility Sanitary Sewerage

1.3 REFERENCES

A. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

B. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

C. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing.

D. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

E. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.

1.4 SUBMITTALS

A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

B. Manufacturer's Installation Instructions: Submit manufacturer's published literature indicating proper installation procedures.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index not exceeding 450 in conformance with ASTM E84.

B. Pipe insulation manufactured in conformance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in conformance with ASTM C450.

D. Maintain 1 copy of each document on site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

B. Applicator: Company specializing in performing work of this Section with minimum 3 years experience.

1.7 PRE-INSTALLATION MEETINGS

A. Administrative Requirements: Pre-installation meeting.

B. Convene minimum 1 week prior to commencing work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 WARRANTY

A. Furnish 5 year manufacturer warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Manufacturers:

1. Certainteed.
2. Johns-Manville.
3. Owens Corning.

2.2 PIPE INSULATION

A. Type P-1: ASTM C547, molded glass fiber pipe insulation.

1. Thermal Conductivity: 0.23 at 75 degrees Fahrenheit (F).
2. Thermal Conductivity: 0.23 at 75 degrees F.
3. Operating Temperature Range: 0 F to 850 degrees F.
4. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
5. Jacket Temperature Limit: Minus 20 F to 150 degrees F.

2.3 PIPE INSULATION JACKETS

A. Vapor Retarder Jacket:

1. White kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms (grain of water vapor per hour, per square foot, per inch of mercury).

B. PVC Plastic Pipe Jacket:

1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.

2. Thickness: 30 mils.

3. Connections: Brush on welding adhesive Tacks Pressure sensitive color matching vinyl tape.

C. ABS Plastic Pipe Jacket:

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

2. Minimum service temperature: Minus 40 degrees F.

3. Maximum service temperature of 180 degrees F.

4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

5. Thickness: 30 mils.

a. Connections: Brush on welding adhesive.

2.4 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify piping and equipment has been tested before applying insulation materials.

B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of 1 hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to FIRE STOPPING AND SMOKE STOPPING Section, for penetrations of assemblies with fire resistance rating greater than 1 hour.

C. Hot Piping Systems less than 140 degrees Fahrenheit or less:

1. Furnish factory applied or field applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory applied jacket and butt strips or both.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

D. Inserts and Shields:

1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.

2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.

a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.

b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.

3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

E. Insulation Terminating Points:

1. Condensate Piping: Insulate entire piping system and components to prevent condensation.

3.3 SCHEDULES

A. Piping Insulation Schedule:

Piping System	Insulation Type	Pipe Size	Insulation Thickness (inches)
Condensate Piping	Molded Glass Fiber	1 inch and smaller 1-1/4 inches and larger	1.0 1.5

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Domestic water piping above grade

B. Unions and flanges

C. Valves

D. Pressure gages

E. Pressure gage taps

F. Thermometers

G. Hose bibbs

H. Access panels

I. Backflow preventers

J. Trap primers

1.2 RELATED SECTIONS

A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

B. Section 31 23 33 - Trenching and Backfilling

C. Section 22 07 00 - Plumbing Insulation

1.3 REFERENCES

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

C. ASME B31.9 - Building Services Piping.

D. ASME B40.100 - Pressure Gauges and Gauge Attachments.

E. ASSE 1001 - Performance Requirements for Atmospheric Type Vacuum Breakers.

F. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers.

G. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies.

H. ASSE 1018 - Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied.

I. ASTM B32 - Standard Specification for Solder Metal.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

K. ASTM D1044 - Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion by the Taber Abraser.

L. ASTM D2464 - Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

M. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers.

N. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

O. AWWA C651 - Disinfecting Water Mains.

P. MSS SP-67 - Butterfly Valves.

Q. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends.

R. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves.

S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

T. NSF 61 - Drinking Water System Components - Health Effects.

U. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.

1.4 SUBMITTALS

A. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

2. Valves: Submit manufacturer’s catalog information with valve data and ratings for each service.

3. Domestic Water Specialties: Submit manufacturer's catalog information, component sizes, rough-in requirements, service sizes, and finishes.

B. Manufacturer's Installation Instructions: Submit installation instructions for valves and accessories.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. PROJECT RECORD DOCUMENTS Section.

B. Project Record Documents: Record actual locations of valves and equipment.

C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.6 QUALITY ASSURANCE

A. For potable water service, provide pipe, valve, fittings, and the like complying with NSF 61 and the California Health and Safety Section 116B75 (AB1953) and the like.

B. Maintain 1 copy of each document on Project Site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3 years experience.

1.8 PRE-INSTALLATION MEETINGS

A. Convene minimum 1 week prior to commencing work of this Section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.11 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.12 WARRANTY

A. Furnish 5 year manufacturer warranty for domestic water piping.

1.13 EXTRA MATERIALS

A. Furnish 2 packing kits for each size valve, 2 loose keys for hose bibbs and hose end vacuum breakers for hose bibbs.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

2.2 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.

2. Copper Piping: Class 150, bronze unions with soldered joints.

3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

4. Polyvinyl Chloride Piping: PVC.

5. Chlorinated Polyvinyl Chloride Piping: CPVC.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.

2. Copper Piping: Class 150, slip-on bronze flanges.

3. PVC Piping: PVC flanges.

4. CPVC Piping: CPVC flanges.

5. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

2.3 VALVES

A. BALL VALVES

1. Manufacturers:

a. Milwaukee

b. Crane

c. Nibco

2. 2 inches and Smaller: MSS SP-110, 400 pounds per square inch (psi) (water, oil and gas), 2 piece bronze body, chrome plated brass ball, full port, teflon seats, blow-out proof stem, solder ends with union, lever handle.

B. BUTTERFLY VALVES

1. Manufacturers:

a. Milwaukee

b. Crane

c. Nibco

2. 2-1/2 inches and Larger: MSS SP-67, Class 150.

a. Body: Cast or ductile iron, wafer lug or grooved ends, stainless steel stem, extended neck.

b. Disc: Nickel plated ductile iron.

c. Seat: Resilient replaceable ethylene propylene diene terpolymer (EPDM).

d. Handle and Operator: 10 position lever handle.

C. CHECK VALVES

1. Horizontal Swing Check Valves:

a. Manufacturers; Horizontal Swing Check Valves:

1) Milwaukee

2) Crane

3) Nibco

b. 2 inches and Smaller: MSS SP-80, Class 150, bronze body and cap, bronze seat, Buna-N disc, solder or threaded ends.

c. 2-1/2 inches and Larger: MSS SP-71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

2.4 PRESSURE GAGES

A. Manufacturers:

1. Ameter, Inc.

2. Trerice

3. Weiss

B. Gage: ASME B40.100, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.

1. Case: Steel.

2. Bourdon Tube: Brass.

3. Dial Size: 3-1/2 inches diameter.

4. Mid-Scale Accuracy: 2 percent.

5. Scale: 0 to 100 psi.

2.5 PRESSURE GAGE TAPS

A. Manufacturers:

1. Ameter, Inc.

2. Trerice

3. Weiss

B. Needle Valve: Brass, 1/4 inch NPT for minimum 300 psi.

C. Ball Valve: Brass, 1/8 inch NPT for 250 psi.

2.6 STEM TYPE THERMOMETERS

A. Manufacturers:

1. Ashcroft

2. Trerice

3. Weiss

B. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.

1. Size: 7 inches scale.

2. Window: Clear glass.

3. Stem: Brass, 3/4 inch NPT, 3-1/2 inches long.

4. Accuracy: ASTM E77, 2 percent.

5. Calibration: Both degrees Fahrenheit (F) and degrees Celsius (C).

2.7 HOSE BIBBS

A. Manufacturers:

1. Acorn

2. MiFab

3. J.R. Smith

B. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with lock shield and removable key, integral vacuum breaker in conformance with ASSE 1011.

2.8 ACCESS PANELS

A. Manufacturers:

1. Milcor

2. Karp

3. J.R. Smith

B. Panel: 8 inches by 8 inches minimum size, but larger if required. Concealed hinge, Allen head lock.

C. Styles:

1. Gypsum board or Masonry: Karp DSC-214M prime coated steel.

2. Tile: Karp DSC-214M stainless steel.

3. Plaster Karp DSC-214L prime coated steel.

4. Acoustical Plaster: Karp DSC-210PL.

5. Fire Rated Construction: Karp KRP-150FR prime coated steel, UL Listed B label.

2.9 BACKFLOW PREVENTERS

A. Manufacturers:

1. Zurn-Wilkins

2. Watts

3. Conbraco

B. Reduced Pressure Backflow Preventers:

1. Comply with ASSE 1013.

2. Bronze body, with bronze internal parts and stainless steel springs.

3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with 2 gate valves, strainer, and 4 test cocks.

2.10 TRAP PRIMERS

A. Manufacturers:

1. PPP

2. MiFAB

B. Standard: ASTM D1044, ASSE 1018 .

C. Piping: NPS 1/2 inch ASTM B88, Type L copper water tubing.

D. Vacuum Breaker: ASSE 1001.

E. Size outlet: NPS 1/2 inch.

F. Provide distribution box as required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Administrative Requirements: Coordination and Project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated in conformance with TRENCHING AND BACKFILLING Section.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

3.3 THERMOMETERS AND GAGES INSTALLATION

A. Install gage taps in piping.

B. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage.

C. Provide instruments with scale ranges selected according to service with largest appropriate scale.

D. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

E. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.4 ABOVE GROUND PIPING INSTALLATION

A. Use brass ball valve and brass nipple connections whenever joining dissimilar metals.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange systems to drain at low points.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not accessible.

H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply 1 coat of zinc rich primer to welding.

I. Provide support for utility meters in conformance with requirements of utility companies.

J. Install domestic water piping in conformance with ASME B31.9.

K. Sleeve pipes passing through partitions, walls and floors. Refer to HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT Section.

L. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to HANGER AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT Section.

M. Install unions downstream of valves and at equipment or apparatus connections.

N. Install valves with stems upright or horizontal, not inverted.

O. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

P. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

Q. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

R. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

S. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

3.5 FIELD QUALITY CONTROL

A. Test domestic water piping system in conformance with 2017 California Plumbing Code (CPC), Chapter 6, 609.4.

3.6 CLEANING

A. Disinfect water distribution system in conformance with AWWA C651.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 miligrams per liter (mg/L) to 80 mg/L.

E. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. When final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 2 percent of outlets and from water entry, and analyze in conformance with AWWA C651.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sanitary sewer piping buried within 5 feet of building

B. Sanitary sewer and vent piping above grade

C. Condensate drain piping

D. Floor drains

E. Floor sinks

F. Cleanouts

G. Bedding and cover materials

1.2 RELATED SECTIONS

A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

B. Section 22 07 00 - Plumbing Insulation

C. Section 31 23 33 - Trenching and Backfilling

1.3 REFERENCES

A. ASME A112.6.3 - Floor Drains.

B. ASTM A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

C. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

D. ASTM C1540 - Standard Specification for Heavy-Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

E. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

F. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.

1.4 SUBMITTALS

A. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer’s catalog information.

2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

3. Sanitary Drainage Specialties: Submit manufacturer’s catalog information, component sizes, rough-in requirements, service sizes, and finishes.

B. Manufacturer's Installation Instructions: Submit installation instructions for material and equipment.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of equipment and clean-outs.

E. Operation and Maintenance Data: Submit frequency of treatment required for interceptors. Include, spare parts lists, exploded assembly views for pumps and equipment.

1.5 QUALITY ASSURANCE

A. Perform Work in conformance with 2017 California Plumbing Code (CPC), Chapter 7.

B. Maintain 1 copy of each document on Project Site.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3 years experience.

1.7 PRE-INSTALLATION MEETINGS

A. Convene with Engineer minimum 1 week prior to commencing work of this Section.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of Work, and isolating parts of completed system.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 WARRANTY

A. Furnish 5 year manufacturer warranty.

1.12 EXTRA MATERIALS

A. Furnish 2 sets of pump seals.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: CISPI 301, ASTM A888 service weight hubless. Charlotte, Tyler or AB & I

1. Fittings: Cast iron, CISPI 301, ASTM A888 hubless.

2. Joints: ASTM C1540, ASTM C564 gaskets, heavy duty 316 stainless steel assemblies. Husky SD4000, Clamp 125 or MG Couplings.

2.2 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 310, ASTM A888 hubless, service weight. Charlotte , Tyler, or AB & I.

1. Fittings: Cast iron, CISPI 301, ASTM A888.

2. Joints: ASTM C1540, with ASTM C564 neoprene gaskets and 316 stainless steel clamp and shield assemblies. Husky SD4000, Clamp 125 or MG Couplings.

2.3 CONDENSATE DRAINAGE PIPING

A. Type L Copper.

2.4 FLOOR DRAINS

A. Manufacturers:

1. J.R. Smith
2. Zurn
3. MiFab

B. Floor Drain: ASME A112.6.3; lacquered cast iron 2 piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel bronze strainer.

2.5 FLOOR SINKS

A. Manufacturers:

1. J.R. Smith
2. Zurn
3. MiFab

B. Floor Sink: Square lacquered cast iron body with integral seepage pan, epoxy coated interior, dome strainer, clamp collar, sediment bucket, epoxy coated, nickel bronze frame and half grate.

2.6 CLEANOUTS

A. Manufacturers:

1. J.R. Smith
2. Zurn
3. MiFab

B. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.

C. Exterior Unsurfaced Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket.

D. Interior Finished Floor Areas: Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.

E. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.

1. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.7 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in TRENCHING AND BACKFILLING Section.

B. Soil backfill from above pipe to finish grade: Soil type, as specified in TRENCHING AND BACKFILLING Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 BURIED PIPING SYSTEMS INSTALLATION

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Establish minimum separation of 12 inches from other services piping.

C. Remove scale and dirt on inside of piping before assembly.

D. Excavate pipe trench in conformance with 2017 CPC, Section 314.0.

E. Install pipe to elevation as indicated on Drawings.

F. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted loose depth; compact to 95 percent maximum density.

G. Install pipe on prepared bedding.

H. Route pipe in straight line.

I. Cover pipe in conformance with TRENCHING AND BACKFILLING Section.

J. Backfill trench in conformance with 2017 CPC, Section 314.0.

3.4 ABOVE GROUND PIPING INSTALLATION

A. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearances at cleanout for snaking drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

G. Install piping to maintain headroom. Do not spread piping, conserve space.

H. Group piping whenever practical at common elevations.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to PLUMBING INSULATION Section.

K. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors.

L. Install piping penetrating roofed areas to maintain integrity of roof assembly.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

N. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

O. Sleeve pipes passing through partitions, walls, and floors.

P. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

Q. Support cast iron drainage piping at every joint.

3.5 FIELD QUALITY CONTROL

A. Test sanitary waste and vent piping system in conformance with 2017 CPC, Chapter 7, section 7230.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Natural gas piping above grade

B. Unions and flanges

C. Valves

D. Natural gas pressure regulators

E. Natural Gas Flow Meter

1.2 RELATED SECTIONS

A. Section 07 84 01 - Firestopping and Smokestopping

B. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires natural gas piping.

1.4 REFERENCES

A. ANSI Z21.15/CSA 9.1 - Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose-end Valves.

B. ANSI Z21.80/CSA 6.22 - Line Pressure Regulators.

C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.

D. ASME B16.33 - Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 175 psi (Sizes NPS 1/2 Through NPS 2).

E. ASME B31.9 - Building Services Piping.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.

H. MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends.

I. NFPA 54 - National Fuel Gas Code.

J. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.

1.5 SYSTEM DESCRIPTION

A. Where more than 1 piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.

B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves, equipment.

C. Provide pipe hangers and supports in conformance with ASME B31.9.

D. Use plug or valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.6 SUBMITTALS

A. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

2. Valves: Submit manufacturer's catalog information with valve data and ratings for each service.

3. Hangers and Supports: Submit manufacturer's catalog information including load capacity.

4. Piping Specialties: Submit manufacturer's catalog information including capacity, rough-in requirements, and service sizes for the following:

a. Strainers.

b. Natural gas pressure regulators.

c. Natural gas pressure relief valves.

B. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

C. Test Reports: Indicate results of piping system pressure test.

D. Manufacturer's Installation Instructions: Submit Installation instructions for material and equipment.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Welders Certificates: Certify welders employed on Work, verifying AWS qualification within previous 12 months.

G. Project Record Documents: Record actual locations of valves, piping system, and system components.

H. Operation and Maintenance Data: Submit for valves and gas pressure regulators installation instructions, spare parts lists.

1.7 QUALITY ASSURANCE

A. Perform natural gas Work in conformance with NFPA 54.

B. Perform Work in conformance with 2017 CBC, Chapter 12 and local gas company requirements.

C. Perform Work in conformance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

D. Furnish shutoff valves complying with ASME B16.33 or ANSI Z21.15/CSA 9.1.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years experience.

B. Installer: Company specializing in performing Work of this Section with minimum 3 years experience.

1.9 PRE-INSTALLATION MEETINGS

A. Convene minimum 1 week prior to commencing Work of this Section.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on Project Site in shipping containers with labeling in place. Inspect for damage.

B. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Furnish temporary protective coating on cast iron and steel valves.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

1.12 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.13 COORDINATION

A. Coordinate with other trades.

1.14 WARRANTY

A. Furnish 5 year manufacturer warranty for valves excluding packing.

1.15 EXTRA MATERIALS

A. Furnish 2 packing kits for each type and size valve.

PART 2 - PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.

B. Joints: Threaded for pipe 2 inches and smaller; welded for pipe 2-1/2 inches and larger.

2.2 REGULATOR VENT PIPING, ABOVE GRADE

A. Indoors: Same as natural gas piping, above grade.

B. Outdoors: PVC pipe, tubing, and fittings, UL 651.

C. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.

D. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.

2. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.3 GAS VALVES

A. Manufacturers:

1. Nordstrom

2. Homestead

3. Milwaukee

B. 2 inches and Smaller: MSS SP-78, Class 150, semi-steel construction, round port, full pipe area, pressure lubricated, teflon packing, threaded ends. Furnish 1 plug valve wrench for every 10 plug valves with minimum of 1 wrench.

C. 2-1/2 inches and Larger: MSS SP-78, Class 150, semi-steel construction, round port, full pipe area, pressure lubricated, teflon packing, flanged ends. Furnish wrench operated.

2.4 NATURAL GAS PRESSURE REGULATORS

A. Manufacturers:

1. Fisher Control Valve

2. Sensus

B. Product Description: Spring loaded, general purpose, self-operating service regulator including internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in relation to body.

1. Comply with ANSI Z21.80/CSA 6.22.

2. Temperatures: minus 20 degrees Fahrenheit (F) to 150 degrees F.

3. Body: Steel.

4. Spring case, lower diaphragm casing, union ring, seat ring and disk holder: Aluminum.

5. Disk, diaphragm, and O-ring: Nitrile.

6. Maximum inlet pressure: 150 pounds per square inch gage (psig) (1030 kPa).

7. Furnish sizes 2 inches and smaller with threaded ends. Furnish sizes 2-1/2 inches and larger with flanged ends.

C. Regulator Vent Piping: Steel Pipe, ASTM A53/A53M, Schedule 40, black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.

D. Joints: Threaded for pipe 2 inches and smaller; welded for pipe 2-1/2 inches and larger.

2.5 NATURAL GAS FLOW METERS

A. Manufacturers:

1. Onicon

2. Sierra

3. Fox

4. Product Description: Thermal mass flow meter, insertion style, 24 VDC - 100 mA power input, analog/digital 4 to 20 mA output and a separate scalable contact closure pulse output, plus minus 1.0 percent accuracy of reading from 500 to 7000 surface feet per minute, 5 to 3500 surface feet per minute flow range, sensing thermal mass flow, utilizing hybrid analog/digital sensing circuitry, 1 inch through 24 inch pipe range, flow conditioner, local display module 50 psi-200 degrees F installation kit. Refer to detail on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Administrative Requirements: Coordination and Project conditions.

B. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Refer to HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT Section.

3.4 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. Install natural gas piping in conformance with NFPA 54.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Install piping to conserve building space and not interfere with use of space.

D. Size and install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Sleeve pipe passing through partitions, walls and floors. Refer to HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT Section.

H. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT and FIRESTOPPING AND SMOKESTOPPING Sections.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Engineer.

K. Install vent piping from gas pressure reducing valves to outdoors and terminate in weatherproof hood. Protect vent against entry of insects and foreign material.

1. Minimum Vent Size: Connection size at regulator vent connection.

2. Run individual vent line from each relief device, independent of breather vents.

L. Install identification on piping systems including underground piping.

M. Install valves with stems upright or horizontal, not inverted.

N. Protect piping systems from entry of foreign materials by temporary covers, completing sections of Work, and isolating parts of completed system.

3.5 FIELD QUALITY CONTROL

A. Inspect, test, and purge gas piping in conformance with 2017 California Plumbing Code (CPC), Chapter 12 and local gas company requirements.

B. Where new branch piping is extended from existing system, pressure test new branch piping only. Leak test joint between new and existing piping with noncorrosive leak detection fluid or other approved method.

C. When pressure tests do not meet specified requirements, remove defective work, replace, and retest.

D. Immediately after gas is applied to a new system, or a system has been restored after gas service interruption, check pipe for leakage.

E. Where leakage is detected, shut off gas supply until necessary repairs are complete.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Demolition and removal

B. Cleaning and repair

1.2 RELATED SECTIONS

A. Section 02 41 13 - Selective Site Demolition

B. Section 23 05 01 - Basic Mechanical Requirements

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and existing piping and ductwork arrangements are as shown on Drawings.

B. Verify that abandoned equipment serve only abandoned facilities.

C. Demolition drawings are based on field observation and existing record documents. Drawings are diagrammatic and show the general scope of demolition work and do not show the construction detail of the original record drawings. Report discrepancies to Engineer before disturbing existing installation.

D. Visit the existing building and grounds and review the existing building record drawings for details of existing installation to familiarize himself/herself with existing conditions prior to commencing Work.

3.2 PREPARATION

A. Disconnect mechanical systems in areas scheduled for removal. Notify Engineer of areas to be affected by mechanical demolition Work prior to commencing.

B. The building shall be occupied during the entire construction period. Coordinate demolition schedule with Engineer and building occupants to avoid disruption to building operations. Protect adjacent areas not currently scheduled for Work.

3.3 DEMOLITION AND EXTENSION OF EXISTING MECHANICAL WORK

A. Demolish and remove from Project Site, and extend existing mechanical Work under provisions of this Section and as indicated on Drawings unless otherwise noted.

B. Unless otherwise noted on Drawings, salvaged items removed in connection with Contract shall become the property of Contractor. Salvaged items noted to remain the property of Department shall be delivered to a location to be designated by Engineer. Contractor shall remove from construction areas trash or debris as it accumulates and dispose of it off Project Site. Construction areas shall be kept clean, safe, and orderly at all times. At the completion and acceptance of Work, Contractor shall remove from Project Site debris and surplus materials resulting from Work and dispose of them off Project Site at no additional cost to Department.

C. Remove, relocate, and extend existing installations to accommodate new construction as required for proper system installation and operation.

D. Remove, relocate, or provide brackets, hangers, and other accessories as required.

E. Repair adjacent construction and finishes damaged during demolition and extension Work.

F. Maintain access to existing mechanical installations which remain active.

G. Refer to SELECTIVE SITE DEMOLITION for additional requirements.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be relocated and reused.

B. Building surfaces damaged and openings left by new Work, transport of material or equipment or the removal or relocation of mechanical equipment, and the like, shall be repaired to original condition and painted by Contractor.

C. Clean each area of Work and reinstall removed or disturbed ceiling tiles after each shift to maintain satisfactory office working environment to building occupants for duration of construction period.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality assurance

B. Submittals

C. Warranty

D. Operation and maintenance manual

E. Delivery, storage, and handling

F. Painting

G. Record drawings

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires basic mechanical requirements.

1.3 REFERENCES

A. IEEE C37.20.1 - IEEE Standard for Metal-Enclosed Low-Voltage (1000 Vac and Below, 3200 Vdc and Below) Power Circuit Breaker Switchgear.

B. NEMA ICS 6 - Industrial Control and Systems: Enclosures.

C. NFPA 70B - Recommended Practice for Electrical Equipment Maintenance.

1.4 SUBMITTALS

A. Submittal shall include a statement that the submitted equipment complies with the requirement of this Section showing respective paragraphs and specified items and features as specified in this specification. Exceptions shall be identified by referencing respective paragraph and other requirements of this Specification.

B. Note that prior to acceptance of shop drawings for review, a submittal schedule shall be submitted to Engineer.

C. Submit shop drawings and product data grouped and referenced by Specifications Section number in electronic format. Submit Sections in 1 complete package, do not submit individual sections. Individual submittals shall be returned without review.

D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

E. Proposed Products List: Include products as required by the individual Sections in this Division.

F. Contractor shall be responsible for equipment ordered and installed prior to receipt of shop drawings returned from Engineer or Department as applicable. Corrections or modifications to the equipment as noted on the shop drawings shall be performed and equipment removed from Project Site at the request of Engineer without additional compensation.

G. Shop Drawings: Drawings shall be a minimum of 8-1/2 inches by 11 inches in size with a minimum scale of 1/4-inch per foot, except as specified otherwise. Include installation details of equipment indicating proposed location, layout and arrangement, accessories, piping, and other items that must be shown to assure a coordinated installation. Indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, revise drawings to show acceptable equipment and resubmit.

H. Manufacturer's Data: For each manufactured item, provide current manufacturer's descriptive literature of cataloged products, certified equipment drawings, diagrams, performance and characteristic curves if applicable, and catalog cuts.

I. Certified Test Reports: Before delivery of materials and equipment, certified copies of test reports specified in individual Sections shall be submitted for approval.

J. Certificates of Compliance or Conformance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the Technical Sections. Certifications shall be documents prepared specifically for Contract. Pre-printed certifications and copies of previously submitted documents shall not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as as good as; or achieve the same end use and results as materials formulated in conformance with the referenced publications; or equal or exceed the service and performance of the specified material. Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance or conformance.

K. Submit 1 draft of completed volumes in electronic format 15 days prior to final inspection. This draft shall be reviewed and returned with Engineer comments. Revise content of document sets as required prior to final submission.

L. Submit 3 sets of revised final volumes and 1 set in electronic format, within 10 days after final inspection.

M. Submit data bound in 8-1/2 by 11 inch text pages, 3 D ring binders with durable plastic covers.

N. Prepare binder cover with printed title Operation and Maintenance Instructions, title of Project, and subject matter of binder when multiple binders are required.

O. Furnish approved operating instructions for systems and equipment indicated in the Technical Sections for use by operation and maintenance personnel.

P. The operating instructions shall include control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment. Provide weather resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

Q. Where installation procedures or any part thereof are required to be in conformance with manufacturer's written recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

R. Operation and Maintenance Manual:

1. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

2. Contents: Prepare a table of contents for each volume, with each product or system description identified, typed on white card stock, in 3 parts as follows:

a. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, subcontractors, and major equipment suppliers.

b. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification Section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:

1) Significant design criteria.

2) List of equipment.

3) Parts list for each component.

4) Operating instructions.

5) Maintenance instructions for equipment and systems.

6) Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

c. Part 3: Project documents and certificates, including the following:

1) Shop drawings and product data.

2) Air and water balance reports.

3) Certificates.

4) Photocopies of warranties and bonds.

1.5 QUALITY ASSURANCE

A. Discrepancies: Examine Drawings immediately upon receipt and promptly notify Engineer of discrepancies. Figures marked on Drawings shall, in general, be followed in preference to scale measurements. Piping and instrumentation diagrams shall in general govern floor plans and sections. Large-scale drawings shall in general govern small-scale drawings. Compare Drawings and verify the figures before laying out Work.

B. Changes: Make and obtain approval from Engineer for necessary adjustments in piping and equipment layouts as required to accommodate the relocations of equipment or devices, which are affected by any approved authorized changes or product substitutions. Changes shall be clearly indicated on Project Record Drawings.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing by Engineer and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

D. Obtain construction permits and inspections in conformance with REGULATORY REQUIREMENTS Section, including any independent testing required to verify standard compliance, and deliver certificates for same to Engineer.

1.6 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. Cooperate with other trades to facilitate general progress of Work. Contractor shall allow other trades every reasonable opportunity for installation of their Work.

B. Set pipe sleeves and inserts and verify that openings for chases and pipes are provided.

C. Work with other trades in determining exact location of outlets, pipes, and pieces of equipment to avoid interference with lines required to maintain proper installation of Work.

D. Contractor shall make such progress in Work to not delay work of other trades.

E. Mechanical Work shall have precedence over the other trades in the following sequence:

1. Duct mains
2. Soil and waste piping
3. Low pressure ductwork
4. Hydronic piping
5. Fire sprinkler piping
6. Domestic water piping

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle, store, and protect equipment and materials in conformance with tmanufacturer's written instructions and with the requirements of Appendix 1 of NFPA 70B, titled Equipment Storage and Maintenance During Construction. Replace damaged or defective items with new items.

1.8 PROJECT SITE CONDITIONS

A. Location and sizes of electrical, mechanical, and plumbing service facilities are shown in conformance with data secured from existing Project Record Drawings and site observations. Data shown are offered as an estimating guide without guarantee of accuracy. Check and verify data given, and verify exact location of utility services pertaining to Work prior to performing Work.

B. The arrangement of and connection to equipment shown on Drawings is based upon information available and is not intended to show exact dimensions pertaining to a specific manufacturer. Drawings are, in part, diagrammatic and some aspect of equipment installation illustrated may require revision to meet actual equipment installation requirements. Structural supports, housekeeping pads, piping connections and adjacent equipment may have to be altered to accommodate the equipment provided. Examine Project Site conditions and account for equipment support and anchorage in bid.

C. Examine Project Site related Work and surfaces before starting Work.

D. Take photos of existing conditions before starting Work and after each Work session.

E. Install Work in locations shown on approved Drawings, unless prevented by Project conditions.

F. Prepare revised drawings showing proposed rearrangement of work to meet Project conditions, including changes to work specified in other Sections. Obtain permission from Engineer before proceeding.

G. Beginning of Work on any Specification Section constitutes acceptance of field conditions.

1.9 WARRANTY

A. Except as may be specified under other Sections in Specifications, guarantee equipment furnished under Specifications for a period of 5 year from date of Project acceptance, against defective workmanship and material and improper installation. Upon notification of failure, correct deficiency immediately and without cost to Department.

B. Standard warranty of manufacturer shall apply for replacement of parts after expiration of the above period. Manufacturer shall furnish replacement parts to Department for their service agency as directed.

PART 2 - PRODUCTS- NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. X-ray existing concrete walls and slabs and receive approval from Engineer prior to coring or saw cutting.

3.2 WORK RESPONSIBILITIES

A. Drawings indicate diagrammatically the desired locations or arrangement of piping, equipment and shall be followed as closely as possible. Proper judgment shall be exercised in executing Work so as to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference with structural conditions.

B. Contractor shall be responsible for the correct placing of Work and the proper location and connection of Work in relation to work of other trades. Advise appropriate trade as to locations of access panels.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without extra cost, providing the change is ordered before the ductwork, piping, and work directly connected to same is installed and no extra materials are required.

D. Where equipment is furnished by other Divisions, verify dimensions and the correct locations of this equipment before proceeding with the roughing-in of connections.

E. Scaled and figured dimensions are approximate of typical equipment of the class indicated. Before proceeding with any Work, carefully check and verify dimensions and sizes with Drawings to see that the equipment shall fit into the spaces provided without violation of applicable codes.

F. In the event any changes to Work indicated on Drawings or described in Specifications be necessary in order to comply with the above requirements, notify Engineer immediately and cease Work on parts of Contract, which are affected until approval for any required modifications to the construction has been obtained from Engineer.

G. Replace or repair, without additional compensation, any Work, which does not comply with these requirements.

3.3 PAINTING

A. Factory Applied: Mechanical equipment shall have factory applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of IEEE C37.20.1 shall have a finish as specified in IEEE C37.20.1. Refer to individual Sections of this Division for more stringent requirements.

B. Field Applied: Paint mechanical equipment as required to touch up, to match finish on other equipment in adjacent spaces or to meet safety criteria.

3.4 RECORD DRAWINGS

A. Drawings shall be provided in conformance with PROJECT RECORD DOCUMENTS Section. Drawings shall be provided based on Contract Documents detailing final location and arrangement of mechanical equipment including but not limited to air distribution units, ducts, piping, and controls. Supply Engineer with 1 complete set of record drawings in AutoCAD 2018 format and a full size 22 inches by 34 inches paper copy within 30 days of final inspection.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Motor requirements

B. Motor characteristics

C. Polyphase motors

D. Single phase motors

1.2 RELATED SECTIONS

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires motor requirements for HVAC equipment.

1.4 REFERENCES

A. NEMA MG 1 - Motors and Generators.

B. NFPA 70 - National Electrical Code.

1.5 DEFINITION

A. Factory Installed Motor: A motor installed by motorized equipment manufacturer as a component of equipment.

1.6 SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that motors, accessories, and components shall withstand seismic forces defined in VIBRATION AND SEISMIC CONTROLS FOR HVAC Section. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term withstand means the unit shall remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit shall be fully operational after the seismic event.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Qualification Data: For testing agency.

C. Source quality control test reports.

D. Operation and Maintenance Data: For motors to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by Underwriters Laboratories, Incorporated (UL), and marked for intended use.

B. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices and features that comply with the following:

1. Compatible with the following:

a. Magnetic controllers.

b. Multispeed controllers.

c. Reduced voltage controllers.

d. Variable speed drive.

2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.

3. Matched to torque and horsepower requirements of the load.

4. Matched to ratings and characteristics of supply circuit and required control sequence.

PART 2 - PRODUCTS

2.1 MOTOR REQUIREMENTS

A. Motor requirements apply to factory installed motors except as follows:

1. Different ratings, performance, or characteristics for motor are specified in another Section.

2. Motorized equipment manufacturer requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.2 MOTOR CHARACTERISTICS

A. Motors 3/4 horsepower (hp) and Larger: 3-phase.

B. Motors Smaller Than 3/4 horsepower (hp): Single phase or in conformance with manufacturer’s written recommendation.

C. Frequency Rating: 60 herz (Hz).

D. Voltage Rating: National Electrical Manufacturers Association (NEMA) standard voltage selected to operate on nominal circuit voltage to which motor is connected.

E. Service Factor: 1.15 for open dripproof and totally enclosed motors.

F. Duty: Continuous duty at ambient temperature of 92 degrees Fahrenheit (F) and at altitude of 10 feet above sea level.

G. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

H. Enclosure:

1. Open dripproof (ODP) for indoor applications.

2. Totally enclosed fan cooled (TEFC) for outdoor applications.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium, as defined in NEMA MG 1.

C. Stator: Copper windings, unless otherwise indicated on Drawings.

1. Multispeed motors shall have separate winding for each speed.

D. Rotor: Squirrel cage, unless otherwise indicated on Drawings.

E. Bearings: Double shielded, prelubricated ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated on Drawings.

G. Insulation: Class F, unless otherwise indicated on Drawings.

H. Code Letter Designation:

1. Motors 15 hp and Larger: NEMA starting Code F or Code G.

2. Motors Smaller Than 15 hp: Manufacturer's standard starting characteristic.

I. Enclosure: Cast iron for motors 7.5 hp and larger; rolled steel for motors smaller than 7.5 hp.

1. Finish: Gray enamel.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.

2. Temperature Rise: Matched to rating for Class B insulation.

3. Insulation: Class H.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE PHASE MOTORS

A. Type: One of the following, to suit starting torque and requirements of specific motor application:

1. Permanent split capacitor.

2. Split phase start, capacitor run.

3. Capacitor start, capacitor run.

B. Shaded Pole Motors: For motors 1/20 hp and smaller only.

C. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device shall automatically reset when motor temperature returns to normal range.

D. Bearings: Ball type for belt connected motors and other motors with high radial forces on motor shaft; sealed, prelubricated sleeve type for other single phase motors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive motors for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sleeves

B. Sleeve seal systems

C. Sleeve seal fittings

D. Grout

E. Joint sealant

1.2 RELATED SECTIONS

A. Section 07 84 01 - Firestopping and Smokestopping

B. Section 23 05 01 - Basic Mechanical Requirements

C. Section 23 07 19 - HVAC Piping Insulation

D. Section 23 21 13 - Hydronic Piping

E. Section 23 23 00 - Refrigerant Piping

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that require sleeves and sleeve seals for HVAC piping.

1.4 REFERENCES

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

B. ASTM C834 - Standard Specification for Latex Sealants.

C. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

D. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and usage temperature range.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated on Drawings.

B. Galvanized Steel Wall Pipes: ASTM A53/A53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

E. Galvanized Steel Sheet Sleeves: 0.0239 inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded PE Sleeves or PP Sleeves: Removable, tapered cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 SLEEVE SEAL SYSTEMS

A. Manufacturers:

1. Metraflex, https://www.metraflex.com/

2. CALPICO, Inc., https://calpicoinc.com/

3. Pipeline Seal and Insulator, Inc.

B. Description: Modular sealing element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: Ethylene propylene diene monomer (EPDM)-rubber for pipelines temperature up to 250 degrees Fahrenheit (F) and silicon (for pipeline temperature up to 400 degrees F interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: 316 stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE SEAL FITTINGS

A. Manufacturers: Presealed Systems, LLC

B. Description: Manufactured plastic, sleeve type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping outside diameter (OD).

2.4 GROUT

A. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume adjusting, dry, hydraulic cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5,000 psi, 28-day compressive strength.

1. Packaging: Premixed and factory packaged.

2.5 JOINT SEALANT

A. Acrylic latex or siliconized acrylic latex joint sealant for interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement, ASTM C834, Type OP, Grade NF.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that shall have sleeve seal system installed, select sleeves of size large enough to provide 1 inch annular clear space between piping and concrete slabs and walls.

C. Sleeves are not required for core drilled holes.

D. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

E. Permanent sleeves are not required for holes in slabs formed by molded PE or PP sleeves.

F. Cut sleeves to length for mounting flush with both surfaces.

1. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

G. Using grout, seal the space outside of sleeves in slabs and walls without sleeve seal system.

H. Install sleeves for pipes passing through interior partitions.

I. Cut sleeves to length for mounting flush with both surfaces.

J. Install sleeves that are large enough to provide 1/4 inch annular clear space between sleeve and pipe or pipe insulation.

K. Seal annular space between sleeve and piping or piping insulation.

L. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in FIRESTOPPING AND SMOKESTOPPING Section.

3.2 SLEEVE SEALSYSTEM INSTALLATION

A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve inside diameter (ID) or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE SEAL FITTING INSTALLATION

A. Install sleeve seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve seal fittings.

3.4 SLEEVE AND SLEEVE SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Sleeve seal fittings.

b. Piping NPS 6 and Larger: Galvanized steel wall sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized steel wall sleeves with sleeve seal system.

1) Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve seal system.

b. Piping NPS 6 and Larger: Galvanized steel pipe sleeves with sleeve seal system.

1) Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Sleeve seal fittings.

1) Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve seal system.

b. Piping NPS 6 and Larger: Galvanized steel wall sleeves with sleeve seal system.

1) Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve seal system.

4. Interior Partitions:

   a. Piping Smaller Than NPS 6: Galvanized steel pipe sleeves.

   b. Piping NPS 6 and Larger: Galvanized steel sheet sleeves.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Brass ball valves

B. Bronze ball valves

C. Iron, single flange butterfly valves

D. High performance butterfly valves

E. Bronze swing check valves

F. Iron swing check valves

1.2 RELATED SECTIONS

A. Section 23 05 53 - Identification for HVAC Piping and Equipment

B. Section 23 21 13 - Hydronic Piping

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires general duty valves for HVAC piping.

1.4 REFERENCES

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch.

B. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.

D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End.

E. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

F. ASTM A536 - Standard Specification for Ductile Iron Castings.

G. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

H. MSS SP-67 - Butterfly Valves.

I. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends.

J. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves.

K. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.5 SUBMITTALS

A. Product Data: For each type of valve indicated on Drawings.

1.6 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated on Drawings.

D. Valve Actuator Types:

1. Gear Actuator: For quarter turn valves NPS 8 (DN 200) and larger.

2. Handwheel: For valves other than quarter turn types.

3. Handlever: For quarter turn valves NPS 6 (DN 150) and smaller valves.

E. Valves in Insulated Piping: With 2 inch stem extensions and the following features:

1. Gate Valves: With rising stem.

2. Ball Valves: With extended operating handle of non thermal conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

3. Butterfly Valves: With extended neck.

F. Valve End Connections:

1. Flanged: With flanges conforming to ASME B16.10 for iron valves.

2. Solder Joint: With sockets conforming to ASME B16.18.

3. Threaded: With threads conforming to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. 2-Piece, Full-Port, Brass Ball Valves with Stainless Steel Trim:

1. Manufacturers:

a. Hammond Valve

b. Kitz Corporation

c. Milwaukee Valve Company

2. Description:

a. Standard: MSS SP-110

b. SWP Rating: 150 psig.

c. CWP Rating: 600 psig.

d. Body Design: 2-piece.

e. Body Material: Forged brass.

f. Ends: Threaded.

g. Seats: Polytetrafluoroethylene (PTFE) or Tetrafluoroethylene (TFE).

h. Stem: Stainless steel.

i. Ball: Stainless steel, vented.

j. Port: Full.

2.3 BRONZE BALL VALVES

A. 2-Piece, Full-Port, Bronze Ball Valves with Stainless Steel Trim:

1. Manufacturers:

a. Hammond Valve

b. Nibco, Inc.

c. Milwaukee Valve Company

2. Description:

a. Standard: MSS SP-110

b. SWP Rating: 150 psig

c. CWP Rating: 600 psig

d. Body Design: 2-piece.

e. Body Material: Bronze.

f. Ends: Threaded.

g. Seats: PTFE or TFE.

h. Stem: Stainless steel.

i. Ball: Stainless steel, vented.

j. Port: Full.

2.4 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single Flange Butterfly Valves with Ethylene propylene diene monomer (EPDM) Seat and Stainless Steel Disc:

1. Manufacturers:

a. Hammond Valve.

b. Milwaukee Valve Company.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.

b. CWP Rating: 150 psig

c. Body Design: Lug type; suitable for bidirectional dead end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.

e. Seat: EPDM.

f. Stem: 1-piece stainless steel.

g. Disc: Stainless steel.

2.5 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers:

a. Milwaukee Valve Company

b. Nibco, Inc.

c. Red-White Valve Corporation

2. Description:

a. Standard: MSS SP-80, Type 3.

b. CWP Rating: 300 psig

c. Body Design: Horizontal flow

d. Body Material: ASTM B62, bronze

e. Ends: Threaded

f. Disc: Bronze

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers:

a. Hammond Valve

b. Milwaukee Valve Company

c. Nibco

2. Description:

a. Standard: MSS SP-71, Type I.

b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig.

c. NPS 14 to NPS 24 (DN 350 to DN 600), CWP Rating: 150 psig.

d. Body Design: Clear or full waterway.

e. Body Material: ASTM A126, gray iron with bolted bonnet.

f. Ends: Flanged

g. Trim: Bronze

h. Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Replace defective valves with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.

2. Pump Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with disc.

b. NPS 2-1/2 and Larger: Iron globe silent type check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder joint valve end option is indicated in valve schedule.

2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve end option is indicated in valve schedule.

3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

4. For Steel Piping, NPS 2 and Smaller: Threaded ends.

5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve end option is indicated in valve schedule.

6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.5 HEATING HOT WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder joint ends instead of threaded ends.

2. Ball Valves: Two piece, full port, bronze with stainless steel trim.

3. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.

2. Iron, Single Flange Butterfly Valves, NPS 4 to NPS 12: 200 CWP, EPDM seat, stainless steel disc.

3. Iron Globe Silent Type Check Valves, NPS 2-1/2 to NPS 12: Class 125.

3.6 CHILLED WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder joint ends instead of threaded ends.

2. Ball Valves: Two piece, full port, bronze with stainless steel trim.

3. Bronze Swing Check Valves: Class 150, bronze disc.

B. Pipe NPS 2-1/2 and 3:

1. Ball Valves: Two piece, full port, bronze with stainless steel trim.

2. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.

3. Iron, Single Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, stainless steel disc.

4. Iron Globe Silent Type Check Valves, NPS 2-1/2 to NPS 12: Class 125.

C. Pipe NPS 4 and Larger:

1. Iron, Single Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, stainless steel disc.

2. Iron Globe Silent Type Check Valves, NPS 2-1/2 to NPS 12: Class 125.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Steel pipe hangers and supports

B. Trapeze pipe hangers

C. Metal framing systems

D. Thermal hanger shield inserts

E. Fastener systems

F. Pipe stands

G. Pipe positioning systems

H. Equipment supports

1.2 RELATED SECTIONS

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC

B. Section 23 21 13 - Hydronic Piping

C. Section 23 23 00 - Refrigerant Piping

D. Section 23 31 13 - Metal Ducts

1.3 REFERENCES

A. ASME B31.1 - Power Piping.

B. ASME B31.9 - Building Services Piping.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

D. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.

E. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

F. AWS D1.1/D1.1M - Structural Welding Code - Steel.

G. IAPMO PS 42 - Pipe Alignment and Secondary Support Systems.

H. MFMA-4 - Metal Framing Standards Publication.

I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

J. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals.

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water. Design shall comply with City of Los Angeles Building Code.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components. Design shall comply with City of Los Angeles Building Code.

1.5 SUBMITTALS

A. Product data for the following:

1. Steel pipe hangers and supports.

2. Fiberglass pipe hangers.

3. Thermal hanger shield inserts.

4. Powder actuated fastener systems.

5. Pipe positioning systems.

B. Shop Drawings: Show fabrication and installation details and include calculations signed and stamped by professional engineer as required by City of Los Angeles Department of Building and Safety for the following:

1. Trapeze pipe hangers: Include product data for components.

2. Metal framing systems. Include product data for components.

3. Pipe stands: Include product data for components.

4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel in conformance with American Welding Society requirements. Welders shall be City of Los Angeles Department of Building and Safety certified.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory fabricated components. Refer to Hanger and Support Applications Article of this Section for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a Division of Cooper Industries.

2. Grinnell Corp.

3. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop or field fabricated pipe support assembly made from structural steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. Description: MFMA-4, shop or field fabricated pipe support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a Division of Cooper Industries.

2. Tolco Inc.

3. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated on Drawings.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.4 THERMAL HANGER SHIELD INSERTS

A. Description: 100 psig minimum, compressive strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Pipe Shields, Inc.

2. Rilco Manufacturing Company, Inc.

3. Value Engineered Products, Inc.

C. Insulation Insert Material for Cold Piping: Water repellent treated, ASTM C533, Type I calcium silicate with vapor barrier.

D. Insulation Insert Material for Hot Piping: Water repellent treated, ASTM C533, Type I calcium silicate.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Mechanical Expansion Anchors: Insert-wedge-type zinc coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Empire Industries, Inc.

b. Hilti, Inc.

c. Powers Fasteners.

2.6 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field fabricated assemblies made of manufactured corrosion resistant components to support roof mounted piping.

B. Compact Pipe Stand: One piece plastic unit with integral rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Manufacturers:

a. ERICO/Michigan Hanger Co.

b. MIRO Industries

C. High Type, Single Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers:

a. ERICO/Michigan Hanger Co.

b. MIRO Industries

c. Portable Pipe Hangers

2. Base: Stainless steel

3. Vertical Members: 2 or more cadmium plated steel or stainless steel, continuous thread rods.

4. Horizontal Member: Cadmium plated steel or stainless steel rod with plastic or stainless steel, roller type pipe support.

D. High Type, Multiple Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Manufacturers:

a. Portable Pipe Hangers.

2. Bases: 1 or more plastic.

3. Vertical Members: 2 or more protective coated steel channels.

4. Horizontal Member: Protective coated steel channel.

5. Pipe Supports: Galvanized steel, clevis type pipe hangers.

E. Curb MountingType Pipe Stands: Shop or field fabricated pipe support made from structural steel shape, continuous thread rods, and rollers for mounting on permanent stationary roof curb.

2.7 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. C & S Mfg. Corp.

2. HOLDRITE Corp.; Hubbard Enterprises.

3. Samco Stamping, Inc.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop or field fabricated equipment support made from structural steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.

B. Equipment Support Grout: ASTM C1107/C1107M, factory mixed and packaged, dry, hydraulic cement, nonshrink and nonmetallic grout, suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive and nongaseous.

2. Design Mix: 5,000 psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe hanger selections and applications that are not specified in HYDRONIC PIPING Section.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that shall not have field applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal Piping Hangers and Supports: Unless otherwise indicated and except as specified in HYDRONIC PIPING Section, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.

2. Yoke Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 degrees Fahrenheit pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.

3. Carbon or Alloy Steel, Double Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable Swivel Split or Solid Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.

8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.

9. Adjustable Swivel Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.

10. Split Pipe Ring with or without Turnbuckle Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.

11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.

12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast iron floor flange and with U-bolt to retain pipe.

16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast iron floor flange.

17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. Vertical Piping Clamps: Unless otherwise indicated on Drawings and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

2. Carbon or Alloy Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger Rod Attachments: Unless otherwise indicated on Drawings and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 degrees Fahrenheit piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 degrees Fahrenheit piping installations.

I. Building Attachments: Unless otherwise indicated on Drawings and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.

3. Side Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use 1 of the following for indicated loads:

    a. Light (MSS Type 31): 750 pounds

    b. Medium (MSS Type 32): 1,500 pounds

    c. Heavy (MSS Type 33): 3,000 pounds

13. Side Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated on Drawings and except as specified in piping system Sections, install the following types:

1. Steel Pipe Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal Hanger Shield Inserts: For supporting insulated pipe.

K. Comply with MSS SP-58 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-4 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use powder actuated fasteners or mechanical expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping and support together on field fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A36/A36M, steel shapes selected for loads being supported. Weld steel in conformance with AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field assembled metal framing systems.

D. Thermal Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder actuated tool manufacturer. Install fasteners in conformance with powder actuated tool manufacturer's operating manual.

2. Install mechanical expansion anchors in concrete after concrete is placed and completely cured. Install fasteners conforming to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb Mounting Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded structural steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems; to permit freedom of movement between pipe anchors; and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement shall not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

    b. Piping Operating below Ambient Air Temperature: Use thermal hanger shield insert with clamp sized to match outside diameter of insert.

    c. Do not exceed pipe stress limits conforming to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal hanger shield inserts may be used. Include steel weight distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal hanger shield inserts may be used. Include steel weight distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

    b. NPS 4: 12 inches long and 0.06 inch thick.

    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.

6. Insert Material: Length at least as long as protective shield.

7. Thermal Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M and City of Los Angeles Building code procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Clean and touchup paint field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal. Galvanized surfaces shall be cleaned, welded, and bolted at connections.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vibration isolators

B. Seismic restraint devices

C. Vibration isolation equipment bases

D. Factory finishes

1.2 RELATED SECTIONS

A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

B. Section 23 61 23 - Rotary-Screw Refrigerant Compressors

C. Section 23 63 33 - Evaporative Refrigerant Condensers

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires vibration and seismic controls for HVAC.

1.4 REFERENCES

A. AASHTO M 251 - Standard Specification for Plain and Laminated Elastomeric Bridge Bearings.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

C. ASTM E488/E488M - Standard Test Methods for Strength of Anchors in Concrete Elements.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

1.5 PERFORMANCE REQUIREMENTS

A. Component Seismic Coefficient: 3.0.

B. Performance Criteria Factor: 1.0.

C. Attachment Amplification Factor: 1.0.

1.6 SUBMITTALS

A. Product Data: Include load deflection curves for each vibration isolation device.

B. Shop Drawings: Signed and sealed by a qualified professional engineer registered in the State of California. Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

a. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none exists.

b. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

c. Seismic Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

d. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2 inch deflection in x, y, and z planes.

C. Independent Testing Agency: Submit name and qualifications of an independent testing agency to perform tests described in Field Quality Control Article of this Section.

D. Welding certificates.

E. Manufacturer Seismic Qualification Certification: Submit certification that specified equipment shall withstand seismic forces identified in Performance Requirements Article of this Section. Include the following:

1. The term withstand means the unit shall remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit shall be fully operational after the seismic event.

2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.7 QUALITY ASSURANCE

A. Seismic restraint devices shall have horizontal and vertical load testing and analysis performed conforming to OSHPD and Los Angeles Building Code and shall bear anchorage preapproval R number, from OSHPD or another agency acceptable to authorities having jurisdiction, showing maximum seismic restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic restraint designs shall be signed and sealed by a qualified professional engineer registered in the State of California. Testing and calculations shall include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.

B. Welding: Qualify procedures and personnel conforming to AWS D1.1/D1.1M and Los Angeles Building Code. Welders shall be City of Los Angeles Department of Building and Safety certified.

1.8 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor bolt inserts into base. Concrete, reinforcement, and formwork requirements are required to be coordinated with structural engineer.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Seismic Snubber Units: Furnish replacement neoprene inserts for snubbers.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers:

1. California Dynamics Corp.

2. Mason Industries, Inc.

3. Vibrex (M.W. Sausse Co.)

B. Elastomeric Isolator Pads (Type EIP): 1/4 inch to 5/16 inch thick ribbed or waffled neoprene, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Standard neoprene.

2. Durometer Rating: 40 or 50.

3. Number of Layers: 2.

C. Elastomeric Mounts (Type EM): Neoprene-in-shear type with steel reinforced top and base. Metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed. Bolt holes shall be provided in the base and the top shall have a threaded fastener. The mounts shall include leveling bolts that may be rigidly connected to the equipment. Color code or otherwise identify to indicate capacity range.

1. Durometer Rating: 40 or 50.

D. Spring Isolators (Type SI): Freestanding, laterally stable, open spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

2. Minimum Additional Travel: 50 percent of the required deflection at rated load.

3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4 inch thick, rubber or neoprene isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 pounds per square inch gage (psig).

6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

E. Restrained Spring Isolators (RSI): Freestanding, steel, open spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical limit stops to prevent spring extension due to wind loads or if weight is removed; factory drilled baseplate bonded to 1/4 inch thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

F. Elastomeric Hangers (Type EH): Neoprene-in-shear type with molded, oil resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color code or otherwise identify to indicate capacity range.

G. Spring Hangers (Type SH): Combination coil spring and elastomeric insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil resistant rubber or neoprene. Steel washer reinforced cup to support spring and bushing projecting through bottom of frame.

H. Spring Hangers with Vertical-Limit Stop (Type SHVLS): Combination coil spring and elastomeric insert hanger with spring and insert in compression and with a vertical limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil resistant rubber or neoprene.

7. Adjustable Vertical Stop: Steel washer with neoprene washer up stop on lower threaded rod.

I. Thrust Limits (Type TL): Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle iron brackets for attaching to equipment.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Element: Molded, oil resistant rubber or neoprene.

7. Coil Spring: Factory set and field adjustable for a maximum of 1/4 inch movement at start and stop.

J. Pipe Riser Resilient Support (Type PRRS): Directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2 inch thick, 60 durometer neoprene. Include steel and neoprene vertical limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

K. Resilient Pipe Guides (Type RPS): Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2 inch thick, 60 durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

L. Flexible Pipe Connections (Type FPC): Flexible pipe connectors shall be fabricated of Kevlar or nylon cord, fabric, and neoprene. Flexible pipe connections shall result in a flexible and highly compliant connection that can allow longitudinal, transverse, and angular movements and provide micro vibration isolation. The flexible connections shall be selected and specially fitted, if necessary, to suit the system temperature, pressure, and fluid type. Rods or cables may be used to control extension of the connector if required by the manufacturer, but shall not inhibit movement necessary to provide sufficient vibration isolation. Flexible pipe connections shall be equivalent to Mason Industries' Type SFDEJ twin sphere connectors.

M. Flexible Duct Connections (Type FDC): Flexible duct connections shall be supplied in conformance with SMACNA (DCS) standards. Material width shall be 150 percent of clear dimension in addition to width required for attachment. Flexible duct connections shall result in a loose and highly compliant connection.

N. Flexible Conduit Connections (Type FCC): Flexible conduit shall be formed of one continuous length of electro-galvanized spiral wound steel strip. Liquid tight flexible conduit shall be formed of one continuous length of electro galvanized spiral wound steel strip, with neoprene gasket.

2.2 SEISMIC RESTRAINT DEVICES

A. Manufacturers:

1. California Dynamics Corp.

2. Mason Industries, Inc.

3. Vibrex (M.W. Sausse Co.)

B. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge bearing neoprene complying with AASHTO M 251 and having a durometer of 50, plus or minus 5, with a flat washer face.

C. Seismic Snubbers: Factory fabricated using welded structural steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

D. Anchor bolts for attaching to concrete shall be seismic rated, drill-in, and stud wedge or female wedge type.

1. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge bearing neoprene complying with AASHTO M 251 and having a durometer of 50, plus or minus 5.

E. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.

F. Anchor Bolts: Seismic rated, drill-in, and stud wedge or female wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

2.3 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers:

1. California Dynamics Corp.

2. Mason Industries, Inc.

3. Vibrex (M.W. Sausse Co.)

B. Steel Base SB: Factory fabricated, welded, structural steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1 inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.

3. Support Brackets: Factory welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

C. Inertia Base IB: Factory fabricated, welded, structural steel bases and rails ready for field applied, cast in place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1 inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A36/A36M. Bases shall have shape to accommodate supported equipment.

3. Support Brackets: Factory welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

4. Fabrication: Fabricate steel templates to hold equipment anchor bolt sleeves and anchors in place during placement of concrete. Obtain anchor bolt templates from supported equipment manufacturer.

2.4 FACTORY FINISHES

A. Manufacturer's standard prime coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory assembled and tested equipment before shipping.

C. Powder coating on springs and housings.

1. Hardware shall be electrogalvanized. Hot dip galvanize metal components for exterior use.

2. Baked enamel for metal components on isolators for interior use.

3. Color code or otherwise mark vibration isolation and seismic control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic control devices for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast in place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Thrust restraints shall be provided in conformance with manufacturer's written instructions for horizontal discharge vibration isolated fans and air handlers where the air thrust exceeds 10 percent of the vibration isolated equipment weight. Thrust is calculated in conformance with the following formula:

1. Thrust (LB) = Total pressure (Inches water column) x 5.3 x Area (square feet)

2. Thrust restraints shall be oriented parallel to the direction of thrust and located symmetrically about the center of thrust. Ducting at thrust restraints shall be designed to withstand thrust loading or an auxiliary structure shall be provided for thrust restraint mounting. Thrust restraint shall not interfere with or restrict free operation of vibration isolation systems.

B. Install seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.

C. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

D. Install steel angles or channel, sized to prevent buckling, clamped with ductile iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.

E. Install resilient bolt isolation washers on equipment anchor bolts.

3.3 EQUIPMENT BASES

A. Fill concrete inertia bases, after installing base frame, with 3,000 psi concrete; trowel to a smooth finish.

B. Cast in place concrete materials and placement requirements shall be coordinated with equipment manufacturer and structural engineer.

C. Concrete Bases: Anchor equipment to concrete base conforming to supported equipment manufacturer's written instructions for seismic codes at Project Site.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated on Drawings, install dowel rods on 18 inch centers around the full perimeter of the base.

2. Install epoxy coated anchor bolts for supported equipment that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

5. Install anchor bolts according to anchor bolt manufacturer's written instructions.

6. Cast in place concrete materials and placement requirements shall be coordinated with equipment manufacturer and Engineer via shop drawing process.

3.4 FIELD QUALITY CONTROL

A. Testing: Contractor shall provide field quality control and pay for a qualified testing agency to perform the following field quality control testing:

1. Isolator seismic restraint clearance:

2. Isolator deflection.

3. Snubber minimum clearances.

3.5 ADJUSTING

A. Adjust isolators after piping systems have been filled and equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Attach thrust limits at centerline of thrust and adjust to maximum of 1/4 inch movement during start and stop.

D. Adjust air spring leveling mechanism.

E. Adjust active height of spring isolators.

F. Adjust snubbers conforming to manufacturer's written instructions.

G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

H. Torque anchor bolts conforming to equipment manufacturer's written instructions to resist seismic forces.

3.6 CLEANING

A. After completing equipment installation, inspect vibration isolation and seismic control devices. Remove paint splatters and other spots, dirt, and debris.

3.7 DEMONSTRATION

A. Provide a factory authorized service representative to train Department personnel to adjust, operate, and maintain air mounting systems.

3.8 VIBRATION BALANCE CRITERIA

A. Rotating equipment shall operate at speeds less than 80 percent of their true critical speed. Unless otherwise required, equipment shall be balanced according to recommendations:

1. Equipment components such as motors, pump rotors, fan wheels, and the like shall be factory balanced, both statically and dynamically, to meet the filed balance requirements described in Vibration Balance Criteria Article, paragraph A.2 of this Section.

2. Following field installation, each fan and pump over 25 horsepower shall be balanced in conformance with the following maximum root mean square (rms) velocity levels:

   a. Fans: 0.15 inch per second.

   b. Pumps: 0.13 inch per second.

3. Final in-field balance shall be measured with each fan and pump over 25 horsepower (hp) installed on springs specified for unit. Fans shall be loaded with design static pressure. Measurement shall be carried out in vertical and horizontal and axis planes at impeller shaft bearing location when the equipment is mounted on its vibration isolation mounts.

4. If the equipment is inertia base or skid mounted, the weight of inertia bases or skids (and of any other components mounted on the same inertia base or skid) shall reduce the vibration response when equipment is balanced. Therefore, the balance criteria shall be multiplied by the following factor for such equipment.

   FACTOR = W / (WT + W)

   Where WT = Inertia weight (base + other components)

   W = Weight of the subject equipment

3.9 PIPE ISOLATION

A. Piping connected to vibration isolated equipment shall be isolated from the equipment using twin sphere flexible pipe connectors as specified in Vibration Isolators Article, paragraph L of this Section.

B. Piping, 4 inches diameter or greater, which is connected to vibration isolated equipment shall be supported, for a distance of 25 feet or 50 pipe diameters, whichever is greater, from the building structure by spring isolators, resilient pipe riser, and resilient penetration sleeves.

C. The spring isolators shall be selected for a static deflection, under the actual load, of not less than 1 inch. Unit SI and SH isolators (whichever is applicable to the mounting condition) shall be used.

D. Resilient pipe risers and guides shall be used to support pipe risers, 6 inches or greater in diameter and within the limits specified in Pipe Isolation Article, paragraph B of this Section, Mason Industries' type ADA anchors. The piping shall make no direct contact with the gypsum board shaft walls.

E. Pipes within the limits specified in Pipe Isolation Article, paragraph B of this Section that penetrate the building structure shall be isolated from the structure by the use of resilient penetration sleeve/seals. A 1/2 inch clear space shall be left around the penetrating duct or pipe. The clear space shall be filled with fiberglass for the full depth of the penetration. Both ends of the clear space shall be sealed airtight with a non-hardening resilient sealant.

F. Pipe Isolation Article, paragraphs C, D, and E of this Article above also apply to piping 2 inches diameter or over suspended below or near noise sensitive spaces.

G. Piping smaller than 2 inches diameter suspended below or near noise sensitive spaces shall be supported with a resilient element of felt, neoprene, or other suitable material inserted between the pipe and pipe clamp.

3.10 DUCT ISOLATION

A. Flexible canvas or rubber duct connections as described in Vibration Isolators Article, paragraph M of this Section shall be used at the intake and discharge of each fan or air handling unit. The duct openings shall be squarely aligned prior to installation of the flexible connection, so that the clear length is approximately equal around the perimeter. Minimum metal to metal clearance shall be 4 inches. Flexible duct connections shall not be installed until these provisions are met. The fan unit or adjacent duct section shall be able to move 1 inch in any direction without causing metal to metal contact or stretching out the flexible connection. There shall be a distance of at least 3 duct diameters between the inlet of a vaneaxial fan and a flexible connector.

1. The ductwork shall make no direct contact with the gypsum board shaft walls.

B. A 1/2 inch clear space shall be left around the penetrating duct or pipe. The clear space shall be filled with fiberglass for the full depth of the penetration. Both ends of the clear space shall be sealed airtight with a non-hardening resilient silicone sealant.

C. When ducts are suspended below or near a noise sensitive area, they shall be isolated, especially for large ducts with air velocities above 1,500 feet per minute (fpm) or with duct static pressure of 2 inches water gage or higher. The isolators shall be Unit SH. The isolators shall be selected for a static deflection, under the actual load, of not less than 1 inch.

D. No vibration isolation shall be required for other ducts.

3.11 ELECTRICAL ISOLATION

A. Electrical service connections to vibration isolated mechanical equipment shall be made with flexible conduit. Conduit shall provide a minimum 360 turn and result in a loose and compliant connection.

B. Transformers shall be supported on Type EIP vibration isolation pads or provided with integral internal neoprene vibration mounts. For dry transformers, install the isolation beneath the core; for oil filled transformers, install the isolation beneath the tank.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates

B. Tags

C. Stencils

D. Pipe markers

1.2 RELATED SECTIONS

A. Section 01 78 39 - Project Record Documents

B. Section 23 05 01 - Basic Mechanical Requirements

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that require identification for HVAC piping and equipment.

1.4 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.5 SUBMITTALS

A. Submit the following in conformance with BASIC MECHANICAL REQUIREMENTS Section:

1. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

2. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

3. Product Data: Provide manufacturer's catalog literature for each product required.

1.6 PROJECT RECORD DOCUMENTS

A. Record actual locations of tagged valves on Record Drawings.

B. Submit in conformance with PROJECT RECORD DOCUMENTS Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Seton Name Plate Company, Inc.

B. Marking Services, Inc.

C. WH Brady Company.

2.2 NAMEPLATES

A. Description: Laminated 3 layer plastic with engraved white letters on black background color.

2.3 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Chart: Typewritten letter size list in anodized aluminum frame.

2.4 STENCILS

A. Stencils: With clean cut symbols and letters of following sizes:

3/4 to 1-1/4 inch O.D. of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.

1-1/2 to 2 inch O.D. of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.

2-1/2 to 6 inch O.D. of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.

Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: Provide in semi- gloss enamel, colors conforming to ASME A13.1 unless otherwise specified.

2.5 PIPE MARKERS

A. Plastic markers for coding pipe shall conform to ASME A13.1. Markers shall be the mechanically attached type that are easily removable and firmly attached; they shall not be the adhesive applied type. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe. Markers shall withstand a continuous operating temperature range of minus 40 degrees Fahrenheit to 180 degrees Fahrenheit. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.

B. Markers bearing the legends on the background colors specified in ASME A13.1 shall be provided in the following letter heights:

Outside Pipe Diameter*, Inches	Letter Height, Inches
Less than 1-1/2	1/2
1-1/2 through 3	1-1/8
* Outside pipe diameter shall include insulation and jacketing	

In addition, pipe markers shall include uni-directional and bi-directional arrows in the same sizes as the legend. Legends and arrows shall be white on blue or red backgrounds and black on other specified backgrounds.

C. Tracer tape shall be 6 inches wide, colored the same as the background colors as specified in ASME A13.1, and made of inert plastic material suitable for direct burial. Tape shall be capable of stretching to twice its original length.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting accordingly.

D. Install plastic pipe markers in conformance with manufacturer's written instructions.

E. Install plastic tape pipe markers complete around pipe in conformance with manufacturer's written instructions.

F. Identify air handling units, condensing units, exhaust fans and zone dampers with plastic nameplates. Small devices, such as a control valve, may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates.

H. Identify room sensors relating to zone dampers with nameplates.

I. Identify valves in main and branch piping with tags.

J. Tag automatic controls, instruments, and relays. Key to control schematic.

K. Identify piping, concealed or exposed with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

L. Identify ductwork with stenciled painting. Identify zone dampers with identification number and area served. Locate identification at air handling unit, at one side of the unit. Label fire damper access doors.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Balancing of air and hydronic systems

B. Testing, adjusting, and balancing (TAB) of equipment

1.2 RELATED SECTIONS

A. Section 23 09 00 - Instrumentation and Controls for HVAC

B. Section 23 21 23 - Hydronic Pumps

C. Section 23 29 23 - Variable Frequency Motor Controllers

D. Section 23 36 00 - Air Terminal Units

E. Section 23 52 16 - Condensing Boilers

F. Section 23 61 23 - Rotary-Screw Refrigerant Compressors

G. Section 23 63 33 - Evaporative Refrigerant Condensers

H. Section 23 64 16 - Centrifugal Water Chillers

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires testing, adjusting, and balancing for HVAC.

1.4 REFERENCES

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition.

B. AMCA 201 - Fans and Systems.

C. SMACNA HVAC DUCT DESIGN - HVAC Systems Duct Design.

1.5 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals according to indicated quantities on Drawings in mechanical schedules.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. cfm: Cubic feet per minute.

E. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

F. fpm: Feet per minute.

G. gpm: Gallons per minute.

H. hp: Horsepower.

I. iwg: Inches water gage.

J. NC: Noise criteria.

K. NPS: Nominal pipe size.

L. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

M. psig: Pounds per square inch gage.

N. RC: Room criteria.

O. Report Forms: Test data sheets for recording test data in logical order.

P. rpm: Revolutions per minute.

Q. Smoke Control System: An engineered system that uses fans to produce airflow and pressure differences across barriers to limit smoke movement.

R. Smoke Control Zone: A space within a building that is enclosed by smoke barriers and is a part of a zoned smoke control system.

S. Stair Pressurization System: A type of smoke control system that is intended to positively pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the stair towers during an alarm condition.

T. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

U. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

V. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

W. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

X. TAB: Testing, adjusting, and balancing.

Y. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

Z. Test: A procedure to determine quantitative performance of systems or equipment.

AA. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.6 SUBMITTALS

A. Qualification Data: Within 30 Calendar Days from Notice to Proceed, submit 4 copies of evidence that TAB firm and Project's TAB team members meet the qualifications specified in Quality Assurance Article of this Section.

B. Contract Documents Examination Report: Within 45 days from Notice to Proceed, submit 4 copies of Contract Documents review report as specified in this Section.

C. Strategies and Procedures Plan: Within 60 days from Notice to Proceed, submit 4 copies of TAB strategies and step by step procedures as specified in Preparation Article of this Section. Include a complete set of report forms intended for use on Project.

D. Certified TAB Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

E. Sample Report Forms: Submit 2 sets of sample TAB report forms.

F. Warranties specified in this Section.

1.7 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm specializing in testing, adjusting, and balancing of systems specified in this Section with minimum 5 years documented experience certified by Associated Air Balance Council (AABC).

B. TAB Conference: Meet with Engineer on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide 7 days advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.

b. Contract Documents examination report.

c. TAB plan.

d. Work schedule and Project Site access requirements.

e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Section.

D. TAB Report Forms: Use standard forms from AABC (NSTSB).

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC (NSTSB).

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.8 PROJECT CONDITIONS

A. Understanding of TAB Scheduling:

1. Building operation is 24 hours a day, Monday through Sunday.

2. TAB operations shall be performed in such a way as to allow occupants to continue normal business operations during construction.

3. Coordinate start of Work in advance with Engineer. Provide Engineer with proposed schedule for work in each area prior to start.

1.9 COORDINATION

A. Coordinate the efforts of factory authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.10 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC (NSTSB) forms stating that AABC shall assist in completing requirements of Contract Documents if TAB firm fails to comply with Contract Documents.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in GENERAL CONDITIONS Section of the Specifications.

2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow control devices, balancing valves and fittings, and manual volume dampers, are required by Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

D. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, Sections 7 through 10; or in SMACNA HVAC DUCT DESIGN, Sections 5 and 6. Compare this data with the design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable air volume boxes, to verify that they are accessible and their controls are connected and functioning.

K. Examine plenum ceilings used for supply air to verify that plenum are airtight. Verify that pipe penetrations and other holes are sealed.

L. Examine strainers for clean screens and proper perforations.

M. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine heat transfer coils for correct piping connections and for clean and straight fins.

O. Examine system pumps to ensure absence of entrained air in the suction piping.

P. Examine equipment for installation and for properly operating safety interlocks and controls.

Q. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.

2. Dampers and valves are in the position indicated by the controller.

3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable air volume terminals.

4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected.

5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.

6. Sensors are located to sense only the intended conditions.

7. Controller set points are set at indicated values.

8. Interlocked systems are operating.

9. Changeover from heating to cooling mode occurs according to indicated values.

R. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step by step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Hydronic systems are filled, clean, and free of air.

3. Automatic temperature control systems are operational.

4. Equipment and duct access doors are securely closed.

5. Balance, smoke, and fire dampers are open.

6. Isolating and balancing valves are open and control valves are operational.

7. Ceilings are installed in critical areas where air pattern adjustments are required and access to balancing devices is provided.

8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system conforming to the procedures contained in AABC (NSTSB) and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish conforming to insulation specifications for Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper control positions, valve position indicators, fan speed ontrol levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' As-Built duct layouts.

C. For variable air volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Check airflow patterns from the outside air louvers and dampers and the return and exhaust air dampers, through the supply fan discharge and mixing dampers.

F. Locate start stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air handling unit components.

L. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR VARIABLE AIR VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure Independent, Variable Air Volume Systems: After the fan systems have been adjusted, adjust the variable air volume systems as follows:

1. Set outside air dampers at minimum, and return and exhaust air dampers at a position that simulates full cooling load.

2. Select the terminal unit that is most critical to the supply fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal unit discharge system losses.

3. Measure total system airflow. Adjust to within indicated airflow.

4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant volume air systems.

5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return air ducts and inlets as described for constant volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static pressure controller at the main supply air sensing station to ensure that adequate static pressure is maintained at the most critical unit.

8. Record the final fan performance data.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' As-Built piping layouts.

C. Prepare hydronic systems for testing and balancing as follows:

1. Open manual valves for maximum flow.

2. Check expansion tank liquid level.

3. Check makeup water station pressure gage for adequate pressure for highest vent.

4. Check flow control valves for specified sequence of operation and set at indicated flow.

5. Set differential pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive displacement type unless several terminal valves are kept open.

6. Set system controls so automatic valves are wide open to heat exchangers.

7. Check pump motor load. If motor is overloaded, throttle main flow balancing device so motor nameplate rating is not exceeded.

8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.7 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures, except for positive displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

2. Check system resistance. With valves open, read pressure differential across the pump and mark pump manufacturer's head capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

3. Verify pump motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.

4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow pressure drop relationship may be used as a flow indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

E. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.

2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.

3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor air temperature.

G. Measure the differential pressure control valve settings existing at the conclusions of balancing.

3.8 PROCEDURES FOR MOTORS

A. Motors, 1/2 horse power and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.

2. Motor horsepower rating.

3. Motor rpm.

4. Efficiency rating.

5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.

7. Starter thermal protection element rating.

B. Motors Driven by Variable Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.9 PROCEDURES FOR EVAPORATIVE CONDENSING UNITS

A. Verify proper rotation of fans and circulating pump.

B. Measure entering and leaving water temperatures.

C. Measure entering and leaving refrigerant temperatures.

D. Record motor data.

3.10 PROCEDURES FOR BOILERS

A. If hydronic, measure entering and leaving water temperatures and water flow.

B. If steam, measure entering water temperature and flow and leaving steam pressure, temperature, and flow.

3.11 PROCEDURES FOR HEAT TRANSFER COILS

A. Water Coils: Measure the following data for each coil:

1. Entering and leaving water temperature.

2. Water flow rate.

3. Water pressure drop.

4. Dry bulb temperature of entering and leaving air.

5. Wet bulb temperature of entering and leaving air for cooling coils.

6. Airflow.

7. Air pressure drop.

B. Refrigerant Coils: Measure the following data for each coil:

1. Dry bulb temperature of entering and leaving air.

2. Wet bulb temperature of entering and leaving air.

3. Airflow.

4. Air pressure drop.

5. Refrigerant suction pressure and temperature.

3.12 PROCEDURES FOR CHILLERS

A. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator water entering and leaving temperatures, pressure drop and water flow.

2. Evaporator and condenser refrigerant temperatures and pressures using instruments furnished by chiller manufacturer.

3. Power factor if factory installed instrumentation is furnished for measuring kilowatts. Kilowatt input if factory installed instrumentation is furnished for measuring kilowatts.

4. Capacity: Calculate in tons of cooling.

5. For air cooled chillers, verify condenser fan rotation and record fan and motor data including number of fans and entering and leaving air temperatures.

3.13 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature control system.

B. Measure indoor wet and dry bulb temperatures every other hour for a period of 2 successive 8 hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside air, wet and dry bulb temperatures.

3.14 PROCEDURES FOR SPACE PRESSURIZATION MEASUREMENTS AND ADJUSTMENTS

A. Before testing for space pressurization, observe the space to verify the integrity of the space boundaries. Verify that windows and doors are closed and applicable safing, gaskets, and sealants are installed. Report deficiencies and postpone testing until after the reported deficiencies are corrected.

B. Measure, adjust, and record the pressurization of each room, each zone, and each building by adjusting the supply, return, and exhaust airflows to achieve the indicated conditions.

C. Measure space pressure differential where pressure is used as the design criteria, and measure airflow differential where differential airflow is used as the design criteria for space pressurization.

1. For pressure measurements, measure and record the pressure difference between the intended spaces at the door with doors in the space closed. Record the high pressure side, low pressure side, and pressure difference between each adjacent space.

2. For applications with cascading levels of space pressurization, begin in the most critical space and work to the least critical space.

3. Test room pressurization first, then zones, and finish with building pressurization.

D. To achieve indicated pressurization, set the supply airflow to the indicated conditions and adjust the exhaust and return airflow to achieve the indicated pressure or airflow difference.

E. For spaces with pressurization being monitored and controlled automatically, observe and adjust the controls to achieve the desired set point.

1. Compare the values of the measurements taken to the measured values of the control system instruments and report findings.

2. Check the repeatability of the controls by successive tests designed to temporarily alter the ability to achieve space pressurization. Test overpressurization and underpressurization, and observe and report on the system's ability to revert to the set point.

3. For spaces served by variable air volume supply and exhaust systems, measure space pressurization at indicated airflow and minimum airflow conditions.

F. In spaces that employ multiple modes of operation, such as normal mode and emergency mode or occupied mode and unoccupied mode, measure, adjust, and record data for each operating mode.

G. Record indicated conditions and corresponding initial and final measurements. Report deficiencies.

3.15 TEMPERATURE CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high and low temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail safe operations.

3.16 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: 0 to minus 10 percent.

3. Heating Water Flow Rate: 0 to minus 10 percent.

4. Cooling Water Flow Rate: 0 to minus 5 percent.

3.17 REPORTING

A. Initial Construction Phase Report: Based on examination of Contract Documents as specified in Examination Article of this Section, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.18 FINAL REPORT

A. General: Typewritten or computer printout in letter quality font, on standard bond paper, in 3 ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.

2. Fan curves.

3. Manufacturers' test data.

4. Field test reports prepared by system and equipment installers.

5. Other information relative to equipment performance, but do not include shop drawings and product data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.

2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outside, return, and exhaust air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet and dry bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.

f. Inlet vane settings for variable air volume systems.

g. Settings for supply air, static pressure controller.

h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.

2. Water and steam flow rates.

3. Duct, outlet, and inlet sizes.

4. Pipe and valve sizes and locations.

5. Terminal units.

6. Balancing stations.

7. Position of balancing devices.

F. Air Handling Unit Test Reports: For air handling units with coils, include the following:

1. Unit Data: Include the following:

a. Unit identification.

b. Location.

c. Make and type.

d. Model number and unit size.

e. Manufacturer's serial number.

f. Unit arrangement and class.

g. Discharge arrangement.

h. Sheave make, size in inches, and bore.

i. Sheave dimensions, center to center, and amount of adjustments in inches.

j. Number of belts, make, and size.

k. Number of filters, type, and size.

2. Motor Data:

a. Make and frame type and size.

b. hp and rpm.

c. Volts, phase, and hertz.

d. Full load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Sheave dimensions, center to center, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.

b. Total system static pressure in iwg.

c. Fan rpm.

d. Discharge static pressure in iwg.

e. Filter static pressure differential in iwg.

f. Preheat coil static pressure differential in iwg.

g. Cooling coil static pressure differential in iwg.

h. Heating coil static pressure differential in iwg.

i. Outside airflow in cfm.

j. Return airflow in cfm.

k. Outside air damper position.

l. Return air damper position.

m. Vortex damper position.

G. Apparatus Coil Test Reports:

1. Coil Data:
    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch on center (oc).
    f. Make and model number.
    g. Face area in square feet.
    h. Tube size in NPS.
    i. Tube and fin materials.
    j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
    a. Airflow rate in cfm.
    b. Average face velocity in fpm.
    c. Air pressure drop in iwg.
    d. Outside air, wet and dry bulb temperatures in degrees Fahrenheit.
    e. Return air, wet and dry bulb temperatures in degrees Fahrenheit.
    f. Entering air, wet and dry bulb temperatures in degrees Fahrenheit.
    g. Leaving air, wet and dry bulb temperatures in degrees Fahrenheit.
    h. Water flow rate in gpm.
    i. Water pressure differential in feet of head or psig.
    j. Entering water temperature in degrees Fahrenheit.
    k. Leaving water temperature in degrees Fahrenheit.
    l. Refrigerant expansion valve and refrigerant types.
    m. Refrigerant suction pressure in psig.

n. Refrigerant suction temperature in degrees Fahrenheit.

o. Inlet steam pressure in pounds in psig.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.

b. Location.

c. Make and type.

d. Model number and size.

e. Manufacturer's serial number.

f. Arrangement and class.

g. Sheave make, size in inches, and bore.

h. Sheave dimensions, center to center, and amount of adjustments in inches.

2. Motor Data:

a. Make and frame type and size.

b. hp and rpm.

c. Volts, phase, and hertz.

d. Full load amperage and service factor.

e. Sheave make, size in inches, and bore.

f. Sheave dimensions, center to center, and amount of adjustments in inches.

g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.

b. Total system static pressure in iwg.

c. Fan rpm.

d. Discharge static pressure in iwg.

e. Suction static pressure in iwg.

I. Round, Flat Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross section and record the following:

1. Report Data:

a. System and air handling unit number.

b. Location and zone.

c. Traverse air temperature in degrees Fahrenheit.

d. Duct static pressure in iwg.

e. Duct size in inches.

f. Duct area in square feet.

g. Indicated airflow rate in cfm.

h. Indicated velocity in fpm.

i. Actual airflow rate in cfm.

j. Actual average velocity in fpm.

k. Barometric pressure in psig.

J. Air Terminal Device Reports:

1. Unit Data:

a. System and air handling unit identification.

b. Location and zone.

c. Test apparatus used.

d. Area served.

e. Air terminal device make.

f. Air terminal device number from system diagram.

g. Air terminal device type and model number.

h. Air terminal device size.

i. Air terminal device effective area in square feet

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.

b. Air velocity in fpm.

c. Preliminary airflow rate as needed in cfm.

d. Preliminary velocity as needed in fpm.

e. Final airflow rate in cfm.

f. Final velocity in fpm.

g. Space temperature in degrees Fahrenheit.

K. System Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air handling unit identification.

b. Location and zone.

c. Room or riser served.

d. Coil make and size.

e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.

b. Entering water temperature in degrees Fahrenheit.

c. Leaving water temperature in degrees Fahrenheit.

d. Water pressure drop in feet of head or psig.

e. Entering air temperature in degrees Fahrenheit.

f. Leaving air temperature in degrees Fahrenheit.

L. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand alone refrigerant compressors, air cooled condensing units, or water cooled condensing units, include the following:

1. Unit Data:

    a. Unit identification.

    b. Location.

    c. Unit make and model number.

    d. Compressor make.

    e. Compressor model and serial numbers.

    f. Refrigerant weight in pounds.

    g. Low ambient temperature cutoff in degrees Fahrenheit.

2. Test Data (Indicated and Actual Values):

    a. Inlet duct static pressure in iwg.

    b. Outlet duct static pressure in iwg.

    c. Entering air, dry bulb temperature in degrees Fahrenheit.

    d. Leaving air, dry bulb temperature in degrees Fahrenheit.

    e. Condenser entering water temperature in degrees Fahrenheit.

    f. Condenser leaving water temperature in degrees Fahrenheit.

    g. Condenser water temperature differential in degrees Fahrenheit.

    h. Condenser entering water pressure in feet of head or psig.

    i. Condenser leaving water pressure in feet of head or psig.

    j. Condenser water pressure differential in feet of head or psig.

    k. Control settings.

    l. Unloader set points.

    m. Low pressure cutout set point in psig.

    n. High pressure cutout set point in psig.

o. Suction pressure in psig.

p. Suction temperature in degrees Fahrenheit.

q. Condenser refrigerant pressure in psig.

r. Condenser refrigerant temperature in degrees Fahrenheit.

s. Oil pressure in psig.

t. Oil temperature in degrees Fahrenheit.

u. Voltage at each connection.

v. Amperage for each phase.

w. Kilowatt input.

x. Crankcase heater kilowatt.

y. Number of fans.

z. Condenser fan rpm.

aa. Condenser fan airflow rate in cfm.

bb. Condenser fan motor make, frame size, rpm, and hp.

cc. Condenser fan motor voltage at each connection.

dd. Condenser fan motor amperage for each phase.

M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.

b. Location.

c. Service.

d. Make and size.

e. Model and serial numbers.

f. Water flow rate in gpm.

g. Water pressure differential in feet of head or psig.

h. Required net positive suction head in feet of head or psig.

i. Pump rpm.

j. Impeller diameter in inches.

k. Motor make and frame size.

l. Motor hp and rpm.

m. Voltage at each connection.

n. Amperage for each phase.

o. Full load amperage and service factor.

p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.

b. Pump shutoff pressure in feet of head or psig.

c. Actual impeller size in inches.

d. Full open flow rate in gpm.

e. Full open pressure in feet of head or psig.

f. Final discharge pressure in feet of head or psig.

g. Final suction pressure in feet of head or psig.

h. Final total pressure in feet of head or psig.

i. Final water flow rate in gpm.

j. Voltage at each connection.

k. Amperage for each phase.

N. Boiler Test Reports:

1. Unit Data:

a. Unit identification.

b. Location.

c. Service.

d. Make and type.

e. Model and serial numbers.

f. Fuel type and input in British thermal units per hour (Btuh).

g. Number of passes.

h. Ignition type.

i. Burner control types.

j. Voltage at each connection.

k. Amperage for each phase.

2. Test Data (Indicated and Actual Values):

a. Operating pressure in psig.

b. Operating temperature in degrees Fahrenheit.

c. Entering water temperature in degrees Fahrenheit.

d. Leaving water temperature in degrees Fahrenheit.

e. Number of safety valves and sizes in NPS.

f. Safety valve settings in psig.

g. High limit setting in psig.

h. Operating control setting.

i. High fire set point.

j. Low fire set point.

k. Voltage at each connection.

l. Amperage for each phase.

m. Draft fan voltage at each connection.

n. Draft fan amperage for each phase.

o. Manifold pressure in psig.

O. Indoor Air Quality Measurement Reports for Each HVAC System:

1. HVAC system designation.
2. Date and time of test.
3. Outdoor temperature, relative humidity, wind speed, and wind direction at start of test.
4. Room number or similar description for each location.
5. Measurements at each location.
6. Observed deficiencies.

P. Instrument Calibration Reports:

1. Report Data:
   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of use.
   e. Dates of calibration.

3.19 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Randomly check the following for each system:
   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure water flow of at least 5 percent of terminals.
   c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.

d. Measure sound levels at 2 locations.

e. Measure space pressure of at least 10 percent of locations.

f. Verify that balancing devices are marked with final balance position.

g. Note deviations to Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Engineer.

2. TAB firm test and balance engineer shall conduct the inspection in the presence of Engineer.

3. Engineer shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8 hour business day.

4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed in the Tolerances Article of this Section, the measurements shall be noted as failed.

5. If the number of failed measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

6. TAB firm shall recheck measurements and make adjustments. Revise the final report and balancing device settings to include changes and resubmit the final report.

7. Request a second final inspection. If the second final inspection also fails, Engineer shall contract the services of another TAB firm to complete the testing and balancing in conformance with Contract Documents and deduct the cost of the services from the final payment.

3.20 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near peak summer and winter conditions.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Insulation materials

B. Field applied jackets

C. Accessories and attachments

D. Vapor retarders

1.2 RELATED SECTIONS

A. Section 23 31 13 - Metal Ducts

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires duct insulation.

1.4 REFERENCES

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

E. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Removable insulation sections at access panels.

2. Application of field applied jackets.

3. Applications at linkages for control devices.

C. Samples: For each type of insulation and field applied jacket. Identify each sample, describing product and intended use. Submit 12 inch square sections of each sample material.

1. Manufacturer's Color Charts: Show the full range of colors available for each type of field applied finish material indicated.

1.6 QUALITY ASSURANCE

A. Fire Test Response Characteristics: As determined by testing materials identical to those specified in this Section conforming to ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame spread rating of 25 or less, and smoke developed rating of 50 or less.

2. Insulation Installed Outdoors: Flame spread rating of 75 or less, and smoke developed rating of 150 or less.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.8 SCHEDULING

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mineral Fiber Insulation:

1. CertainTeed Manson.
2. Knauf FiberGlass GmbH.
3. Owens Corning Fiberglass Corporation

2.2 INSULATION MATERIALS

A. Mineral Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IB, without facing and with service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

B. Mineral Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II, without facing and with service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

2.3 FIELD APPLIED JACKETS

A. Foil and Paper Jacket: Laminated, glass fiber reinforced, flame retardant kraft paper and aluminum foil.

B. PVC Jacket: High impact, ultraviolet resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.
2. PVC Jacket Color: White

C. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B209/B209M, and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness and corrugation dimensions are scheduled at the end of this Section.

1. Finish: Smooth finish.
2. Finish: Cross crimp corrugated finish.
3. Finish: Stucco embossed finish.

4. Finish: Factory painted finish.

5. Moisture Barrier: 1-mil thick, heat bonded polyethylene and kraft paper.

D. Stainless Steel Jacket: Deep corrugated sheets of stainless steel complying with ASTM A666, Type 316; 0.10 inch thick; and roll stock ready for shop or field cutting and forming to indicated sizes.

1. Moisture Barrier: 1-mil thick, heat bonded polyethylene and kraft paper.

2. Moisture Barrier: 3-mil thick, heat bonded polyethylene and kraft paper.

3. Jacket Bands: Stainless steel, Type 316, 3/4 inch wide.

2.4 ACCESSORIES AND ATTACHMENTS

A. All Service Jacket (ASJ) Tape: White vapor retarder tape matching factory applied jacket with acrylic adhesive, complying with ASTM C11366.

1. Tape Width: 3 inches.

2. Thickness: 11.5 mils.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Bands: 3/4 inch wide, in 1 of the following materials compatible with jacket:

1. Stainless Steel: ASTM A666, Type 304; 0.020 inch thick.

2. Galvanized Steel: 0.005 inch thick.

3. Aluminum: 0.007 inch thick.

4. Brass: 0.010 inch thick.

5. Nickel Copper Alloy: 0.005 inch thick.

C. Wire: 0.080 inch, nickel copper alloy; 0.062 inch, soft annealed, stainless steel; or 0.062 inch, soft annealed, galvanized steel.

D. Weld Attached Anchor Pins and Washers: Copper coated steel pin for capacitor discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

1. Welded Pin Holding Capacity: 100 pounds for direct pull perpendicular to the attached surface.

E. Adhesive Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 pounds for direct pull perpendicular to the adhered surface.

F. Self Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes conforming to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.

3. Vapor Retarder Mastics: Where vapor retarders are required, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation conforming to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor retarder mastic and pressure sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor retarder seal.

2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.

3. Seal insulation to roof flashing with vapor retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire rated walls and partitions.

Q. Fire Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor retarder mastic.

3.4 MINERAL FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to surfaces of fittings and transitions.

3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches on center.

    b. On duct sides with dimensions larger than 18 inches. Space 16 inches on center each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

    c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

    d. Do not overcompress insulation during installation.

4. Impale insulation over anchors and attach speed washers.

5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2 inch staples, 1 inch on center, and cover with pressure sensitive tape having same facing as insulation.

7. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches on center.

8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat oval duct elbows with individually mitered gores cut to fit the elbow.

9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6 inch wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches on center.

10. Apply vapor retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to surfaces of fittings and transitions.

3. Space anchor pins as follows:

   a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches on center.

   b. On duct sides with dimensions larger than 18 inches. Space 16 inches on center each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

   c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

   d. Do not overcompress insulation during installation.

4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2 inch staples, 1 inch on center, and cover with pressure sensitive tape having same facing as insulation.

6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6 inch wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches on center.

8. Apply vapor retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to ducts and plenums as follows:

1. Follow the manufacturer's written instructions for applying insulation.

2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that shall allow passage of air to the duct and plenum surface.

3.6 FIELD APPLIED JACKET APPLICATION

A. Apply glass cloth jacket, where indicated, directly over bare insulation or insulation with factory applied jackets.

1. Apply jacket smooth and tight to surface with 2 inch overlap at seams and joints.

2. Embed glass cloth between two 0.062 inch thick coats of jacket manufacturer's recommended adhesive.

3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.7 FINISHES

A. Glass Cloth Jacketed Insulation: Paint insulation finished with glass cloth jacket.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply 2 coats of insulation manufacturer's recommended protective coating at manufacturer's recommended thickness.

C. Color: Final color as selected by Engineer. Vary first and second coats to allow visual inspection of the completed Work.

3.8 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

1. Indoor concealed supply and return ductwork.

2. Indoor exposed supply and return ductwork.

3. Outdoor exposed supply and return ductwork.

D. Items Not Insulated: Unless otherwise indicated on Drawings, do not apply insulation to the following systems, materials, and equipment:

1. Fibrous glass ducts.

2. Metal ducts with duct liner.

3. Factory insulated flexible ducts.

4. Factory insulated plenums, casings, terminal boxes, and filter boxes and sections.

5. Flexible connectors.

6. Vibration control devices.

7. Testing agency labels and stamps.

8. Nameplates and data plates.

9. Access panels and doors in air distribution systems.

3.9 INTERIOR INSULATION APPLICATION SCHEDULE

A. Indoor Duct and Plenum Application Schedule:

1. Service: Round, supply air ducts, concealed, in return air plenum.

a. Material: Mineral fiber blanket.

b. Thickness: 1-1/2 inch to achieve the minimum code required thermal (R) value.

c. Number of Layers: 1

d. Vapor Retarder Required: Yes.

2. Service: Round, return air ducts, concealed, in return air plenum.

a. Material: Mineral fiber blanket.

b. Thickness: 1-1/2 inch to achieve the minimum code required thermal (R) value.

c. Number of Layers: 1

d. Vapor Retarder Required: Yes.

3. Service: Rectangular, supply air ducts, concealed, in return air plenum.

a. Material: Mineral fiber blanket.

b. Thickness: 1-1/2 inch to achieve the minimum code required thermal (R) value.

c. Number of Layers: 1

d. Vapor Retarder Required: Yes.

4. Service: Rectangular, return air ducts, concealed, in return air plenum.

a. Material: Mineral fiber blanket.

b. Thickness: 1-1/2 inch to achieve the minimum code required thermal (R) value.

c. Number of Layers: 1

d. Vapor Retarder Required: Yes.

5. Service: Round, supply air ducts, exposed.

a. Material: Mineral fiber lined insulation board (Circ-liner).

b. Thickness: 1 inch to achieve the minimum code required thermal (R) value.

c. Number of Layers: 1

d. Vapor Retarder Required: Yes.

6. Service: Round, return air ducts, exposed.
    a. Material: Mineral fiber lined insulation board (Circ-liner).
    b. Thickness: 1 inch to achieve the minimum code required thermal (R) value.
    c. Number of Layers: 1
    d. Vapor Retarder Required: Yes.
7. Service: Rectangular, supply air ducts, exposed.
    a. Material: Mineral fiber lined insulation board (Circ-liner).
    b. Thickness: 1 inch to achieve the minimum code required thermal (R) value.
    c. Number of Layers: 1
    d. Vapor Retarder Required: Yes.
8. Service: Rectangular, return air ducts, exposed.
    a. Material: Mineral fiber lined insulation board (Circ-liner).
    b. Thickness: 1 inch to achieve the minimum code required thermal (R) value.
    c. Number of Layers: 1
    d. Vapor Retarder Required: Yes.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Insulation materials

B. Field applied jackets

C. Accessories and attachments

D. Vapor retarders

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 07 13 - Duct Insulation

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires HVAC equipment insulation.

1.4 REFERENCES

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product.

B. Samples: For each type of insulation and field applied jacket. Identify each Sample, describing product and intended use. Submit 12 inch square sections of each sample material.

1. Manufacturer's Color Charts: Show the full range of colors available for each type of field applied finish material indicated.

C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

1.6 QUALITY ASSURANCE

A. Fire Test Response Characteristics: As determined by testing materials identical to those specified in this Section conforming to ASTM E84. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame spread rating of 25 or less, and smoke developed rating of 50 or less.

2. Insulation Installed Outdoors: Flame spread rating of 75 or less, and smoke developed rating of 150 or less.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate American Society for Testing Materials (ASTM) specification designation, type and grade, and maximum use temperature.

1.8 COORDINATION

A. Coordinate clearance requirements with equipment manufacturer for insulation application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mineral Fiber Insulation:

1. CertainTeed Manson

2. Knauf FiberGlass GmbH

3. Owens Corning Fiberglass Corporation

B. Flexible Elastomeric Thermal Insulation:

1. Armstrong World Industries, Inc.

2. Rubatex Corporation

2.2 INSULATION MATERIALS

A. Mineral Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II, without facing and with service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

B. Flexible Elastomeric Thermal Insulation: Closed cell, sponge or expanded rubber materials. Comply with ASTM C534/C534M, Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.

2. Ultraviolet Protective Coating: As recommended by insulation manufacturer.

2.3 FIELD APPLIED JACKETS

A. PVC Jacket: High impact, ultraviolet resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.

2. PVC Jacket Color: Color coded to match connected piping jackets based on materials contained within the piping system.

B. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B209/B209M, and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness and corrugation dimensions are scheduled at the end of this Section.

1. Finish: Smooth finish.

C. Stainless Steel Jacket: Deep corrugated sheets of stainless steel complying with ASTM A666, Type 316; 0.10 inch thick; and roll stock ready for shop or field cutting and forming to indicated sizes.

1. Moisture Barrier: 1-mil thick, heat bonded polyethylene and kraft paper.

2. Jacket Bands: Stainless steel, Type 316, 3/4 inch wide.

2.4 ACCESSORIES AND ATTACHMENTS

A. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A666, Type 316; 0.020 inch thick.

2. Galvanized Steel: 0.005 inch thick.

3. Aluminum: 0.007 inch thick.

4. Brass: 0.010 inch thick.

5. Nickel Copper Alloy: 0.005 inch thick.

B. Wire: 0.080 inch, nickel copper alloy; 0.062 inch, soft annealed, stainless steel; or 0.062 inch, soft annealed, galvanized steel.

C. Adhesive Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 pounds for direct pull perpendicular to the adhered surface.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes in conformance with the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of equipment.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each equipment system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either the wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor retarder integrity, unless otherwise indicated on Drawings.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.

3. Vapor Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges and fittings.

M. Cut insulation in conformance with manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor retarder mastic on equipment scheduled to receive vapor retarders. Overlap insulation facing at seams and seal with vapor retarder mastic and pressure sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor retarder seal.

O. Insulate the following indoor equipment:

1. Heating hot water air separators (small tanks).

2. Heating hot water expansion tanks (small tanks).

3. Heating hot water pumps.

P. Insulate the following outdoor equipment:

1. Chilled water air separators (small tanks).

2. Chilled water expansion tanks (small tanks).

3. Chilled water pumps.

Q. Omit insulation from the following:

1. Vibration control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Maintenance holes.

5. Handholes.

6. Cleanouts.

3.4 TANK AND VESSEL INSULATION APPLICATION

A. Blankets, Board, and Block Applications for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives conforming to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of tank and vessel surfaces.

2. Groove and score insulation materials to fit as closely as possible to the equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joint. Stagger end joints.

3. Protect exposed corners with secured corner angles.

4. Install adhesive attached or self adhesive anchor pins and speed washers on sides of tanks and vessels as follows:

   a. Do not weld anchor pins to American Society for Mechanical Engineers (ASME) labeled pressure vessels.

   b. On tank and vessel, 3 inches maximum from insulation end joints, and 16 inches on center in both directions.

   c. Do not overcompress insulation during installation.

   d. Cut and miter insulation segments to fit curved sides and dome heads of tanks and vessels.

5. Impale insulation over anchor pins and attach speed washers.

6. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing

7. Secure each layer of insulation with stainless steel bands.

8. Stagger joints between insulation layers at least 3 inches.

9. Apply insulation in removable segments on equipment access doors and other elements that require frequent removal for service.

10. Bevel and seal insulation ends around maintenance holes, handholes, ASME stamps, and nameplates.

11. Apply vapor retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

B. Flexible Elastomeric Thermal Insulation Applications for Tanks and Vessels: Apply insulation over entire surface of tanks and vessels according to the manufacturer's written instructions.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.

2. Seal longitudinal seams and end joints.

3.5 FIELD APPLIED JACKET APPLICATION

A. Apply glass cloth jacket where indicated, directly over bare insulation or insulation with factory applied jackets.

1. Apply jacket smooth and tight to surface with 2 inch overlap at seams and joints.

2. Embed glass cloth between two 0.062 inch thick coats of jacket manufacturer's recommended adhesive.

3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.

2. Apply lap or joint strips with the same material as jacket.

3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Apply jackets with 1-1/2 inch laps at longitudinal seams and 3 inch wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor retarder jackets and exposed insulation with vapor retarder mastic.

C. PVC Jackets: Apply jacket with longitudinal seams along top and bottom of tanks and vessels for horizontal applications. Secure and seal seams and end joints with manufacturer's welding adhesive.

1. Apply 2 continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along the seam and joint edge.

D. Aluminum Jackets: Secure jackets conforming to jacket manufacturer's written instructions.

E. Stainless Steel Jackets: Secure jackets conforming to jacket manufacturer's written instructions.

3.6 FINISHES

A. Glass Cloth Jacketed Insulation: Paint insulation finished with glass cloth jacket.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply 2 coats of insulation manufacturer's recommended protective coating at manufacturer's recommended thickness.

C. Color: White or gray. Vary first and second coats to allow visual inspection of the completed Work.

3.7 EQUIPMENT APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

3.8 INTERIOR EQUIPMENT INSULATION APPLICATION SCHEDULE

A. Equipment: Heating hot water air separators and expansion tanks.

1. Operating Temperature: 100 to 200 degrees Fahrenheit (F).

2. Insulation Material: Mineral fiber.

3. Insulation Thickness: 2 inches

4. Field Applied Jacket: Aluminum.

a. Aluminum Thickness: 0.032 inch.

b. Corrugation Dimension: 1-1/4 inch by 1/4 inch.

5. Vapor Retarder Required: Yes.

6. Finish: None.

B. Equipment: Heating hot water pumps.

1. Operating Temperature: 100 to 200 degrees F.
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 2 inches
4. Field Applied Jacket: PVC, 20 mils thick.
    a. Aluminum Thickness: 0.032 inch.
    b. Corrugation Dimension: 1-1/4 inch by 1/4 inch.
5. Vapor Retarder Required: Yes.
6. Finish: Color coded by system.

3.9 EXTERIOR EQUIPMENT INSULATION APPLICATION SCHEDULE

A. Equipment: Chilled water air separators and expansion tanks.

1. Operating Temperature: 42 to 60 degrees F.
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 1 inch
4. Field Applied Jacket: Aluminum with Z-shaped locking seam.
    a. Aluminum Thickness: 0.032 inch.
    b. Corrugation Dimension: None.
5. Vapor Retarder Required: Yes.
6. Finish: Stucco embossed.

B. Equipment: Chilled water pumps.

1. Operating Temperature: 42 to 60 degrees F.
2. Insulation Material: Flexible elastomeric.
3. Insulation Thickness: 1 inch
4. Field Applied Jacket: Aluminum with Z-shaped locking seam.
    a. Aluminum Thickness: 0.032 inch.
    b. Corrugation Dimension: None.
5. Vapor Retarder Required: Yes.
6. Finish: Stucco embossed.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Insulation materials

B. Field applied jackets

C. Tapes

D. Securements

E. Sealants

1.2 RELATED SECTIONS

A. Section 07 84 01 - Firestopping and Smokestopping

B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid included in each corresponding bid item of Bid Proposal Line Items that requires HVAC piping insulation.

1.4 REFERENCES

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

C. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

D. ASTM C871 - Standard Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate, and Sodium Ions.

E. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

F. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

2. Detail insulation application at pipe expansion joints for each type of insulation.

3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

4. Detail removable insulation at piping specialties.

C. Qualification Data: For qualified installer.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.6 QUALITY ASSURANCE

A. Surface Burning Characteristics: For insulation and related materials, as determined by testing identical products conforming to ASTM E84, by a testing and inspecting agency acceptable to Engineer. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame spread index of 25 or less, and smoke developed index of 50 or less.

2. Insulation Installed Outdoors: Flame spread index of 75 or less, and smoke developed index of 150 or less.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.8 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT Section.

B. Coordinate clearance requirements with piping installer for piping insulation application. Before preparing piping shop drawings, establish and maintain clearance requirements for installation of insulation and field applied jackets and finishes and for space required for maintenance.

1.9 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 parts per million (ppm) when tested conforming to ASTM C871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable conforming to ASTM C795.

D. Foam insulation materials shall not use chlorofluorocarbon (CFC) or hydrochlorafluorocarbon (HCFC) blowing agents in the manufacturing process.

E. Mineral Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type I.

1. Products:
    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.

F. Mineral Fiber, Preformed Pipe Insulation:
1. Products:
    a. Johns Manville; Micro-Lok.
    b. Knauf Insulation; 1,000 Degree Pipe Insulation.
    c. Owens Corning; Fiberglas Pipe Insulation.

G. Flexible Elastomeric Insulation: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Comply with ASTM C553, Type I.
1. Products:
    a. Armacell LLC Armaflex
    b. Aeroflex USA, Inc. Aerocel
    c. K-Flex USA Insul-sheet

2.2 FIELD APPLIED JACKETS

A. PVC Jacket: High impact resistant, UV resistant PVC complying with ASTM D1784 , Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field applied jacket schedules.
1. Products:
    a. Johns Manville: Zeston 2000 Series.
    b. P.I.C. Plastics, Inc.: FG Series.
    c. Proto Corporation: LoSmoke.
2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.

4. Factory fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45 and 90 degree, short and long radius elbows, tees, valves, flanges, unions, reducers, end caps, soil pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

B. Aluminum Jacket: Comply with ASTM B209/B209M, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.

    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.

    c. RPR Products, Inc.; Insul-Mate.

2. Factory cut and rolled to size.

3. Finish and thickness are indicated in field applied jacket schedules.

4. Moisture Barrier for Indoor Applications: 1-mil thick, heat bonded polyethylene and kraft paper, 3-mil thick, heat bonded polyethylene and kraft paper, 2.5-mil thick polysurlyn.

5. Moisture Barrier for Outdoor Applications: 3-mil thick, heat bonded polyethylene and kraft paper 2.5-mil thick polysurlyn.

6. Factory Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.

    b. Preformed 2 piece or gore, 45 and 90 degree, short and long radius elbows.

    c. Tee covers.

    d. Flange and union covers.

    e. End caps.

    f. Beveled collars.

    g. Valve covers.

h. Field fabricate fitting covers only if factory fabricated fitting covers are not available.

2.3 TAPES

A. ASJ Tape: White vapor retarder tape matching factory applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Products:

a. ABI, Ideal Tape Division: 428 AWF ASJ.

b. Avery Dennison Corporation, Specialty Tapes Division: Fasson 0836.

c. Compac Corporation: 104 and 105.

2. Width: 3 inches.

3. Thickness: 11.5 mils

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 pound force (lbf)/inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil face, vapor retarder tape matching factory applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Products:

a. ABI, Ideal Tape Division: 491 AWF FSK.

b. Avery Dennison Corporation, Specialty Tapes Division: Fasson 0827.

c. Compac Corporation: 110 and 111.

2. Width: 3 inches.

3. Thickness: 6.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 pound force lbf/inch in width.

7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor retarder tape matching field applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products:

a. ABI, Ideal Tape Division: 370 White PVC tape.

b. Compac Corporation: 130.

c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.

3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.

5. Elongation: 500 percent.

6. Tensile Strength: 18 pound force lbf/inch in width.

D. Aluminum Foil Tape: Vapor retarder tape with acrylic adhesive.

1. Products:

a. ABI, Ideal Tape Division: 488 AWF.

b. Avery Dennison Corporation, Specialty Tapes Division: Fasson 0800.

c. Compac Corporation: 120.

d. Venture Tape: 3520 CW.

2. Width: 2 inches

3. Thickness: 3.7 mils.

4. Adhesion: 100 ounces force/inch in width.

5. Elongation: 5 percent.

6. Tensile Strength: 34 pound force lbf/inch in width.

2.4 SECUREMENTS

A. Aluminum Bands: ASTM B209/B209M, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch 3/4 inch wide with closed seal.

1. Products::

    a. ITW Insulation Systems: Gerrard Strapping and Seals.

    b. RPR Products, Inc.: Insul Mate Strapping, Seals, and Springs.

B. Staples: Outward clinching insulation staples, nominal 3/4 inch wide, stainless steel or Monel.

C. Wire: 0.062 inch soft annealed, stainless steel.

1. Manufacturer:

    a. C & F Wire

2.5 SEALANTS

A. Flashing Sealant: Nonslumping, fire and water resistant, flexible, elastomeric sealant, compatible with insulation materials, jackets and substrates.

B. Service Temperature Range: Minus 40 to plus 250 degrees Fahrenheit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.

3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3 inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches on center.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches 4 inches on center.

a. For below ambient services, apply vapor barrier mastic over staples.

4. Cover joints and seams with tape, conforming to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Maintenance holes.

5. Handholes.

6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire rated walls and partitions.

1. Comply with requirements in FIRESTOPPING AND SMOKESTOPPING Section for firestopping and fire resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire rated assemblies. Comply with requirements in FIRESTOPPING AND SMOKESTOPPING Section.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this Article generally apply to insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor retarder integrity unless otherwise indicated on Drawings.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric reinforcing mesh. Trowel the mastic to a smooth and well shaped contour.

8. For services not specified to receive a field applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word union. Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated on Drawings. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the 2 part section on the vertical center line of valve body.

4. When covers are made from block insulation, make 2 halves, each consisting of mitered blocks wired to stainless steel fabric. Secure wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR GLASS INSULATION

A. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular glass block insulation of same thickness as pipe insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure conforming to manufacturer's written instructions.

2. When preformed sections of insulation are not available, install mitered sections of cellular glass insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular glass insulation to valve body.

2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF MINERAL FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor barrier mastic and joint sealant.

3. For insulation with factory applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches on center.

4. For insulation with factory applied jackets on below ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated on Drawings, install with 1 inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply 2 continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2 inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches on center and at end joints.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than 1 material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated on Drawings, do not install insulation on the following:

1. Drainage piping located in crawl spaces.

2. Underground piping.

3. Chrome plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot Gas Piping: Flexible elastomeric, 1.5 inch thick, with PVC jacket, 30 mils thick.

B. Heating Hot Water Supply and Return, 200 Degrees Fahrenheit and Below:

1. Smaller than NPS 1.5: Insulation shall be the following:

a. Mineral Fiber, Preformed Pipe, Type I: 1-1/2 inch thick, with PVC jacket, 30 mils thick.

2. NPS 1.5 and less than NPS 4: Insulation shall be the following:

a. Mineral Fiber, Preformed Pipe, Type I: 2 inch thick, with PVC jacket, 30 mils thick.

C. Chilled Water Supply and Return

1. Smaller than NPS 1.5: Insulation shall be the following:

a. Flexible elastomeric, 3/4 inch thick, with PVC jacket, 30 mils thick.

2. NPS 1.5 and larger: Insulation shall be the following:

a. Flexible elastomeric, 1 inch thick, with PVC jacket, 30 mils thick.

3.11 OUTDOOR PIPING INSULATION SCHEDULE

A. Chilled Water Supply and Return:

1. Smaller than NPS 1.5: Insulation shall be the following:

a. Flexible elastomeric, 3/4 inch thick, with aluminum jacket.

2. NPS 1.5 and larger: Insulation shall be the following:

a. Flexible elastomeric, 1 inch thick, with aluminum jacket.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Mechanical subcontractor responsibilities

B. Controls subcontractor responsibilities

C. Testing, adjusting, and balancing (TAB) contractor responsibilities

1.2 RELATED SECTIONS

A. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires commissioning of HVAC.

1.4 REFERENCES

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition.

B. NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems.

1.5 DEFINITIONS

A. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean as-built systems, subsystems, equipment, and components.

1.6 SUBMITTALS

A. Qualification Data: For building automation system (BAS) and HVAC Testing Technician.

B. Construction checklists for the following:

1. Vibration and seismic controls for HVAC piping and equipment.

2. Instrumentation and control for HVAC.

3. Chilled water piping and accessories.

4. Heating water piping and accessories.
5. Refrigerant piping.
6. Metal ducts and accessories.
7. Fans.
8. Particulate air filtration.
9. Air handling units. (built-up)
10. Fan coils.
11. Computer room units.
12. Boilers.
13. Pumps.
14. Evaporative refrigerant condensers.
15. Refrigerant compressors.
16. Chillers.

1.7 QUALITY ASSURANCE

A. BAS Testing Technician Qualifications: Technicians to perform BAS construction checklist verification tests, construction checklist verification test demonstrations, commissioning tests, and commissioning test demonstrations shall have the following minimum qualifications:

1. Journey level or equivalent skill level with knowledge of BAS, HVAC, electrical concepts, and building operations.
2. Minimum five years experience installing, servicing, and operating systems manufactured by approved manufacturer.
3. International Society of Automation (ISA) Certified Control Systems Technician (CCST) Level I.

B. HVAC Testing Technician Qualifications: Technicians to perform HVAC construction checklist verification tests, construction checklist verification test demonstrations, commissioning tests, and commissioning test demonstrations shall have the following minimum qualifications:

1. Journey level or equivalent skill level. Vocational School 4-year program graduate or an Associates degree in mechanical systems, air conditioning, or similar field. Degree may be offset by 3 years' experience in servicing mechanical systems in HVAC industry. Generally, required knowledge includes HVAC systems, electrical concepts, building operations, and application and use of tools and instrumentation to measure performance of HVAC equipment, assemblies, and systems.
2. Minimum 5 years experience installing, servicing, and operating systems manufactured by approved manufacturer.
3. One of the following:
    a. National Environmental Balancing Bureau (NEBB) NEBB (TAB).
    b. Associated Air Balance Council (AABC) AABC (NSTSB).
    c. Engineer retains the right to waive NEBB (TAB) or AABC (NSTSB) Certification.

C. Testing Equipment and Instrumentation Quality and Calibration: For test equipment and instrumentation required to perform HVAC commissioning work, perform the following:

1. Submit test equipment and instrumentation list. For each equipment or instrument, identify the following:
    a. Equipment/instrument identification number.
    b. Planned commissioning application or use.
    c. Manufacturer, make, model, and serial number.
    d. Calibration history, including certificates from agencies that calibrate the equipment and instrumentation.
2. Test equipment and instrumentation shall meet the following criteria:
    a. Capable of testing and measuring performance within the specified acceptance criteria.
    b. Be calibrated at the manufacturer's recommended intervals with current calibration tags permanently affixed to the instrument being used.

c. Be maintained in good repair and operating condition throughout the duration of use on Project.

d. Be recalibrated/repaired if dropped or damaged in any way since last calibrated.

D. Proprietary Test Instrumentation and Tools:

1. Equipment Manufacturer's Proprietary Instrumentation and Tools: For installed equipment included in the commissioning process, test instrumentation and tools manufactured or prescribed by equipment manufacturer to service, calibrate, adjust, repair, or otherwise work on its equipment or required as a condition of equipment warranty, perform the following:

a. Submit proprietary instrumentation and tools list. For each instrument or tool, identify the following:

1) Instrument or tool identification number.

2) Equipment schedule designation of equipment for which the instrument or tool is required.

3) Manufacturer, make, model, and serial number.

4) Calibration history, including certificates from agencies that calibrate the instrument or tool, where appropriate.

b. Include a separate list of proprietary test instrumentation and tools in the operation and maintenance manuals.

c. HVAC proprietary test instrumentation and tools become the property of Engineer at the time of Substantial Completion.

1.8 RESPONSIBILITIES

A. Mechanical, Controls, and Test and Balance (TAB) Subcontractors: The commissioning responsibilities applicable to each of the subcontractors are as follows (references apply to commissioned equipment only):

1. Attend a commissioning kickoff meeting and other meetings necessary to facilitate the commissioning process.

2. Provide the Commissioning Authority with normal cut sheets and submittals of commissioned equipment.

3. Provide additional requested documentation, prior to normal Operation and Maintenance manual submittals, to the Commissioning Authority for development of start-up and functional testing procedures.

4. Provide a copy of the Operation and Maintenance manuals and submittals of commissioned equipment to the Commissioning Authority for review.

5. Subcontractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

6. Subcontractors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

7. Execute the mechanical and electrical related portions of the pre-functional checklists for commissioned equipment.

8. Perform and clearly document completed startup and system operational checkout procedures, providing a copy to the Commissioning Authority.

9. Address current Engineer of Record punch list items before functional testing. TAB shall be completed with discrepancies and problems remedied before functional testing.

10. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests for sufficient duration to complete the necessary tests, adjustments and problem solving.

11. Correct deficiencies identified by the Commissioning Authority, Engineer, and Engineer of Record, and retest the equipment.

12. Prepare Operation and Maintenance (O&M) manuals conforming to Contract Documents.

13. Provide training of Department’s operating staff.

14. Record Department personnel training sessions and provide a copy in video file and CD formats to Engineer.

15. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

B. Mechanical subcontractor: The responsibilities of the mechanical subcontractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Provide startup for HVAC equipment.

2. Assist and cooperate with TAB subcontractor and Commissioning Authority by:

   a. Putting HVAC equipment and systems into operation as required.

   b. Including cost of sheaves and belts that may be required by TAB.

   c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Provide an approved plug.

   d. Providing temperature and pressure taps conforming to Construction Documents for TAB and commissioning testing.

3. Prepare a preliminary schedule for pipe system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the Commissioning Authority. Update the schedule as appropriate.

4. Notify the Engineer when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB shall occur.

5. Assist with functional testing on locally controlled equipment not part of the central building automation system.

C. Controls subcontractor. The responsibilities of the controls subcontractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals: The controls subcontractor’s submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in Specifications.

2. Control Drawings Submittal:

   a. The control drawings shall have a key to abbreviations.

   b. The control drawings shall contain graphic schematic depictions of the systems and each component.

c. The schematics shall include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

d. Provide a full points list.

e. The controls subcontractor shall keep the Commissioning Authority informed of changes to this list during programming and setup.

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with TAB subcontractor in the following manner:

a. Meet with TAB subcontractor prior to beginning TAB and review TAB plan to determine the capabilities of the control system toward completing TAB. Provide TAB any needed unique instruments that may be needed.

b. For a given area, have required pre-functional checklists, calibrations, startup and selected functional tests of the system completed and approved by Commissioning Authority prior to TAB.

c. Provide a qualified technician to operate the controls to assist TAB subcontractor.

5. Assist and cooperate with Commissioning Authority in the following manner:

a. Execute the functional testing of the controls system. Assist in the functional testing of equipment to be commissioned. Provide 2-way radios during the testing.

b. Execute control system trend logs.

6. The controls subcontractor shall prepare a written plan indicating in a step by step manner, the procedures that shall be followed to test, checkout and adjust the control system prior to functional performance testing.

7. Provide a signed and dated certification to Commissioning Authority and Engineer upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that allsystem programming is complete as to respects of the design intent and Contract Documents, except functional testing requirements.

8. As well as the control points necessary to execute documented control sequences, provide monitoring, control and virtual points.

9. List and clearly identify on the as-built duct and piping drawings the locations of static and differential pressure sensors (air, water, and building pressure).

10. The controls subcontractor is responsible for assisting Commissioning Authority throughout the entire commissioning process. The controls work is not complete until the Commissioning Authority and Engineer have signed off on the commissioned systems.

D. TAB subcontractor. The responsibilities of the TAB subcontractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Submit the outline of TAB plan and approach for each system and component to Commissioning Authority, Engineer and the controls subcontractor 6 weeks prior to starting TAB.

2. The submitted plan shall include:

   a. Certification that TAB subcontractor has reviewed the construction documents and the systems with the design engineers and subcontractors to sufficiently understand the design intent for each system.

   b. An explanation of the intended use of the building control system. The controls subcontractor shall comment on feasibility of the plan.

   c. Field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

   d. Discussion of what notations and markings shall be made on the duct and piping drawings during the process.

   e. Final test report forms to be used.

f. Detailed step by step procedures for TAB work for each system.

g. List of measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

h. Details of how total flow shall be determined.

i. The identification and types of measurement instruments to be used and their most recent calibration date.

j. Plan for hand written field technician logs of discrepancies, deficient or uncompleted Work by others, Contract interpretation requests and lists of completed tests. (scope and frequency)

3. A running log of events and issues shall be kept by TAB field technicians.

4. Communicate in writing to Contractor and the controls subcontractor setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

5. TAB shall mark on Drawings where traverse and other critical measurements were taken and cross reference the location in theTAB report.

6. Provide Commissioning Authority with any requested data, gathered, but not shown on the draft reports.

7. Provide calibrated instruments to assist Commissioning Authority in conducting calibration checks of sensors and any other devices requiring field checkout.

8. Provide a final TAB report for Commissioning Authority with details.

9. Conduct functional performance tests and checks on the original TAB.

10. The test and balance subcontractor is responsible for assisting Commissioning Authority throughout the entire commissioning process. This includes assistance with reading airflows, water flows, taking pressure measurements, temperature measurements, and providing any other readings requested by Commissioning Authority related to the commissioned equipment.

11. TAB work shall not be complete until signed off by Commissioning Authority and Engineer.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 STARTUP

A. Mechanical, TAB, and controls subcontractors have start-up responsibility and are required to complete systems and sub-systems so they are fully functional, meeting the design objectives of Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to Commissioning Authority or Engineer.

B. Functional testing is intended to begin upon completion of a system.

3.2 FUNCTIONAL TESTING

A. This Section presents representative functional testing requirements for HVAC systems and equipment.

B. Parties Responsible to Execute Functional Test:

1. Controls subcontractor shall operate the controls as needed.

2. Test and balance subcontractor shall take readings and assist with set up of equipment.

3. HVAC mechanical subcontractor or vendor shall assist in testing sequences as needed.

4. Commissioning Agent shall witness, direct and document testing but each subcontractor shall be responsible for documenting testing.

C. Testing and Acceptance criteria:

1. Test each sequence in the sequence of operations, and other significant modes and sequences not mentioned.

2. Ability of system to maintain the temperature and humidity range within prescribed tolerance.

3. Alarms.

4. For the conditions, sequences and modes tested, the BAS, integral components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and conforming to acceptable operating practice.

D. Required Monitoring:

1. Points requested by Commissioning Agent shall be trended by the controls subcontractor. The trending shall be for 7 days per week, 24 hours per day at 5 minute intervals or as requested by Commissioning Agent.

E. BAS Functional Testing:

1. A significant part of BAS functional testing requirements is the successful completion of the functional tests of equipment BAS controls or interlocks with. Uncompleted equipment functional tests or outstanding deficiencies in those tests lend the required BAS functional testing incomplete.

2. Integral or stand alone controls are functionally tested with the equipment they are attached to, including any interlocks with other equipment or systems.

3. In addition to the controlled equipment testing, the following tests are required for BAS, where features have been specified. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in Specifications.

a. Specified functions and features are set up, debugged and fully operable.

b. Power failure and battery backup and power-up restart functions if applicable.

c. Global commands features.

d. Security and access codes.

e. Occupant over-rides. (manual, telephone, key, keypad, and the like.)

f. O&M schedules and alarms if applicable.

g. Scheduling features fully functional and setup, including holidays.

h. Date and time setting in central computer and verify field panels read the same time.

i. Demonstrate functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad.

j. Graphic screens and value readouts completed.

k. Set-point changing features and functions.

l. Sensor calibrations.

m. Final as-builts or redlines (per spec) control drawings, final points list, program code, set-points, schedules, warranties, and the like, per specs, submitted for O&Ms.

n. Verify that points that are monitored only, having no control function, are checked for proper reporting to BAS.

o. Communication time between network controllers and field controllers.

p. Labeling of points.

3.3 WRITTEN WORK PRODUCTS

A. Written Work products shall consist of the filled out start-up, initial checkout and pre-functional checklists.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Instrumentation and controls for HVAC systems, including but not limited to control components for terminal heating and cooling units not supplied with factory wired controls.

1.2 RELATED SECTIONS

A. Section 23 33 00 - Air Duct Accessories

B. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires instrumentation and controls for HVAC.

1.4 REFERENCES

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating.

B. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks.

C. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

D. ASTM A536 - Standard Specification for Ductile Iron Castings.

E. IEEE 802.3 - IEEE Standard for Ethernet.

F. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats.

G. NFPA 70 - National Electrical Code.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

I. UL 486A-486B - Wire Connectors.

1.5 SYSTEM DESCRIPTION

A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multi user, multitasking environment on token passing network and programmed to control mechanical systems.

1.6 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, software interface, finishes for materials, and installation and startup instructions for each type of product indicated.

1. Each control device labeled with setting or adjustable range of control.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.

2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer installed and field installed wiring.

3. Details of control panel faces, including controls, instruments, and labeling.

4. Schedule of dampers including size, leakage, and flow characteristics.

5. Schedule of valves including leakage and flow characteristics.

6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.

7. Listing of connected data points, including connected control unit and input device.

8. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

9. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

10. Sequence of operation for equipment, including set points and alarms.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Building Automation and Control Networks (BACnet) Statement: Protocol Implementation Conformance Statement (PICS) for each direct digital control (DDC) system component (panel, zone controller, field devices, and operator workstation) proposed.

D. Samples: For each color required, of each type of thermostat cover.

E. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.

2. Program Software Backup: On a magnetic media or compact disc, complete with data files.

3. Device address list.

4. Printout of software application and graphic screens.

5. Software license required by and installed for DDC workstations and control systems.

F. Software Upgrade Kit: For Department use in modifying software to suit future power system revisions or monitoring and control revisions.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

H. Maintenance Data: Include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed air station.

2. Interconnection wiring diagrams with identified and numbered system components and devices.

3. Keyboard illustrations and step bystep procedures indexed for each operator function.

4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

5. Calibration records and list of set points.

I. Qualification Data: For firms and persons specified in Quality Assurance Article of this Section.

J. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise shop drawings to reflect actual installation and operating sequences.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the automatic control system manufacturer for both installation and maintenance of units required for Project.

B. Manufacturer Qualifications: A firm experienced in manufacturing automatic temperature control systems similar to those indicated for Project and with a record of successful in-service performance.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, Underwriters Laboratories, Incorporated (UL), and marked for intended use.

D. Comply with NFPA 90A.

E. Comply with ASHRAE Std 135 for DDC system control components.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Factory Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.9 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate supply of conditioned electrical circuits for control units and operator workstation.

C. Coordinate control of HVAC system to operate with any existing lighting, fire alarm or other control systems, as necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Control Systems Components:

1. Automated Logic,

2. Belimo Aircontrols (USA), Inc., https://www.belimo.com/us/en_US/

3. Honeywell, Inc.; Home & Building Control, https://buildings.honeywell.com/us/en

B. Electric, Electronic, and DDC Systems:

1. Johnson Controls, Inc.; Controls Group, https://www.johnsoncontrols.com/

2.2 DDC EQUIPMENT

A. Operator Station: Microcomputer station with printer.

B. Workstation: IBM compatible microcomputer with minimum configuration as follows:

1. Processor: Intel Xeon 8 Core, 3.1 GHz.

2. Random Access Memory: 12 GB.

3. Cache Memory: 24 GB.

4. Graphics: Video card with 2 digital visual interface (DVI) ports, minimum 1280 by 1024 pixels, 1.0-GB onboard video memory.

5. Monitor: 27 inches, wide screen, color, flat panel.

6. Keyboard: QWERTY, 105 keys in ergonomic shape.

7. Hard Disk Drive: 200 GB.

8. DVD Drive: 16x, plus/minus read and write.

9. Mouse: 3-button.

10. Backup Drive: External hard drive, 500 GB.

11. Operating System: Microsoft Windows 10 or later.

12. BACnet Conformance: Workstation shall support BACnet device and have minimum capabilities defined in PICS for the following areas:
    a. Network.
    b. Functional groups.
    c. Standard application services supported.
    d. Standard objects supported.

C. Printer: Color, ink-jet type as follows:
1. Print Head: 1440 by 1440 dpi photoquality color resolution.
2. Internal Memory Buffer: 32 kB.
3. Paper Handling: Minimum of 100 sheets.
4. Print Speed: Minimum of 8 ppm in black and 4 ppm in color.

D. Application Software: Include the following:
1. Input/output capability from operator station.
2. Operator system access levels via software password.
3. Database creation and support.
4. Dynamic color graphic displays.
5. Alarm processing.
6. Event processing.
7. Automatic restart of field equipment on restoration of power.
8. Data collection.
9. Graphic development on workstation.
10. Maintenance management.

E. Control Units: Modular, comprising of processor board with programmable, nonvolatile, random access memory; local operator access and display panel; integral interface equipment; and backup power source.

1. Units monitor or control each input/output point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator station.

2. Stand alone mode control functions operate regardless of network status. Functions include the following:

    a. Global communications.

    b. Discrete/digital, analog, and pulse input/output.

    c. Monitoring, controlling, or addressing data points.

    d. Testing and developing control algorithms without disrupting field hardware and controlled environment.

3. Local operator interface provides for download from or upload to mobile operator station.

4. BACnet Conformance: Reside on BACnet local area network (LAN) in Ethernet IEEE 802.3, Class 3, minimum, with routers between LAN and other panels, with at least 1 communication port, and have minimum capabilities defined in PICS for the following areas:

    a. Network.

    b. Functional groups.

    c. Standard application services supported.

    d. Standard objects supported.

F. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read only memory; and backup power source.

1. Units monitor or control each input/output point; process information; and download from or upload to operator station.

2. Stand alone mode control functions operate regardless of network status. Functions include the following:

    a. Global communications.

    b. Discrete/digital, analog, and pulse input/output.

    c. Monitoring, controlling, or addressing data points.

3. Local operator interface provides for download from or upload to mobile operator station.

4. BACnet Conformance: Reside on BACnet LAN using Master-Slave/Token Passing (MS/TP), Class 2, minimum, with at least one communication port, and have minimum capabilities defined in PICS for the following areas:

   a. Network.

   b. Functional groups.

   c. Standard application services supported.

   d. Standard objects supported.

G. LANs: Capacity for a minimum of 10 workstations connected to multiuser, multitasking environment with concurrent capability to access DDC network or control units.

1. Media: Ethernet, peer to peer Carrier Sense Multiple Access/Collision Detection (CSMA/CD), operating at 1 GBps.

H. Software: Update to latest version of software at Project completion. Include and implement the following capabilities from the control units:

1. Units of Measure: Inch-pound and SI (metric).

2. Load Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, DDC with fine tuning, and trend logging.

3. HVAC Control Programs: Optimal run time, supply air reset, and enthalpy switchover.

4. Chiller Control Programs: Control function of condenser water reset, chilled water reset, and equipment sequencing.

5. Programming Application Features: Include trend point, alarm messages, weekly scheduling, and interlocking.

2.3 CONTROL PANELS

A. Central (Master) Control Panels: Fully enclosed, steel rack type cabinet with locking doors or locking removable backs. Match finish of panels and provide multicolor graphic displays, schematically showing system being controlled.

B. Local Control Panels: Unitized cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for panels.

1. Fabricate panels of 0.06 inch thick, furniture quality steel, or extruded aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop painted finish.

2. Panel Mounted Equipment: Temperature and humidity controllers, relays, and automatic switches; except safety devices. Mount devices with adjustments accessible through front of panel.

3. Door Mounted Equipment: Flush mounted (on hinged door) manual switches, including damper positioning switches, changeover switches, thermometers, and gages.

4. Graphics: Color coded graphic, laminated plastic displays on doors, schematically showing system being controlled, with protective, clear plastic sheet bonded to entire door.

C. Alarm Panels: Indicating light for each alarm point, single horn, acknowledge switch, and test switch, mounted in hinged cover enclosure.

1. Alarm Condition: Indicating light flashes and horn sounds.

2. Acknowledge Switch: Horn is silent and indicating light is steady.

3. Second Alarm: Horn sounds and indicating light is steady.

4. Alarm Condition Cleared: System is reset and indicating light is extinguished.

5. Contacts in alarm panel allow remote monitoring by independent alarm company.

2.4 ANALOG CONTROLLERS

A. Step Controllers: 6 or 10 stage type, with heavy duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor Reset Controllers: Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 degrees Fahrenheit (F), and single or double pole contacts.

C. Electronic Controllers: Wheatstone bridge amplifier type, in steel enclosure with provision for remote resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

D. Fan Speed Controllers: Solid state model providing field adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

E. Receiver Controllers: Single or multiple input models with control point adjustment, direct or reverse acting with mechanical set point adjustment with locking device, proportional band adjustment, authority adjustment, and proportional control mode.

1. Remote control point adjustment shall be plus or minus 20 percent of sensor span, input signal of 3 to 13 pound-force per squre inch gage (psig).

2. Proportional band shall extend from 2 to 20 percent for 5 psig.

3. Authority shall be 20 to 200 percent.

4. Air supply pressure of 18 psig, input signal of 3 to 15 psig, and output signal 0 to supply pressure.

5. Gauges: 2-1/2 inches in diameter, 2.5 percent wide scale accuracy, and range to match transmitter input or output pressure.

2.5 TIME CLOCKS

A. 7 day, programming switch timer with synchronous timing motor and 7 day dial; continuously charged, nickel cadmium battery driven, 8 hour, power failure carryover; multiple switch trippers; minimum of 2 and maximum of 8 signals per day with 2 normally open and 2 normally closed output contacts.

B. Solid state, programmable time control with 4 separate programs; 24 hour battery carryover; individual on off auto switches for each program; 365 Calendar Days with 20 programmable holidays; choice of fail safe operation for each program; and system fault alarm.

2.6 SENSORS

A. Electronic Sensors: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

1. Thermistor temperature sensors as follows:

a. Accuracy: Plus or minus 0.5 degrees F at calibration point.

b. Wire: Twisted, shielded pair cable.

c. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 square feet.

d. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 9 square feet; length as required.

e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

f. Room Sensors: Match room thermostats, locking cover.

g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

h. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.

2. Resistance Temperature Detectors: Platinum.

a. Accuracy: Plus or minus 0.2 percent at calibration point.

b. Wire: Twisted, shielded pair cable.

c. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 square feet.

d. Averaging Elements in Ducts: 36 inches long, flexible; use where prone to temperature stratification or where ducts are larger than 9 square feet; length as required.

e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.

f. Room Sensors: Match room thermostats, locking cover.

g. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

h. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.

3. Humidity Sensors: Bulk polymer sensor element.

a. Accuracy: 5 percent full range with linear output.

b. Room Sensors: With locking cover matching room thermostats, span of 25 to 90 percent relative humidity.

c. Duct and Outside Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

4. Static Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.

a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.

b. Output: 4 to 20 mA.

c. Building Static Pressure Range: 0 to 0.25 inch wg.

d. Duct Static Pressure Range: 0 to 5 inches wg.

5. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

B. Equipment operation sensors as follows:

1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.

2. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psig.

3. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. Electronic Valve and Damper Position Indication: Visual scale indicating percent of travel and 2 to 10 V dc, feedback signal.

D. Water Flow Switches: Pressure flow switches of bellows-actuated mercury or snap acting type, with appropriate scale range and differential adjustment, with stainless steel or bronze paddle. For chilled water applications, provide vaporproof type.

E. Carbon Dioxide Sensor and Transmitter: Single detectors, using solid state infrared sensors, suitable over a temperature range of 23 to 130 degrees F, calibrated for 0 to 2 percent, with continuous or averaged reading, 4 to 20 mA output, and wall mounted.

F. Oxygen Sensor and Transmitter: Single detectors, using solid state zircon cell sensing, suitable over a temperature range of minus 32 to plus 1,100 degrees F, calibrated for 0 to 5 percent, with continuous or averaged reading, 4 to 20 mA output, and wall mounted.

G. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180 degree field of view with vertical sensing adjustment, for flush mounting.

2.7 THERMOSTATS

A. Combination Thermostat and Fan Switches: Line voltage thermostat with 2, 3, or 4 positions, push button or lever operated fan switch.

1. Label switches FAN ON-OFF, FAN HIGH LOW-OFF, FAN HIGH MED LOW-OFF. Provide unit for mounting on 2-gang switch box.

B. Electric solid state, microcomputer based room thermostat with remote sensor.

1. Automatic switching from heating to cooling.

2. Preferential rate control to minimize overshoot and deviation from set point.

3. Set up for four separate temperatures per day.

4. Instant override of set point for continuous or timed period from 1 hour to 31 days.

5. Short cycle protection.

6. Programming based on weekdays, Saturdays and Sundays.

7. Selection features include degrees Fahrenheit or degrees Celsius display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.

8. Battery replacement without program loss.

9. Thermostat display features include the following:

   a. Time of day.

   b. Actual room temperature.

   c. Programmed temperature.

   d. Programmed time.

   e. Duration of timed override.

   f. Day of week.

   g. System mode indications include heating, off, fan auto, and fan on.

C. Low Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal operated, mercury switch type, with adjustable or fixed anticipation heater.

D. Line Voltage, On-Off Thermostats: Bimetal actuated, open contact or bellows actuated, enclosed, snap switch type, or equivalent solid state type, with heat anticipator, integral manual on-off auto selector switch.

1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break ungrounded conductors.

2. Dead Band: Maximum 2 degrees F.

E. Remote Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature, with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.

2. Bulbs in air ducts with flanges and shields.

3. Averaging Elements: Copper tubing with either single or multiple unit elements, extended to cover full width of duct or unit, adequately supported.

4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.

5. On-Off Thermostat: With precision snap switches, with electrical ratings required by application.

6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

F. Fire Protection Thermostats: UL listed with fixed or adjustable settings to operate at not less than 75 degrees F above normal maximum operating temperature, with the following:

1. Reset: Manual.

G. Room Thermostat Cover Construction: Manufacturer's standard locking covers.

1. Set Point Adjustment: Concealed.

2. Set Point Indication: Concealed.

3. Thermometer: Concealed.

4. Color: Selected by Engineer.

5. Orientation: Vertical.

H. Room thermostat accessories include the following:

1. Insulating Bases: For thermostats located on exterior walls.

2. Adjusting Key: As required for calibration and cover screws.

3. Aspirating Boxes: For flush mounted aspirating thermostats.

4. Set Point Adjustment: 1/2 inch diameter, adjustment knob.

I. Immersion Thermostat: Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range and adjustable set point.

J. Airstream Thermostats: 2-pipe, fully proportional, single temperature type, with adjustable set point in middle of range and adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

K. Electric Low Limit Duct Thermostat: Snap acting, single pole, single throw, manual or automatic reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet.

2. Quantity: One thermostat for every 20 square feet of coil surface.

L. Electric High Limit Duct Thermostat: Snap acting, single pole, single throw, manual or automatic reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet.

2. Quantity: One thermostat for every 20 square feet of coil surface.

M. Heating and Cooling Valve Top Thermostats: Proportional acting for proportional flow, molded rubber diaphragm, remote bulb liquid filled element, direct and reverse acting at minimum shutoff pressure of 25 psig, and cast housing with position indicator and adjusting knob.

2.8 HUMIDISTATS

A. Duct Mounted Humidistats: Electric insertion, 2 position type with adjustable 2 percent throttling range, 20 to 80 percent operating range, single or double pole contacts.

2.9 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or 2-position action.

1. Permanent Split Capacitor or Shaded Pole Type: Gear trains completely oil immersed and sealed. Equip spring return motors with integral spiral spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

2. Nonspring Return Motors for Valves Larger than NPS 2-1/2: Size for running torque of 150 inch-pounds and breakaway torque of 300 inch-pounds.

3. Spring Return Motors for Valves Larger than NPS 2-1/2: Size for running and breakaway torque of 150 inch-pounds.

4. Nonspring Return Motors for Dampers Larger than 25 square feet: Size for running torque of 150 inch-pounds and breakaway torque of 300 inch-pounds.

5. Spring Return Motors for Dampers Larger than 25 square feet: Size for running and breakaway torque of 150 inch-pounds.

B. Electronic Damper and Large Valve Actuators: Direct coupled type designed for minimum 60,000 full stroke cycles at rated torque.

1. Valves: Size for torque required for valve close-off at maximum pump differential pressure.

2. Dampers: Size for running torque calculated as follows:

a. Parallel Blade Damper with Edge Seals: 7 inch-pounds per square foot of damper.

b. Opposed Blade Damper with Edge Seals: 5 inch-pounds per square foot of damper.

c. Parallel Blade Damper without Edge Seals: 4 inch-pounds per square foot of damper.

d. Opposed Blade Damper without Edge Seals: 3 inch-pounds per square foot of damper.

e. Dampers with 2 to 3 Inches water gage (iwg) of Pressure Drop or Face Velocities of 1,000 to 2,500 FPM (feet per minute): Multiply the minimum full stroke cycles above by 1.5.

f. Dampers with 3 to 4 Inches water gage (iwg) of Pressure Drop or Face Velocities of 2,500 to 3,000 FPM (feet per minute): Multiply the minimum full stroke cycles above by 2.0.

3. Coupling: V-bolt and V-shaped, toothed cradle.

4. Overload Protection: Electronic overload or digital rotation sensing circuitry.

5. Fail Safe Operation: Mechanical, spring return mechanism. Provide external, manual gear release on non-spring return actuators.

6. Power Requirements (2-Position Spring Return): 120-V ac.

7. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.

8. Proportional Signal: 2-V to 10-V dc or 4 to 20 mA, and 2-V to 10-V dc position feedback signal.

9. Temperature Rating: Minus 22 to plus 122 degrees F.

10. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 degrees F.

11. Run Time: 12 seconds open, 5 seconds closed.

2.10 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated on Drawings.

B. Globe Valves NPS 2 and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.

C. Globe Valves NPS 2-1/2 and Larger: Iron body, bronze trim, rising stem, plug type disc, flanged ends, and renewable seat and disc.

D. Hydronic system globe valves shall have the following characteristics:

1. Rating: Class 125 for service at 125 psig (pound per square inch gage) and 250 degrees F operating conditions.

2. Internal Construction: Replaceable plugs and seats of stainless steel or brass.

a. Single Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom of guided plugs.

b. Double Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.

3. Sizing: 3 psig maximum pressure drop at design flow rate.

4. Flow Characteristics: 2-way valves shall have equal percentage characteristics; 3-way valves shall have linear characteristics. Operators shall close valves against pump shutoff head.

E. Butterfly Valves: 200 psig, 150 psig maximum pressure differential, ASTM A126 cast iron or ASTM A536 ductile iron body and bonnet, extended neck, stainless steel stem, field replaceable EPDM or Buna N sleeve and stem seals.

1. Body Style: Wafer.

2. Disc Type: Nickel plated ductile iron.

3. Sizing: 1 psig maximum pressure drop at design flow rate.

F. Terminal Unit Control Valves: Bronze body, bronze trim, 2 or 3 port as indicated on Drawings, replaceable plugs and seats, union and threaded ends.

1. Rating: Class 125 for service at 125 psig and 250 degrees F operating conditions.

2. Sizing: 3 psig maximum pressure drop at design flow rate, to close against pump shutoff head.

3. Flow Characteristics: 2-way valves shall have equal percentage characteristics; 3-way valves shall have linear characteristics.

2.11 DAMPERS

A. Dampers: AMCA rated, opposed blade design; 0.1084 inch minimum, galvanized steel frames with holes for duct mounting; damper blades shall not be less than 0.0635 inch galvanized steel with maximum blade width of 8 inches.

1. Blades shall be secured to 1/2 inch diameter, zinc plated axles using zinc plated hardware, with nylon blade bearings, blade linkage hardware of zinc plated steel and brass, ends sealed against spring stainless steel blade bearings, and thrust bearings at each end of every blade.

2. Operating Temperature Range: From minus 40 to plus 200 degrees F.

3. For standard applications, include optional closed cell neoprene edging.

4. For low leakage applications, use parallel or opposed blade design with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm (cubic feet per minute) per square foot of damper area, at differential pressure of 4 inches wg when damper is being held by torque of 50 inch-pounds; when tested in conformance with AMCA 500-D.

2.12 COMMUNICATION AND CONTROL WIRING

A. General:

1. Provide copper wiring, plenum cable, and raceways as specified in LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES Section unless otherwise noted in this Section.

2. Insulated wire to be copper conductors, UL labeled for 90 degrees Celsius minimum service.

B. Wire Sizing and Insulation:

1. Wiring shall comply with minimum wire size and insulation based on services listed below:

Service	Minimum Gage/Type	Insulation Class
AC 24V Power	12 Ga Solid	600 volt
DC 24V Power	10 Ga Solid	600 volt
Class 1	14 Ga Stranded	600 volt
Class 2	18 Ga Stranded	300 volt
Class 3	18 Ga Stranded	300 volt

2. Provide plenum rated cable when open cable is permitted in supply or return air plenum.

C. Control Wiring:

1. Digital input/output wiring shall use Class 2 twisted pair, insulated.

2. Analog inputs shall use Class 2 twisted shielded pair, insulated and jacketed and require a grounded shield.

3. Actuators with tri state control shall use 3 conductor with same characteristics.

D. Communication Wiring:

1. Ethernet cable shall be minimum Category 5 cable (cat5).

2. Secondary level network shall be 24 gage, twisted shielded pair (TSP), low capacitance cable.

2.13 ELECTRICAL CONTROL POWER AND LOW VOLTAGE WIRING

A. Provide wiring (low voltage, 120 volts, and the like) and conduit (3/4 inch minimum or as required by City of Los Angeles Electrical Code) for connection of associated DDC sensors, panels, valves, and any other DDC components for a completely operational DDC system.

B. Provide interlock wiring between mechanical equipment as required, electrical wiring for relays (including power feed) for temperature pressure indication.

C. Provide power wiring, conduit and connections for sensors, alarms, flow switches, actuating devices for temperature, humidity, pressure and flow indication, point resets and user disconnect switches for electric heating, appliances controlled by this Section.

D. Provide other wiring required for the complete operation of the specified systems.

E. Install wiring raceway systems complying with the requirements of City of Los Angeles National Electrical Code. Installations shall be installed in electrical metallic tubing (EMT) conduits.

F. Network Communication Requirements:

1. Wired network communication shall be via channels consisting of a 22 AWG twisted pair installed in a 3/4 inch EMT.

2. In communication conduits, provide 1 spare twisted pair to be installed, tagged, and labeled at each end.

3. Communication conduits shall not be installed closer than feet from high power transformers or run parallel within 6 feet of electrical high power cables. Care shall be taken to route the cable as far from interference generating devices as possible.

4. Shields shall be ground (earth ground) at one point only, to eliminate ground loops.

5. There shall be no power wiring, in excess of 30 VAC rms, run in conduit with communications wiring. In cases where signal wiring is run in conduit with communication wiring, communication wiring and signal wiring shall be run using separate twisted shielded pairs (24 awg) with the shields grounded in conformance with the manufacturer’s wiring practices.

G. Input/Output Control Wiring:

1. RTD wiring shall be 2-wire or 4-wire twisted, shielded, minimum number 22 gage.

2. Other analog inputs shall be a minimum of number 22 gage, twisted, shielded.

3. Binary control function wiring shall be a minimum of number 18 gage.

4. Analog output control functions shall be a minimum of number 22 gage, twisted, shielded.

5. Binary input wiring shall be a minimum of number 22 gage.

H. Splices:

1. Splices in shielded cables shall consist of terminations and the use of shielded able couplers, which maintain the integrity of the shielding.

2. Terminations shall be in accessible locations.

3. Cables shall be harnessed with cable ties as specified in this Section.

I. Conduit and Fittings:

1. Conduit for Control Wiring, Control Cable and Transmission Cable: EMT with compression fittings, cold rolled steel, zinc coated or zinc coated rigid steel with threaded connections.

2. Outlet Boxes (Dry Location): Sherradized or galvanized drawn steel suited to each application, in general, 4 inches square or octagon with suitable raised cover.

3. Outlet Boxes (Exposed to Weather): Threaded hub cast aluminum or iron boxes with gasket device plate.

4. Pull and Junction Boxes: Size conforming to number, size, and position of entering raceway as required by City of Los Angeles Electrical Code. Enclosure type shall be suited to location.

5. Conduits, fittings, and supports in the cooling tower area shall be PVC coated galvanized steel. Function or pull boxes shall be NEMA 4X stainless steel. Other supports and hardware shall be stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation.

B. Verify that duct, pipe, and equipment mounted devices and wiring and pneumatic piping are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment level and plumb.

B. Install software in control units and operator workstation. Implement features of programs to specified requirements and as appropriate to sequence of operation.

C. Connect and configure equipment and software to achieve sequence of operation specified.

D. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate 60 inches above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

E. Install automatic dampers at locations indicated on Drawings.

F. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

G. Install labels and nameplates to identify control components in conformance with this Section.

H. Install hydronic instrument wells, valves, and other accessories in conformance with this Section.

I. Install refrigerant instrument wells, valves, and other accessories in conformance with this Section.

J. Install duct volume control dampers in conformance with AIR DUCT ACCESSORIES Section.

K. Install electronic and fiber optic cables in conformance with this Section.

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets in conformance with this Section.

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed unshielded cable in raceways.

3. Install concealed, shielded cable in raceways.

4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.

5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.

6. Number code or color code conductors for future identification and service of control system, except local individual room control cables.

B. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

C. Connect hand-off auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 CONNECTIONS

A. Piping installation requirements as specified. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Install piping adjacent to machine to allow service and maintenance.

B. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, including piping and electrical connections. Report results in writing and copy submitted to Engineer.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.

3. Calibration test electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.

B. Engage a factory authorized service representative to perform startup service.

C. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.

2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.

3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

D. Verify DDC as follows:

1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.

2. Verify operation of operator workstation.

3. Verify local control units including self-diagnostics.

4. Verify trending is enabled for Project control points.

a. Interval for analog points shall be 5 minutes.

b. Interval for digital points shall be change of value.

3.6 INTEGRATION WITH PORT WIDE METASYS ADX PLATFORM

A. Work with Engineer and POLA Information Technology Division (IT) staff to provide individual IP address for each controller and device that connects directly to control system ethernet.

B. Integrate Project control points into ADX platform using Port standard graphics.

C. Control system trend data shall be archived to ADX server.

3.7 DEMONSTRATION

A. Provide a factory authorized service representative to train Department maintenance personnel to adjust, operate, and maintain control systems and components.

1. Train Department maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs. Include a minimum of 12 hours dedicated instructor time on-site or at a location of Department's choice.

3. Record Department personnel training sessions and provide a copy in video file and CD formats to Engineer.

4. Review data in maintenance manuals.

3.8 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within 1 year of date of Substantial Completion, provide up to 3 Project Site visits, when requested by Department, to adjust and calibrate components and to assist Department personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

3.9 HVAC CONTROL POINTS LIST

A. HVAC control points required in this Section shall be set from the table provided in Appendix "D" of Specifications.

B. HVAC control points list, in conjunction with the control diagrams indicated on Drawings, provides the minimum equipment communication and hardware points for implementation of HVAC sequence of operation. HVAC control point list does not include any software points that Contractor may find necessary for programming HVAC sequence of operation.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sequence of operations

B. Building reports

1.2 RELATED SECTIONS

A. Section 23 08 00 - Commissioning of HVAC

B. Section 23 09 00 - Instrumentation and Controls for HVAC

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in the corresponding bid items of Bid Proposal Line Items.

1.4 REFERENCES

A. ASHRAE Guideline 36 - High-Performance Sequences of Operation for HVAC Systems; 2021.

1.5 SEQUENCE OF OPERATIONS

A. Where applicable, variable air volume (VAV) system sequences herein reference ASHRAE Guideline 36 with modifications and selected options to meet the requirements of Project.

B. General:

1. Fully comply with ASHRAE Guideline 36 Section 5.1 General.

2. Contractor shall review sequences prior to programming and suggest modifications where required to achieve the design intent. Contractor may also suggest modifications to improve performance and stability or to simplify or reorganize logic in a manner that provides equal or better performance. Proposed changes in sequences shall be included as a part of controls submittal.

3. Include costs for minor program modifications if required to provide proper performance of the system.

4. VAV Box Controllable Minimum:

    a. Used to determine the lowest possible VAV box airflow setpoint (other than zero) allowed by the controls (VAV box controllable minimum airflow (Vm)) used in VAV box control sequences. The minimums shall be stored as software points that may be adjusted by the user but need not be adjustable via the graphical user interface.

    b. The minimum setpoint Vm shall be determined from the table below if VAV box manufacturer is listed:

INLET	TITUS	KRUEGER	PRICE	ETI
4	15	15	20	15
6	30	35	30	30
8	55	60	55	55
10	90	90	95	90
12	120	130	135	130
14	190	175	195	180
16	245	230	260	235
24x16	455	445	490	415

C. Zones:

1. Fully comply with ASHRAE Guideline 36 Section 5.2 Generic Ventilation Zones.

    a. Use Title 24 for ventilation logic.

    b. Use Time Averaged Ventilation if schedule VAV minimum is below the lowest allowed by the controls (Vm).

2. Fully comply with ASHRAE Guideline 36 Section 5.3 Generic Thermal Zones.

    a. Default setpoints:

Zone type	Occupied		Unoccupied	
	Heat	Cool	Heat	Cool
Office and Support Spaces	70°F	75°F	60°F	90°F
Conference Rooms	70°F	75°F	60°F	90°F
Auditorium	70°F	74°F	60°F	90°F
IDF/MDF	n/a	85°F	n/a	85°F

D. Zone Groups (Isolation Areas):

1. Fully comply with ASHRAE Guideline 36 Section 5.4 Zone Groups.

2. Each floor shall be a separate Zone Group.

3. Omit the following sections:

    a. Freeze protection setback mode.

4. Add the Following:

    a. Pandemic Mode: Pandemic mode is similar to occupied mode but operates at a higher priority. A zone group is in the pandemic mode when any of the following is true:

        1) The time of day is between a zone group's scheduled pandemic start and stop times.

        2) The zone group is manually overridden to pandemic mode.

E. VAV Cooling Only Boxes:

1. Fully comply with ASHRAE Guideline 36 Section 5.5 except as listed below and using the following parameters:

    a. Design Information (see VAV schedule and Title 24 forms on Drawings):

        1) Vcool-max, zone maximum cooling airflow setpoint.

        2) Vmin, zone minimum airflow setpoint.

3) Vocc-min, zone minimum outdoor airflow for occupants, per Title 24 prescribed airflow-per-occupant requirements.

4) Varea-min, zone minimum outdoor airflow for building area, per Title 24 prescribed airflow-per-area requirements.

b. Add the Following:

1) Set points for pandemic mode:

2) Cooling maximum: Vcool-max.

3) Minimum: Vmin.

4) Heating maximum: Vmin.

F. VAV Reheat Boxes:

1. Fully comply with ASHRAE Guideline 36 Section 5.6 except as listed below and using the following parameters:

a. Design Information (refer to VAV schedule and Title 24 forms on Drawings):

1) Vcool-max, zone maximum cooling airflow setpoint.

2) Vmin, zone minimum airflow setpoint.

3) Vheat-max, zone maximum heating airflow setpoint.

4) Vocc-min, zone minimum outdoor airflow for occupants, per Title 24 prescribed airflow-per-occupant requirements.

5) Varea-min, zone minimum outdoor airflow for building area, per Title 24 prescribed airflow-per-area requirements.

2. Add the Following:

a. Set Points for pandemic mode:

1) Cooling maximum: Vcool-max.

2) Cooling minimum: Vmin.

3) Minimum: Vmin.

4) Heating minimum: Vmin.

5) Heating maximum: Vheat-max.

G. Multiple Zone Built-up Air Handler:

1. Fully comply with ASHRAE Guideline 36 Section 5.15 and 5.16 except as listed below and using the following parametes:

a. Design Information:

1) Temperature Setpoints:

a) Min_ClgSAT, lowest cooling supply air temperature setpoint: 52 degrees Fahrenheit.

b) Max_ClgSAT, highest cooling supply air temperature setpoint: 60 degrees Fahrenheit.

c) OAT_Min, the lower value of OAT reset range: 60 degrees Fahrenheit.

d) OAT_Max, the higher value of OAT reset range: 70 degrees Fahrenheit.

2) Ventilation Setpoints:

a) AbsMinOA: The design outdoor airflow rate when zones with carbon dioxide(co_2) sensors are unpopulated: 18,845 cubic feet per minute (cfm).

b) DesMinOA: The design minimum outdoor airflow when areas served by the system are occupied at their design population: 22,080 cfm.

3) Economizer High Limit: Paragraph 3.1.4.3.2 (California Title 24 economizer high limit requirements).

a) California Climate Zone: 6.

b) High Limit Option: Fixed Dry Bulb plus Differential Dry Bulb.

4) Max_DSP, Duct Design Maximum Static Pressure: 1.5 inches.

5) SPmin shall be temporarily set to 0.5 inches. It shall be lowered as more zones are added to BAS. When nearly all zones are controlled by BAS, value shall be lowered to 0.1 inches.

2. Use the Following Options:

    a. Supply Air Temperature Control: Paragraph 5.16.2.3.b (separate minimum outdoor air and economizer dampers).

    b. Supply Air Temperature Control Map: Paragraph 5.16.2.3.d.3 (return fan with building pressure control).

    c. Minimum Outdoor Airflow Setpoints: aragraph 5.16.3.2 (outdoor airflow setpoint, for California Title 24 ventilation).

    d. Minimum Outdoor Air Control: Paragraph 5.16.5 (AHUs with separate minimum outdoor air damper and measurement by AFMS).

        1) Outdoor Airflow Setpoint: Paragraph 5.16.6.2 (California Title 24 ventilation).

    e. Control Logic for Return/Relief Exhaust:

        1) Paragraph 5.16.10 (AHUs using a return fan with direct building pressure control).

3. Omit the Following Logic:

    a. Chilled Water Reset Requests: Not applicable to refrigerant coil.

    b. Freeze Protection Setback Mode: Not applicable.

4. Modify Supply Air Temperature Control:

    a. Use zone cooling requests in lieu of valve position.

5. Modify Plant Requests:

    a. Refrigerant plant requests in lieu of chiller plant requests: Send the refrigerant plant a request as follows:

        1) When there are 10 or more zone cooling requests, send 1 request.

        2) When there are less than 10 zone cooling requests, send 0 request.

6. Modify Air Handling System Modes:

    a. Add pandemic mode.

    b. Pandemic mode shall have the highest hierarchy of the modes.

H. Single Zone Fan Coil:

1. Fully comply with ASHRAE Guideline 36 Section 5.18 except as listed below and using the following parametes:

    a. Cool_SAT, lowest cooling supply air temperature setpoint: 52 degrees Fahrenheit.

    b. Heat_SAT, highest heating supply air temperature setpoint: 90 degrees Fahrenheit.

    c. MaxDPT, maximum supply air dewpoint temperature: 75 degrees Fahrenheit.

    d. Fan Speed Setpoints:

        1) MinSpeed: 10 percent.

        2) MaxHeatSpeed: 30 percent.

    e. Omit the Following Logic:

        1) Minimum Outdoor Air Control: Mechanical constant airflow device is utilized which does not require control.

        2) Outdoor Air Damper Control: Mechanical constant airflow device is utilized which does not require control.

        3) Economizer Lockout: Not applicable to fan coils.

4) Control of Actuated Relief Dampers Without Fans: Not applicable to fan coils.

5) Relief Fan Control: Not applicable to fan coils.

6) Return Fan Control: Not applicable to fan coils.

7) Freeze Protection: Not required.

I. Refrigerant Plant:

1. Direct digital control (DDC) system shall schedule, turn on and off, monitor and trend refrigerant plant as follows:

a. Schedule On/Off: The refrigerant plant shall be scheduled on/off based on the built-up air handler schedule. The refrigerant plant shall be enabled upon a call for cooling from the air handler.

b. The refrigerant plant controller shall stage the compressors to meet the air handler supply air temperature setpoint. Compressors shall be staged to minimize the plant energy consumption. Refrigerant plant controller shall monitor the compressor suction and discharge temperature and pressure sensors.

c. Each compressor shall have liquid injection. The liquid injection solenoid valve shall be off when the compressor discharge superheat is less than 10 degrees Fahrenheit. When the compressor discharge temperature is greater than 180 degrees Fahrenheit, or the compressor motor temperature is greater than 140 degrees Fahrenheit, the liquid injection solenoid valve shall be on. When the compressor discharge temperature is less than 170 degrees Fahrenheit and the compressor motor temperature is less than 120 degrees Fahrenheit the liquid injection solenoid valve shall be off.

d. The refrigerant plant controller shall turn on and off, modulate and monitor the evaporative condenser fan variable frequency drive (VFD).

e. The refrigerant plant controller shall turn on and off and monitor the evaporative condenser spray pump.

f. The refrigerant plant controller shall monitor the superheat temperature and modulate the liquid solenoid valve at the discharge of each cooling coil.

J. Chiller Plant:

1. System Design Information:

a. CHWSTmin, the lowest chilled water supply temperature setpoint equals to 44 degrees Fahrenheit .

b. CHWSTmax, the maximum chilled water supply temperature setpoint used in plant reset logic equals to 48 degrees Fahrenheit .

c. CH-LOT, the outdoor air lockout temperature below which the chiller plant is prevented from operating equals to 60 degrees Fahrenheit .

d. CHW-DPmin, the minimum differential pressure setpoint used in plant reset logic equals to 0.5 psid (pounds per square inch differential).

e. CHW-MinFlow, the minimum chiller chilled water flowrate per manufacturer’s recommendations equals to 75 gpm (gallons per minute).

f. PCHWFdesign, design primary loop flow equals to 191 gpm.

g. NPCHWP, the number of primary chilled water pumps that operate at design conditions equal to 1.

h. CHW-DPmax, the maximum chilled water differential pressure setpoint equals to 20 psid.

i. Where minimum speeds are not required for flow control per other balancer provided setpoints above, minimum speed setpoints for all VFD-driven chilled water pumps shall be determined in conformance with the test and balance specifications for the following as applicable:

1) Manually set speed to 6 Hertz (10%) unless otherwise indicated in control sequences.

2) Observe fan/pump in field to ensure it is visibly rotating. If fan/pump is not visibly rotating, gradually increase speed until it is.

3) The speed at this point shall be the minimum speed setpoint for this piece of equipment.

2. Chiller Plant Enable/Disable:

    a. The chiller plant shall include an enabling schedule that allows operators to lock out the plant during off-hours, holidays, or any other scheduled event, for example, to allow off-hour operation of HVAC systems except the chiller plant. The default schedule shall be 24/7 (adjustable).

    b. Enable the chiller plant in the lowest stage when the plant has been disabled for at least 15 minutes and:

        1) Number of Chiller Plant Requests greater than I (I equals ignores shall default to 0, adjustable), and

        2) OAT greater than CH-LOT, and

        3) The chiller plant enable schedule is active.

    c. Disable the chiller plant when it has been enabled for at least 15 minutes and:

        1) Number of chiller plant requests less than or equal I for 3 minutes, or

        2) OAT less than CH-LOT minus 1 degrees Fahrenheit , or

        3) The chiller plant enable schedule is inactive.

    d. When the Chiller Plant is Enabled:

        1) Open the CHW isolation valve of the lead chiller.

        2) Stage on lead primary CHW pump, per ASHRAE Guideline 36 Section .

        3) Once the lead pump is proven on, enable the lead chiller.

    e. When the Chiller Plant is Disabled:

        1) Shut off the enabled chiller(s).

        2) For each enabled chiller, close the CHW isolation valve after 3 minutes or the chiller is not requesting CHW flow.

        3) Disable the operating primary CHW pump(s) in conformance with ASHRAE Guideline Section 1.5J.4.

3. Chilled Water Plant Reset:

   a. CHWSTmin in the following logic shall be the lowest CHWSTmin of chillers in the plant.

   b. Differential Pressure Controlled Loops: chilled water supply temperature setpoint CHWSTsp and pump differential pressure setpoint CHW-DPsp shall be reset based on the current value of the logic variable called “CHW Plant Reset” as shown below in Figure 1 and described subsequently.

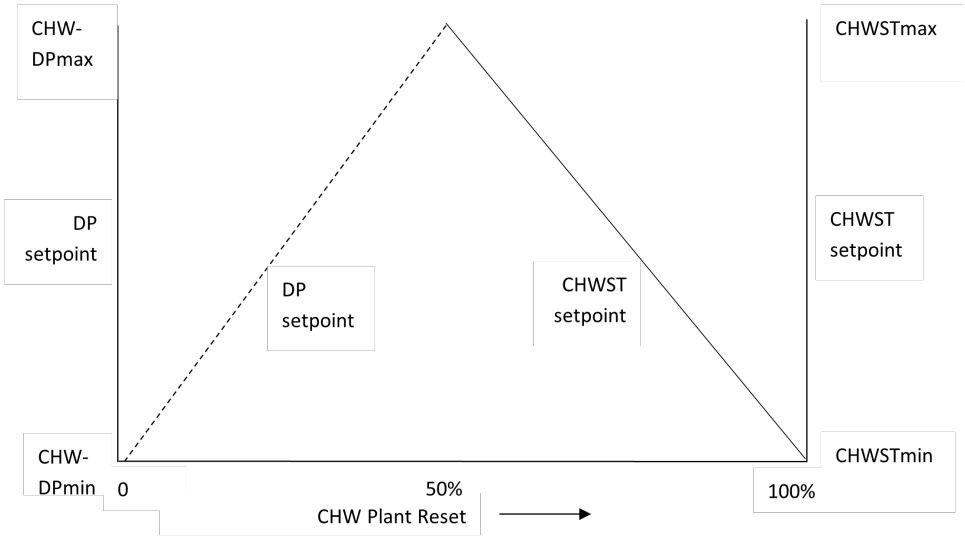


Figure 1

   1) From 0 percent loop output to 50 percent loop output, reset DP setpoint from CHW-DPmin to CHWP-DPmax.

   2) From 50 percent loop output to 100 percent loop output, reset CHWST setpoint from CHWSTmax to CHWSTmin.

c. CHW plant reset variable shall be reset using trim and respond logic with the parameters shown below:

Variable	Value
Device	Any CHW Pump Distribution Loop
SP_0	100%
SP_{min}	0%
SP_{max}	100%
T_d	15 minutes
T	5 minutes
I	10
R	Cooling CHWST Reset Requests
SPtrim	-2%
SPres	+3%
SPres-max	+7%

4. CHWST plant reset loop shall be enabled when the plant is enabled and disabled when the plant is disabled.

5. When a plant stage change is initiated, CHW plant reset logic shall be disabled and value fixed at its last value for the longer of 15 minutes and the time it takes for the plant to successfully stage.

6. Primary Chilled Water Pumps:

   a. Primary CHW pumps shall be lead/lag controlled per ASHRAE Guideline 36 Section 5.1.15.3.

   b. Enable lead primary CHW pump when any chiller CHW isolation valve is commanded open. Disable the lead primary CHW pump when all chiller CHW isolation valves are commanded closed.

   c. CHW pumps shall be staged as a function of CHWFR, the ratio of current chilled water flow, $FLOW_P$, to design primary pump flow, $PCHWF_{design}$. and the number of pumps, NPCHWP, that operate at design conditions. Pumps are assumed to be equally sized.

      $CHWFR = FLOW_P / PCHWF_{design}$

      1) Start the next lag pump whenever the following is true for 10 minutes:

         CHWFR >(Number of Operating Pumps/NPCHWP) - 0.03

2) Shut off the last lag pump whenever the following is true for 10 minutes:

   CHWFR $\leq$ (Number of Operating Pumps/NPCHWP) - 0.03

3) When any pump is proven on, pump speed will be controlled by a reverse acting PID loop maintaining the differential pressure signal at a setpoint CHW-DPsp determined by the reset scheme described herein. All pumps receive the same speed signal.

d. Chilled Water Minimum Flow Bypass Valve:

1) Bypass valve shall modulate to maintain minimum flow as measured by the chilled water flow meter at a setpoint that provides minimum flow through all operating chillers, determined as follows:

   a) For the chillers operating in the stage, identify the chiller with the highest ratio, MinFlowRatio, of CHW-MinFlowX to CHW-DesFlowX.

   b) Calculate the minimum flow setpoint as MinFlowRatio multiplied by the sum of CHW-DesFlowX for the operating chillers.

e. Performance Monitoring: All calculations listed below shall be performed at least once every 30 seconds. Time average values shall be recorded at least once every 5 minutes. The averaging period shall equal the trending interval.

1) Total Plant Power: Calculate total plant power as the sum of chiller power and pump power. For motors with VFDs, power shall be actual power as read through the VFD network interface.

2) Total Plant Load: Calculate plant load using flowrate through the primary circuit, FLOWP; chilled water return temperature upstream of the first HX or chiller, CHWRT; and primary loop chilled water supply temperature leaving the plant, CHWST.

   Q_{PLANT} = [$FLOW_P$ X (CHWRT - CHWST)] / 24 [tons]

3) Equipment Load: Calculate load for each operating chiller using flowrate through the equipment, $FLOW_D$; chilled water return temperature entering the equipment, $CHWRT_D$; and chilled water supply temperature leaving the equipment, $CHWST_D$. Inputs to the below equation shall be determined per the following rules.

   $QD = [FLOW_D \text{ X } (CHWRT_D - CHWST_D)] / 24$ [tons]

   a) For parallel chillers where flowrate through each chiller is not measured, but flowrate through the primary circuit is measured, $FLOW_D$ shall be assumed proportional to design flow through all operating chillers in the circuit.

   b) $CHWRT_D$ shall be the return temperature entering the equipment as read by a hardwired sensor if available. If a hardwired sensor is unavailable for a chiller, temperature shall be read from a sensor internal to the chiller through its network interface.

   c) $CHWST_D$ shall be a hardwired temperature sensor at the outlet of the equipment if available. If a hardwired sensor is unavailable for a chiller, temperature shall be read from a sensor internal to the chiller through its network interface. Only if neither of the above is available shall a common supply temperature sensor (in other words, one measuring the output from multiple chillers), be used.

4) Calculate plant efficiency as total plant power divided by plant load. Calculate efficiency for each chiller as chiller power divided by chiller load.

5) Summary Data: For each chiller, and for the total plant, statistics shall be calculated for runtime, kWh, average actual efficiency (kW/ton), peak demand (tons), average demand (tons) and average load (ton-hours), all on an instantaneous, year-to-date, and previous-year basis.

f. Alarms:

1) Maintenance interval alarm when pump has operated for more than 3,000 hours as indicated by the Staging Runtime: Level 4. Reset the Staging Runtime interval counter when alarm is acknowledged.

2) Maintenance interval alarm when plant has operated for more than 1,000 hours as indicated by the Staging Runtime: Level 4. Reset the Staging Runtime interval counter when alarm is acknowledged.

3) Chiller alarm: level 2.

4) Pump alarm is indicated by the status input being different from the output command for 15 seconds.

   a) Commanded on, status off: Level 2. Do not evaluate alarm until the equipment has been commanded on for 15 seconds.

   b) Commanded off, status on: Level 4. Do not evaluate the alarm until the equipment has been commanded off for 60 seconds.

5) Sensor Failure:

   a) Sensor shall be deemed outside of its widest possible operating range if any of the following are true:

      1 Feedback less than 2 mA (milliampere) from any 4 to 20 mA transducer; or

      2 Temperature reading less than 0 degrees Fahrenheit from any temperature sensor.

   b) Any sensor that goes outside of its widest possible operating range:

      1 If the sensor is used for monitoring only: Level 3.

      2 If the sensor is used for control: Level 2.

g. Automatic Fault Detection and Diagnostics:

1) Fully comply with ASHRAE Guideline 36 Section 5.20.18 except as listed below:

   a) Omit Sections: 5.20.18.3.d, 5.20.18.3.g, 5.20.18.3.h, 5.20.18.3.j, 5.20.18.3.k, 5.20.18.3.o, 5.20.18.3.p, 5.20.18.3.q, 5.20.18.3.r, 5.20.18.3.u, 5.20.18.3.v, 5.20.18.3.w, 5.20.18.3.x. 5.20.18.3.z, 5.20.18.3.bb, 5.20.18.3.cc, 5.20.18.3.dd and 5.20.18.3.ee.

b) Omit Sections: 5.2.18.4.a.3, 5.2.18.4.a.4, 5.2.18.4.a.5, 5.2.18.4.a.6, 5.2.18.4.a.7, 5.2.18.4.a.8, 5.2.18.4.a.11, 5.2.18.4.a.12, 5.2.18.4.a.15, 5.2.18.4.a.16 and 5.2.18.4.a.17.

c) Omit sections: 5.2.18.4.b.2 and 5.2.18.4.b.3.

d) Omit section 5.2.18.4.c.

K. Hot Water Plant:

1. System Design Information:

a. HWSTmin, the lowest hot water supply temperature setpoint equals to 100 degrees Fahrenheit.

b. HWSTmax, the highest hot water supply temperature setpoint equals to 140 degrees Fahrenheit.

c. HW-LOT, the outdoor air lockout temperature above which the heating plant is prevented from operating equals 70 degrees Fahrenheit.

d. Where minimum speeds are not required for flow control per other balancer provided setpoints above, minimum speed setpoints for all VFD-driven secondary heating hot water pumps shall be determined in accordance with the test and balance specifications for the following as applicable:

1) Manually set speed to 6 Hertz (10%) unless otherwise indicated in control sequences.

2) Observe fan/pump in field to ensure it is rotating. If it is not, gradually increase speed until it rotates.

3) The speed at this point shall be the minimum speed setpoint for this piece of equipment.

2. DDC system shall schedule, turn on and off, monitor and trend hot water plant as follows:

a. Hot water plant shall be available for operation 24 hours a day, 7 days a week.

b. Enable the plant when the it has been disabled for at least 15 minutes and:

1) Number of Heating Hot-Water Plant Requests is greater than I (I equals to Ignores shall default to 0, adjustable), and

2) OAT less than HW-LOT, and

3) The Hot Water Plant enable schedule is active.

c. Disable the plant when it has been enabled for at least 15 minutes and:

1) Number of Heating Hot-Water Plant Requests less than or equal to I for 3 minutes, or

2) OAT greater than HW-LOT and plus 1 degrees Fahrenheit or

3) The hot water plant enable schedule is active.

d. When the Plant is Enabled:

1) Command the Modular-Heat-Pump heat pump master controller to HEAT mode.

2) Command the Electric Boiler to ON when:

a) The Modular Heat Pump is at full capacity and the heating hot water supply temperature to the building is 5 degrees Fahrenheit below setpoint, or

b) The Modular Heat Pump is OFF due to an alarm.

3) Enable HW pumps as described in this section.

e. When the Plant is Disabled:

1) Command the Modular-Heat-Pump heat pump master controller to disable HEAT mode.

2) Command the Electric Boiler to OFF.

3) Disable HW pumps as described in this section.

L. Hot Water Plant Reset:

1. Hot water supply temperature setpoint HWSTsp and secondary pump differential pressure setpoint shall be reset based on the current value of the logic variable called “HW Plant Reset” as shown below in Figure 2 and described subsequently.

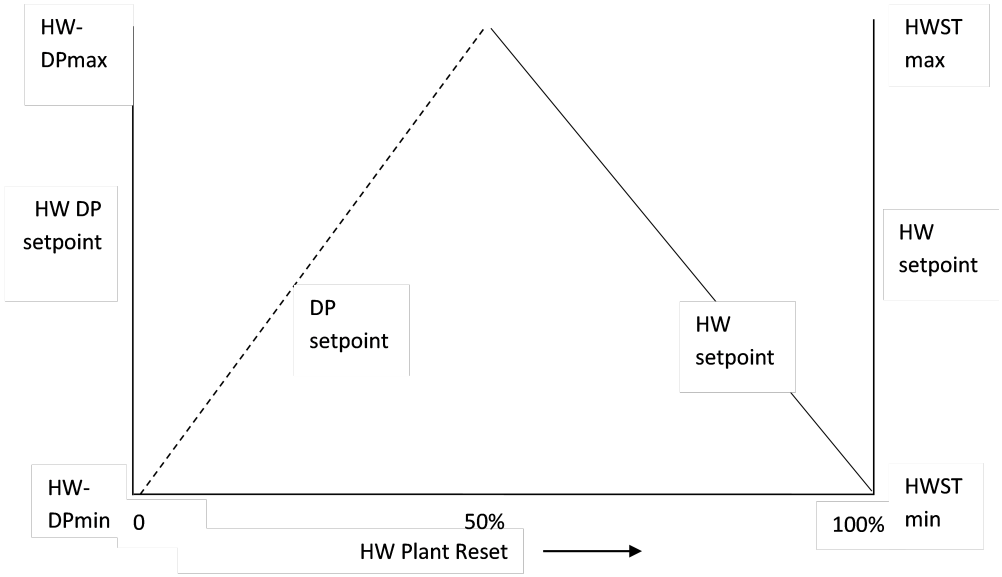


Figure 2

a. From 0 percent loop output to 50 percent loop output, reset DP setpoint from HW-DPmin to HWP-DPmax.

b. From 50 percent loop output ot 100 percecent loop output, reset HWST setpoint from HWSTmax to HWSTmin.

2. HW Plant Reset variable shall be reset using Trim and Respond logic with the following parameters:

Variable	Value
Device	Secondary HW Pump Distribution Loop
SP_0	100%
SP_{min}	0%
SP_{max}	100%
T_d	15 minutes
T	5 minutes
I	2
R	Hot-Water Reset Requests
SPtrim	-2%
SPres	+3%
SPres-maX	+7%

   a. HWST Plant Reset loop shall be enabled when the Hot Water Plant is enabled and disabled when the plant is disabled.

   b. HW temperature setpoint shall be written to the Modular-Heat-Pump and Electric Boiler controllers via network interface.

3. Hot Water Pumps:

   a. Dedicated primary hot water pumps shall operate when their associated heating plant equipment is enabled.

   b. Secondary hot water pumps shall be lead/standby rotated per ASHRAE Guideline 36 Section 5.1.15.

   c. When any secondary pump is proven on, pump speed shall be controlled by a reverse acting PID loop maintaining the differential pressure setpoint, HW-DPsp, determined by the reset scheme described herein. All pumps receive the same speed signal.

      1) Provide graphics page showing valve positions. List the current and historical three most and least open valves. Interface shall allow operator to exclude valves, except system bypass valve, from reset logic.

4. Performance Monitoring:

    a. Total heating plant power: Calculate total plant heating power as the sum of AWHP power (via Modular-Heat-Pump interface when module is in Heating mode), electric boiler power and HW pump power.

    b. Summary Data: For AWHP and total heating plant, statistics shall be retained and displayed on graphic for runtime, average actual efficiency (COP), average heating demand (MBH), and average heating energy (kBTU). Show on heating plant graphic: instantaneous values, year-to-date totals/averages and previous-year totals/averages.

5. Alarms:

    a. Maintenance interval alarm when pump has operated for more than 1,500 hours: Level 5. Reset interval counter when alarm is acknowledged.

    b. Maintenance interval alarm when AWHP has operated for more than 1,000 hours: Level 5. Reset interval counter when alarm is acknowledged.

    c. Maintenance interval alarm when electric boiler has operated for more than 1,000 hours: Level 5. Reset interval counter when alarm is acknowledged.

    d. AWHP alarm: level 2.

    e. Electric boiler alarm: level 2.

    f. Pump alarm is indicated by the status input being different from the output command for 15 seconds.

        1) Commanded on, status off: Level 2. Do not evaluate alarm until the device has been commanded on for 15 seconds.

        2) Commanded off, status on: Level 4. Do not evaluate the alarm until the device has been commanded off for 60 seconds.

    g. Low heating side leaving hot water temperature (more than 5 degrees Fahrenheit below setpoint) for more than 15 minutes when heat pump and/or electric boiler has been enabled in heating mode for longer than 15 minutes: Level 3

h. Deadheaded pump as indicated by any DP sensor equal to 3 times setpoint with system flow less than the minimum flow for 10 minutes: Level 2.

i. HW flow less than 70 percent of HWFmin for 5 minutes: Level 3.

6. Building Exhaust (EF-1):

   a. DDC system shall schedule, turn on and off, monitor, trend, and sequence the exhaust fan serving the general building exhaust as follows:

      1) Schedule On/Off:

         a) Exhaust fan shall be capable of being scheduled through DDC system. Fan shall operate when it is scheduled on.

         b) Pandemic mode: EF-1 shall be on when the air handler is on.

         c) Pandemic mode: EF-1 shall operate continuously.

   b. Alarm: Monitor status and alarm operator when status does not match command signal.

7. Garage Ventilation (EF-2, EF-3, EF-4):

   a. DDC system shall turn on and off, monitor, trend, and sequence the garage exhaust fans as follows:

      1) Schedule On/Off:

         a) Exhaust fans shall be capable of being scheduled through the DDC system. Fans shall operate when they are scheduled on.

   b. Alarm: Monitor status and alarm operator when status does not match command signal.

8. Transformer Vault (SF-3):

    a. DDC system shall turn on and off the transformer vault supply fan as follows:

        1) Schedule On/Off:

            a) Fan shall always be scheduled on. Fan shall be enabled when the space temperature exceeds the space temperature setpoint. Fan shall be disabled when the space temperature is more than 2 degrees below setpoint for 15 minutes.

    b. Alarm: Monitor status and alarm operator when status does not match command signal.

1.6 BUILDING REPORTS

A. Provide year round scheduling incorporating holidays and vacations as provided by Engineer.

B. Annunciation of events and occurrences on 3 levels: routine maintenance, low level alarm condition; high level alarm condition.

1. Maintenance alarms shall annunciate conditions that require routine maintenance, such as dirty filters, or hours of equipment operation reaching elapsed time for scheduled preventive maintenance.

2. Low level alarm shall annunciate conditions which reflect inoperability of equipment that would not prevent HVAC systems from providing service but requires maintenance or repair to re-establish operation such as a failed pump or filter alarm.

3. High level alarms shall annunciate conditions which require immediate response in order to insure provision of building HVAC, or that reflect a catastrophic failure of equipment.

4. Submit to Engineer for review and approval designation of conditions for annunciation. Equipment shall be monitored for elapsed time between inspection and service; status of inoperability shall be monitored; alarm conditions as indicated in this Section shall be monitored by DDC system. Conditions as indicated in this Section shall annunciate via overriding screen display; display and output shall be submitted for review and approval.

C. Trending of system and component operation and completion of trend logs in tabular and graphical format suitable for binding in a weekly, monthly, and yearly report. Reports shall consist of full page form fed output with headers, subheadings, dates, times, instrument numbers, and the like. Output shall be submitted for review and approval.

1. Weekly report shall consist of the following:

a. Hourly and daily load for the following systems:

1) Building Energy Use (kBtu/ft^2).

2) Building Refrigerant Plant Load (Tons).

3) Building Chilled Water Plant Load (Tons).

4) Building Heating Plant Load (TMBH).

5) Building electrical usage (kWh).

b. Maximum hourly and daily load for the following systems:

1) Building Refrigerant Plant Load (Tons).

2) Building Chilled Water Plant Load (Tons).

3) Building Heating Plant Load (MBH).

4) Building electrical maximum demand (kW).

c. Events and occurrences.

2. Monthly report shall consist of the following:

a. Monthly load for the following systems:

1) Building Energy Use (kBtu/ft^2).

2) Building Refrigerant Plant Load (Ton-Hours).

3) Building Chilled Water Plant Load (Ton-Hours).

4) Building Heating Plant Load (MBH).

5) Building electrical usage (kWh).

b. Maximum monthly load for the following systems:

1) Building Refrigerant Plant Load (Tons).

2) Building Chilled Water Plant Load (Tons).

3) Building Heating Plant Load (MBH).

4) Building electrical maximum demand (kW).

c. Hours of operation for each piece of equipment.

d. Identification of equipment approaching elapsed time for preventative maintenance.

e. Identification of equipment past elapsed time for preventative maintenance.

3. Yearly report shall consist of the following:

a. Yearly load for the following systems:

1) Building Energy Use (kBtu/ft^2).

2) Building Refrigerant Plant Load (Ton-Hours).

3) Building Chilled Water Plant Load (Tons).

4) Building Heating Plant Load (MBH).

5) Building electrical usage (kWh).

b. Maximum yearly load for the following systems:

1) Building Refrigerant Plant Load (Tons).

2) Building Chilled Water Plant Load (Tons).

3) Building Heating Plant Load (MBH).

4) Building electrical maximum demand (kW).

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping material

B. Valves

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 05 23 - General Duty Valves for HVAC Piping

C. Section 23 05 53 - Identification for HVAC Piping and Equipment

D. Section 23 07 16 - HVAC Equipment Insulation

E. Section 23 07 19 - HVAC Piping Insulation

F. Section 23 21 14 - Piping Tests

G. Section 23 21 30 - Pipe Cleaning and Water Treatment

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Cold Water Piping and Hot Water Piping bid items of Bid Proposal Line Items respectively.

1.4 REFERENCES

A. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.

B. ASME B31.9 - Building Services Piping.

C. ASME BPVC - Boiler and Pressure Vessel Code.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

E. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

F. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.

G. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

H. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

I. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

J. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.

1.5 DEFINITIONS

A. Maximum: The greatest continuous pressure at which the piping system operates.

B. Test: The hydrostatic pressure used to determine system acceptance.

1.6 SUBMITTALS

A. Product data on piping and valve materials shall be provided as specified in BASIC MECHANICAL REQUIREMENTS Section.

B. Submit piping shop drawings to Engineer a minimum of 4 weeks prior to construction for new piping to be installed.

1.7 QUALITY ASSURANCE

A. Fittings and coupling compatibility: To ensure uniformity and compatibility of piping components, fittings and couplings for grooved end piping systems shall be furnished by the same manufacturer.

B. Welding materials and labor to conform to ASME BPVC and applicable state labor regulations.

C. Welders shall be fully qualified in conformance with AWS requirements and City of Los Angeles Department of Building and Safety certified. Each welder shall be required to identify his/her work with a marking. Mark of welder shall be stamped on each weld joint of pipe, valve or fitting. A listing of the names of the welder, together with corresponding marks, shall be submitted. Welders making defective welds after passing qualification test shall be given a requalification test and upon failing to pass a requalification test shall not be permitted to Work on Project. The defective welds shall be ground out or replaced by another qualified welder and stamped with their marking.

PART 2 - PRODUCTS

2.1 PIPING MATERIAL

A. Unless otherwise specified, piping materials, including pipe, gaskets, fittings, connection and joint assemblies, linings and coatings, shall be selected from those listed in Piping Services Article of this Section. Piping materials shall conform to detailed specifications for each type of pipe and piping appurtenance specified in other Sections of this Division.

B. Sizes: Sizes and arrangement of piping shall be as shown on Drawings. Conflict or inconsistencies of detail for final connections shall be resolved by Engineer.

2.2 VALVES

A. Valves of the same size and service shall be provided by a single valve manufacturer. Packing shall be non-asbestos material. Actual length of valves shall be within 1/16 inch (plus or minus) of the manufacturer's specified length. Flanges shall meet the requirements of ASME B16.5.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

3.2 PIPING INSTALLATION

A. Unless otherwise indicated on Drawings, installation of piping shall be made substantially as indicated on Drawings, installed in conformance with ASME B31.9 building services piping, latest issue, including anchorage of piping, guides and supports for such piping.

B. Drawings: Verify Drawings accuracy and immediately notify Engineer of any discrepancies so that such discrepancies may be resolved prior to actual fabrication or installation of Work. Minor changes in position of piping as necessary to meet Project conditions shall be anticipated by Contractor and shall not be made the basis for change order. Changes affecting accessibility to or clearance about equipment or accessories shall be promptly communicated to Engineer.

C. Piping Diagrams: Piping diagrams are not for the purpose of giving physical dimensions or locations but rather to make clear the interconnection, by the piping, of the various units of the process. If an item is shown on either the piping diagram or the piping detail drawings, but not on both, it shall be assumed that Contractor has included such item in their estimate of the cost of Work and that they shall install the same.

D. Pipe Lengths: In the assembly of the piping system, the longest available commercial standard piping lengths shall be utilized to minimize number of piping joints. Piping shall be accurately cut to field measurements to permit placement without forcing. Cold springing of piping is not allowed.

E. Piping Layout: Piping shall be run straight and parallel with adjacent walls, presenting a uniform and neat appearance.

F. Provide drip pans and drain lines for piping above electrical equipment. Drain lines shall extend out of electrical room or area and shall terminate in readily noticeable location.

3.3 CONNECTIONS

A. Screw joint steel piping up to and including 2 inches. Weld piping 2-1/2 inches and larger, including branch connections.

B. Use full-cut standard taper pipe threads. Make up joints using PTFE tape, Teflon based pipe joint compound, or other Engineer approved nontoxic joint compound applied to male threads only.

C. Use main sized Weld-O-Let or Thread-O-Let male branch connections or Stub-in in steel piping if main is at least 1 pipe size larger than the branch for up to 6 inches mains and main is at least 2 pipe sizes larger than branch for 8 inches and larger mains. Do not project branch pipes inside the main pipe.

D. Joints for cast iron bell and spigot pipe shall have a neoprene gasketing system. Joint for plain end pipe shall have clamp type mechanical fasteners and gaskets.

E. Use grooved mechanical couplings only as shown on Drawings.

F. Provide non conducting type connections wherever jointing dissimilar metals in systems. Brass adapters and valves are acceptable.

G. On copper piping systems, tee drilling shall be permitted for sizes up to and including 1 inch provided the main service pipe size is a minimum 4 pipe sizes larger than the size of the tee drill connection.

3.4 ROUTE AND GRADES

A. Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Grouping piping whenever practical at common elevations. Install concealed pipes close to building structure to keep furring to a minimum.

B. Slope water piping above grade 1 inch in 40 feet and arrange to drain at low points.

C. On closed systems, low points shall be provided with 3/4 inch drain valves and hose nipples. Provide manual air vents at high points. Low points and high points are to be piped to nearest drain, within the same room, with drain valves at 72 inches.

D. Make reductions in water pipes with eccentric reducing fittings installed to provide drainage and venting.

E. Grade horizontal drainage and vent piping at minimum 2 percent slope unless otherwise noted on Drawings.

F. Install piping to allow for expansion and contraction without stressing pipe or connected equipment.

G. Provide clearance for installation of insulation and for access to valves, air vents, drains, and unions.

H. Install same type piping material specified for inside building to 5 feet outside of building.

3.5 IDENTIFICATION

A. Identify piping, flow direction and contents as specified in IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT Section.

3.6 CLEANING

A. Refer to PIPE CLEANING AND WATER TREATMENT Section for additional requirements.

B. General: Piping systems shall be cleaned following completion of testing and prior to connection to operating, control, regulating or instrumentation equipment. Contractor may clean sections of buried or exposed piping systems. Use of this procedure, however, shall not waive the requirement for a full flushing of the completed system. Unless specified otherwise, piping 24 inches in diameter and smaller first be cleaned by pulling a tightly fitting cleaning ball or swab through the system.

C. Liquid Systems: After completion of cleaning, liquid systems, unless otherwise specified, shall be flushed with clean water. With temporary screens in place, the liquid shall be circulated through the piping system using connected equipment for a minimum period of 60 minutes and until no debris is collected on the screens.

3.7 TESTING

A. Refer to PIPING TESTS Section for additional requirements.

B. General: Upon completion of piping, test the piping systems. Pressures, media, and test durations shall be as specified in Article 3.9 of this Section. Equipment, which may be damaged by the specified test conditions, shall be isolated. Testing shall be performed using calibrated test gages and calibrated volumetric measuring equipment to determine leakage rates. Each test gage shall be selected so that the specified test pressure falls within the upper half of the gages range. Unless otherwise specified, notify Engineer 48 hours prior to each test. Engineer shall be present during testing of new and existing piping. Unless otherwise specified, testing, as specified in this Section, shall include existing piping systems, which connect with new pipe systems. Existing pipe shall be tested to the nearest existing valve. Piping, which fails the test, shall be repaired. Repair of existing piping shall be considered and paid for as extra Work and shall be coordinated with Engineer.

C. Testing shall be done in the presence of CxA and Engineer.

D. Complete and test pipe rough in before insulation or other finish work is applied. Covering of work before acceptance is prohibited.

E. Do not test relief valves, pressure regulating valves, valves, or equipment beyond its rated capacity.

F. Pressure systems can be pretested with air, but final acceptance shall use water as specified in Piping Services Article of this Section.

G. Liquid Systems: Leakage shall be zero at the specified test pressure throughout the specified duration for exposed piping. Leakage for buried insulated piping shall not exceed allowed leakage in conformance with AWWA C600.

H. Condenser Water and Hot Water Piping: Leakage testing shall occur at maximum intervals for underground piping from valve pit to the next immediate valve locations. Contractor may test sections of buried or exposed piping systems. Use of this procedure, however, shall not waive the requirement for a full pressure test of the completed system.

3.8 PIPING SERVICE COLOR CODING

A. The following table indicates fluid category, pipe and pipe marker background color of each service:

Symbol	Service	Fluid Category	Pipe Color
CHWS	Chilled Water Supply	Water	Medium Blue
CHWR	Chilled Water Return	Water	Medium Blue
HHWS	Heating Hot Water Supply	Water	Medium Yellow
HHWR	Heating Hot Water Return	Water	Medium Yellow
CW	City Water	Water	Dark Green
ICW	Industrial Water	Water	Dark Grey
IW	Indirect Waste	Water	Green
OD	Overflow Drain	Water	Green
SD	Storm Drain	Water	Green
SS	Sanitary Sewer	Water	Dark Yellow
V	Sanitary Vent	Air	Green
W	Sanitary Waste	Water	Dark Yellow
HW	Hot Water	Water	Medium Yellow
IHW	Industrial Hot Water	Water	Medium Yellow

3.9 PIPING SERVICES

A. Piping Service: Heating Hot Water Supply

Heating Hot Water Return

1. Test Requirements:

a. Medium: Water: As specified in this Section

b. Pressure: 150 psig for above ground piping, 120 psig for underground piping.

c. Duration: 120 minutes

d. Refer to Testing Article of this Section for additional requirements.

2. Gasket Requirements:

a. Flange: Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder.

b. Mechanical Coupling: EPDM

c. Silver Solder/Braze: AWS A5.8M/A5.8; Material shall have 15 percent minimum silver content.

3. Exposed Pipe and Valves: Insulate pipes, valves and fittings in conformance with HVAC PIPING INSULATION Section unless noted otherwise on Drawings. (Refer to drawings for pipe size and valve type)

a. Pipe (2-1/2 inches and smaller): Copper Tube; ASTM B88, Type L, hard drawn. Connections shall be silver solder/braze joint. Fittings shall be solder type with threaded adapters for valves.

b. Valves and ball valves (2-1/2 inches and smaller)Ball valves. Refer to GENERAL-DUTY VALVES FOR HVAC PIPING Section

c. Pipe (larger than 2-1/2 inches): Steel; ASTM A53/A53M, Type E, Grade B, black, Schedule 40 ERW with beveled ends for welding, no lining. Fittings shall be malleable iron, ductile iron, or steel; ends to match pipe.

d. Valves (larger than 2-1/2 inches): Butterfly valves. Refer to GENERAL-DUTY VALVES FOR HVAC PIPING Section.

4. Insulation:

a. Pipe: Polyurethane foam with the following minimum characteristics: K Factor -0.14, Density 2 pcf, compressive strength minimum 20 psi completely filling the annular space between carrier pipe and jacketing. Minimum insulation thickness shall be in conformance with table on Drawings.

b. Valves and Fittings: Insulate in conformance with HVAC EQUIPMENT INSULATION Section, unless noted otherwise on Drawings.

c. Jacketing: High impact, seamless polyvinylchloride (PVC) Class 12454-B compound conforming to ASTM D1784, Type 1, Grade 1 through 14 inches diameter. Above 16 inches, use high density polyethylene (HDPE) minimum thickness 150 mils in conformance with ASTM D1248 and ASTM D3350 for Type III, Category 5, Class C and Grade P23 & P34. No FRP over-wrap or sprayed jacketing shall be allowed. Minimum jacket thickness shall be 0.020 inch.

5. Provide manual air vents at the high points as specified in this Section.

B. Piping Service: Chilled Water Supply Chilled Water Return

1. Test Requirements:

a. Medium: Water: As specified in this Section

b. Pressure: 150 psig for above ground piping, 120 psig for underground piping.

c. Duration: 120 minutes

d. Refer to Testing Article of this Section for additional requirements.

2. Gasket Requirements:

a. Flange: Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder.

b. Mechanical Coupling: EPDM

c. Silver Solder/Braze: AWS A5.8M/A5.8; Material shall have 15 percent minimum silver content.

3. Exposed Pipe and Valves: Insulate pipes, valves and fittings in conformance with HVAC PIPING INSULATION Section unless noted otherwise on Drawings. (Refer to Drawings for pipe size and valve type)

a. Pipe (2-1/2 inches and smaller): Copper Tube; ASTM B88, Type L, hard drawn. Connections shall be silver solder/braze joint. Fittings shall be solder type with threaded adapters for valves.

b. Valves (2-1/2 inches and smaller): Ball valves. Refer to GENERAL-DUTY VALVES FOR HVAC PIPING Section.

c. Pipe (larger than 2-1/2 inches): Steel; ASTM A53/A53M, Type E, Grade B, black, Schedule 40 ERW with beveled ends for welding, no lining. Fittings shall be malleable iron, ductile iron, or steel; ends to match pipe.

d. Valves (larger than 2-1/2 inches): Butterfly valves. Refer to GENERAL-DUTY VALVES FOR HVAC PIPING Section.

4. Insulation:

a. Pipe: Polyurethane foam with the following minimum characteristics: K Factor -0.14, Density 2 pcf, compressive strength minimum 20 psi completely filling the annular space between carrier pipe and jacketing. Minimum insulation thickness shall be in conformance with table on Drawings.

b. Valves and Fittings: Insulate in conformance with HVAC EQUIPMENT INSULATION Section, unless noted otherwise on Drawings.

c. Jacketing: High impact, seamless polyvinylchloride (PVC) Class 12454-B compound conforming to ASTM D1784, Type 1, Grade 1 through 14 inches diameter. Above 16 inches, use high density polyethylene (HDPE) minimum thickness 150 mils in conformance with ASTM D1248 and ASTM D3350 for Type III, Category 5, Class C and Grade P23 and P34. No FRP over-wrap or sprayed jacketing shall be allowed. Minimum jacket thickness shall be 0.020 inch.

5. Provide manual air vents at the high points as specified in this Section.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hydrostatic tests

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

C. Section 23 21 13 - Hydronic Piping

D. Section 23 21 30 - Pipe Cleaning and Water Treatment

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in corresponding bid items of Bid Proposal Line Items that require hydrostatic piping tests.

1.4 SUBMITTALS

A. Provide following information in conformance with BASIC MECHANICAL REQUIREMENTS Section:

1. Submit complete description of testing procedures. Compile test data and submit to Engineer as certification of completion of tests.

1.5 QUALITY ASSURANCE

A. Conform to applicable codes and standards listed in this Section and HYDRONIC PIPING Section.

B. Secure written approval of Engineer for proposed test procedures, testing media, isolation methods, and pressure monitoring techniques prior to commencement of tests.

C. If deviations from specified procedures are proposed, secure approval of Engineer in writing for each such deviation before said deviation is incorporated as part of Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide pumps, gaskets, blinds, instruments, compressed air, compressed gases, temporary supports, and attaching and connecting appurtenances as required to commence and complete tests.

B. Provide items in conformance with HYDRONIC PIPING Section.

C. Provide adequate supply of water at pressure required for test if water supply is unavailable at required pressure at time of test.

PART 3 - EXECUTION

3.1 APPLICATION

A. Adjust and set valves, controls and motorized equipment; operate mechanical equipment demonstrating adequacy of installation and ability to produce rated capacity.

B. Provide services of qualified fully trained engineer to direct performance tests.

C. Systems completed prior to testing shall be in good working order; permission to proceed shall be obtained from Engineer.

D. Maintain operability of systems and equipment during each day of testing.

E. Lubricate motorized equipment prior to operation.

F. Conduct tests in presence of Engineer.

G. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period. Repair leaky piping and re-test. Repeat the procedure until the entire system is proven tight.

H. Maintain instruments in good working condition and assure instruments to be accurately calibrated.

I. Provide tests where required by HYDRONIC PIPING Section and by Engineer.

3.2 FIELD QUALITY CONTROL

A. Test piping and piping components only; isolate or valve off connected equipment including pumps, heat exchangers, relief valves, expansion joints, instruments and filters subject to damage by test pressure. Pipe systems may be tested in sections.

B. Do not include equipment in testing of piping systems unless approved in writing by Engineer.

C. System Protection:

1. Remove or disconnect from system:

   a. Pumps

   b. Traps

   c. Instruments

   d. Safety valves

   e. Rupture discs

   f. Orifice plates

   g. Any other items subject to damage by test or designated by Engineer.

2. Protect piping and equipment against:

   a. Collapse from vacuum

   b. Hydraulic shock

3. Valves:

   a. Do not subject seats of iron valves to pressure greater than maximum cold working pressure of valve.

   b. Do not subject other closed valves to pressures greater than one and one half times their normal pressure rating.

   c. Before commencing tests for system, open valves in system, including bypass valves.

D. Do not apply paint to welds or joints until testing is completed; this may require testing in certain specific areas ahead of and separate from other areas to allow other trades to complete their respective portions of Work.

E. Preparation of Hydrostatic Test:

1. Set control valves in open position or remove for duration of test.

2. Provide vents at high points in piping system and drains in low points or where required.

3. Pipe Supported by Spring Hangers:

a. During hydrostatic testing, install temporary travel stops or locks on spring hangers or install temporary solid rod supports during entire time pipe is filled with water to support additional weight and prevent overstressing springs.

b. Install temporary supports where required to prevent overstressing supports other than spring hangers.

4. Slowly fill each system with water through low connection point located upstream of check valves to completely vent air from each system.

5. Use water at temperature not greater than 100 degrees Fahrenheit (F).

6. Remove or blank off items not to be subjected to test pressure.

F. Test Type HT - Hydrostatic Test for Pressurized Liquid Systems:

1. Test with clean filtered water at 1-1/2 times normal working pressure or as specified in HYDRONIC PIPING Section, whichever is greater.

2. Take pressure readings where convenient. Subtract static pressure at highest point from pressure reading to ensure that piping conforms to specified test pressure.

3. Examine pipe and joints for leakage.

4. Apply pressure gradually and maintain test pressure for the minimum time specified plus additional time to allow for thorough examination of joints, flanges, welds, and connections.

5. Justify to Engineer pressure loss other than that due to temperature change or similar phenomena.

6. Upon completion, drain and purge with air to remove l water; provide special attention to instrument connections, valves, orifice plates and pockets for trapped water.

7. Install new gaskets when reinstalling flanged items at completion of test.

8. Additional Requirements, Exterior Underground Pressurized Water Piping:

    a. During test, leave joints exposed and securely attached, maintaining ample earth cover on piping between joints to prevent movement, buckling, or deformation.

    b. Where thrust blocks are used, test pipe when thrust blocks have sufficiently hardened.

    c. Fill pipe with water 24 hours prior to testing so that air is removed. Using vent valves installed in high points.

    d. Measure leakage at specified test pressure by pumping from calibrated container.

    e. Increase pressure slowly in 50 psi increments to test pressure; examine joints, gaskets, and pipe for leakage deformation, or other defects after each increase and allow to stabilize before increasing further.

G. Take measures required by applicable codes and ordinances and necessary for personnel safety during testing.

H. Test piping prior to installation of insulation, concealment, and painting.

I. Apply test pressure to system only after system and testing medium are at same temperature, preferably not less than 60 degrees F.

J. Repair damage, leaks, and defects caused or indicated by tests or resulting from improper protection, application, or test execution; redo leaking or defective welded, brazed, soldered, and plastic heat fusion welded and solvent joints in conformance with original joining procedure and completely retest.

K. Do not establish system pressure ratings with tests.

L. Retests:

1. Retest shop tested equipment only if equipment is damaged or disassembled during shipment, storage, transportation, and installation.

2. Retest equipment at maximum pressure equal to shop test pressure for equipment.

3. Retest equipment only if directed by Engineer.

4. Retest piping if revisions or repairs are made to piping or connected pressure equipment.

5. Retest piping if design pressure for piping system is increased more than 10 per cent above original design pressure; Engineer shall define pressure for retest.

M. Conduct tests in presence of Engineer.

N. At completion of test, restore system components to normal operating condition.

O. At completion of test, remove temporarily installed items, including blanks, travel stops, and temporary supports.

P. Inspection:

1. Provide to Engineer on request full access to Work and Work areas and full information on progress of parts of Work.

2. If special tests or approvals are required, notify Engineer of readiness for inspection or, if inspection is to be by authority other than Engineer, notify Engineer of time and place for said inspection.

Q. Dispose of test media in manner acceptable to Engineer and in conformance with local storm water and sanitation district regulations.

3.3 PIPING TEST SCHEDULE

A. Unless otherwise noted in HYDRONIC PIPING Section or on Drawings, piping systems shall be tested for a minimum time duration of 4 hours with no measurable loss of head or pressure. Test pressures for services not listed shall be 1.5 times normal working pressure.

B. Contractor shall maintain a schedule of testing and submit copy to Engineer. An example is shown below.

DATE AND TIME	SYSTEM	METHOD	PRESSURE	SPEC. REF.	WITNESSED BY

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Close-coupled, in line centrifugal pumps

B. Separately coupled, vertical in line centrifugal pumps

C. Separately coupled, base mounted, end suction centrifugal pumps

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 05 13 - Common Motor Requirements for HVAC Equipment

C. Section 23 21 13 - Hydronic Piping

D. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

E. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Cold Water Pump bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. 29 CFR 1910.219 - Mechanical Power-Transmission Apparatus.

B. ANSI/HI 14.1-14.2 - Rotodynamic Pumps for Nomenclature and Definitions.

C. ANSI/HI 14.3 - Rotodynamic Pumps for Design and Application.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

E. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.

F. NFPA 70 - National Electrical Code.

1.5 SUBMITTALS

A. Submittals shall be formatted in conformance with BASIC MECHANICAL REQUIREMENTS Section.

B. Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

C. Shop Drawings (For each pump):

1. Show pump layout and connections.

2. Include setting drawings with templates for installing foundation, anchor bolts and other anchorages.

3. Include diagrams for power, signal, and control wiring.

D. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

E. Warranty: Provide a minimum 1 year warranty on materials and installation.

F. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: 1 mechanical seal for each pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Armstrong Fluid Technology, https://armstrongfluidtechnology.com/

B. Bell & Gossett (B&G), https://www.xylem.com/en-us/brands/bell-gossett/

C. ITT Corporation, https://www.itt.com/

2.2 SEPARATELY COUPLED AND VERTICAL IN-LINE CENTRIFUGAL PUMPS

A. Description: Factory assembled and tested, split coupled vertical inline centrifugal pump.

B. Pump Construction:

1. Casing: Class 30 cast iron rated for 175 pound per square inch gage pressure, with threaded gage tappings at inlet and outlet, vent and drain ports, replaceable bronze wear rings, and integral cast iron flanges drilled for 125 pound American National Standards Institute (ANSI) companion flange connections.

2. Impeller: Stainless steel; statically and dynamically balanced, keyed to shaft, and secured with a stainless steel locking cap screw or nut.

3. Coupling: Rigid spacer type of high tensile aluminum alloy. Coupling shall be designed to be easily removed on site to reveal a space between the pump and motor shafts sufficient to remove mechanical seal components for servicing and to be replaced without disturbing the pump or motor.

4. Pump Shaft: 416 Stainless steel guided by carbon graphite lower throttle bushing.

5. Seal: Unitized inside mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and ethylene propylene rubber (EPR) bellows and gasket.

6. Pump Bearings: Permanently lubricated ball bearings.

7. Pump Support: Base ring matching ANSI 125 pound flange that is part of volute.

C. Motor: Single speed and rigidly mounted to pump casing.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency approved by Engineer, and marked for intended location and application.

2. Comply with National Electrical Manufacturers Association (NEMA) designation, temperature rating, service factor, and efficiency requirements for motors specified in COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT Section.

D. Capacities and Characteristics: As shown in Pump Schedule on Drawings.

2.3 SEPARATELY COUPLED, BASE MOUNTED, AND END SUCTION CENTRIFUGAL PUMPS

A. Description: Factory assembled and tested, centrifugal, overhung impeller, separately coupled, end suction pump as defined in ANSI/HI 14.1-14.2 and ANSI/HI 14.3; designed for base mounting, with pump and motor shafts horizontal.

B. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.

2. Impeller: ASTM B584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency drive controlled, trim impeller to match specified performance.

3. Pump Shaft: Steel, with copper alloy shaft sleeve.

4. Seal: Mechanical seal consisting of carbon rotating ring against a ceramic seat held by a stainless steel spring, and Buna-N (nitrile rubber) bellows and gasket.

5. Pump Bearings: Grease lubricated ball bearings in cast iron housing with grease fittings.

C. Provide drop-out coupling that allows removal and replacement of impeller without disconnecting piping. This device is required with volute support described in Casing subparagraph of this Article.

D. Shaft Coupling: Molded rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor. EPDM coupling sleeve for variable speed applications.

E. Coupling Guard: Dual rated; 29 CFR 1910.219 approved; steel; removable; attached to mounting frame.

F. Mounting Frame: Welded steel frame and cross members, factory fabricated from ASTM A36/A36M channels and angles. Fabricate to mount pump casing, coupling guard, and motor.

G. Motor: Single speed and rigidly mounted to pump casing.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency approved by the Engineer, and marked for intended location and application.

2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT Section.

H. Capacities and Characteristics: As shown in Pump Schedule on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine pumps before installation. Reject pumps that are damaged.

B. Examine equipment foundations and anchor bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

C. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

D. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Comply with ANSI/HI 14.3.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Equipment Mounting:

1. Comply with requirements for vibration isolation and seismic control devices specified in VIBRATION AND SEISMIC CONTROLS FOR HVAC Section.

3.3 ALIGNMENT

A. Engage a factory authorized service representative to perform alignment service.

B. Comply with requirements in Hydronics Institute (H standards for alignment of pump and motor shaft. Add shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.

C. Comply with pump and coupling manufacturer's written instructions.

D. Adjust pump and motor shafts for angular and offset alignment by methods specified in ANSI/HI 14.1-14.2.

1. Alignment shall be reverse dial indicator or laser method.

2. Indicated run-out shall not exceed 0.001 inch.

3. Angular and offset misalignment shall be as follows:

	Maximum Angularity	Maximum Offset
1200 rpm	0.0015 inch	0.001 inch
1800 rpm	0.0010 inch	0.001 inch
3600 rpm	0.0005 inch	0.001 inch

E. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.4 CONNECTIONS

A. Comply with requirements for piping specified in HYDRONIC PIPING Section. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to pump, allow space for service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install check and shutoff valves on discharge side of pumps. A check valve is not required in a single pump configuration.

F. Install strainer or suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors with vane straighteners on suction and discharge sides of base mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge or at integral pressure gage tapping.

I. Ground equipment according to GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS Section.

J. Connect wiring according to LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES Section.

3.5 STARTUP SERVICE

A. Engage a factory authorized service representative to perform startup service.

1. Complete installation and startup checks conforming to manufacturer's written instructions.

2. Check piping connections for tightness.

3. Clean strainers on suction piping.

4. Perform the following startup checks for each pump before starting:

a. Verify bearing lubrication.

b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.

c. Verify that pump is rotating in the correct direction.

5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.

6. Start motor.

7. Open discharge valve slowly.

3.6 DEMONSTRATION

A. Engage a factory authorized service representative to train Department personnel to adjust, operate, and maintain hydronic pumps as specified below:

1. Train Department staff on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining pumps.
2. Review data in maintenance manuals.
3. Schedule training with Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Chemical water treatment system

B. Chemicals

C. Equipment

D. Testing equipment

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 21 13 - Hydronic Piping

C. Section 23 21 14 - Piping Tests

D. Section 23 25 00 - HVAC Water Treatment

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in corresponding bid items of Bid Proposal Line items that requires chemical water treatment system.

1.4 REFERENCES

A. ISO 9000 - Quality Management Systems -- Fundamentals and Vocabulary.

1.5 SUBMITTALS

A. Submit shop drawings and product data in conformance with BASIC MECHANICAL REQUIREMENTS Section

B. Submit the following to Engineer:

1. Shop drawings indicating system schematics, equipment and skid locations, and component locations.

2. Material safety data sheets on chemicals.

3. Manufacturer’s field reports.

4. Manufacturer’s installation instructions.

5. Reports indicating start-up of treatment systems are completed and operating properly.

6. Reports indicating analysis of system water after cleaning and after initial treatment (after first month of operation), subsequent reports are to be provided to Engineer after each service visit.

C. Operation and Maintenance Data:

1. Submit operation and maintenance data as specified in BASIC MECHANICAL REQUIREMENTS Section:

2. Include step by step instructions on test procedures including target concentrations.

D. Maintenance Materials:

1. Submit maintenance materials as specified in BASIC MECHANICAL REQUIREMENTS Section.

2. Provide sufficient chemicals and labor for maintaining a full service program during the 1 year warranty period.

1.6 QUALITY ASSURANCE

A. Supplier shall provide a licensed engineer as field supervisor and project manager for start-up of these systems. This representative shall be a full-time employee of the chemical supplier and have a minimum of 5 years of experience in the field of water treatment.

B. Chemicals shall be produced at ISO 9000 certified manufacturing plants. Quality control of chemicals formulations shall be monitored via statistical process control charts which are downloaded into a Statistical Process Control data management program.

C. The hot water treatment shall consist of the services of a knowledgeable water treatment service engineer, selection of appropriate water treatment chemicals, appropriate test kits, and reagents. Contractor provides written instructions from chemical vendor stating point by point how the program is to be applied and how the system is controlled as well as what responses are appropriate in the event that any control parameter does not comply with this specification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Chem Pro Lab, Inc., https://chemprolab.com/index.shtml

B. San Joaquin Chemicals, Inc., https://sjc-inc.com/

2.2 CHEMICAL WATER TREATMENT SYSTEM

A. A report of the existing water conditions and suggested corrective measures shall be submitted at the completion of each visit.

B. In the event scale or biological growths, (fouling) occur in any system, Contractor shall provide labor and chemicals to bring the system to an acceptable level at no additional cost to Department, during normal working hours.

C. Log sheets and instructions shall be provided for Engineer’s review and for Department records.

D. Corrosion coupons shall be installed in each treated water system with representative metals, monitored by Contractor every 90 days with the results included in a written report.

E. Supervise the following:

1. The installation of water treatment equipment.

2. The cleaning of the closed systems with a written certification of cleanliness upon completion.

F. Coordinate discipline specific requirements for a complete and operational chemical water treatment system.

2.3 CHEMICALS

A. Provide necessary and proper chemicals to operate the systems for a period of 1 year from initial operation.

B. The following shall be included:

1. Cleaning chemicals, in liquid form, for the cleaning of closed systems.

2. Sulfuric acid shall be used unless sulfate content of the make up water in the area does not permit its practical usage, in which case, Contractor shall suggest an alternative acid. A pH between 7.8 and 8.1 shall be maintained.

3. A corrosion inhibitor with sequestering properties shall be used in tower systems, both acid and non acid.

4. Closed systems other than aerated systems shall be treated with a borate nitrite compound. The following residuals shall be maintained:

   a. 700 to 1,200 parts per million (ppm) nitrite in chilled water systems.

   b. 1,000 to 1,500 ppm nitrite in hot water heating systems.

   c. A proper biocide shall be added.

C. Chemicals used shall be environmentally safe and acceptable to Environmental Protection Agency (EPA), Federal Drug Administration (FDA), United States Department of Agriculture (USDA), State of California, South Coast Air Quality Management District (SCAQMD), County of Los Angeles, and City of Los Angeles.

2.4 EQUIPMENT

A. For closed heating hot water system, provide one 5 gallon pot feeder with metal corrosion coupon rack with 4 stations and 5 gallons per minute (gpm) flow control.

2.5 TESTING EQUIPMENT

A. Provide the following:

1. One hand held 0 to 5,000 microm conductivity meter: - Myron 512-M5.

2. One pH test kit.

3. One corrosion inhibitor test kit for the closed systems.

PART 3 - EXECUTION

3.1 GENERAL PIPING CLEANING

A. After installation and before installing valve or making final connections, flush or purge piping systems clean of foreign substances, using water to flush piping conducting liquid and compressed air to clear piping conducting air or gas. Flush pressure systems with water to achieve a minimum 5 FPS continuous velocity for a minimum of 10 minutes.

B. Temporary Screens: Upon completion of cleaning, connect the piping systems to related process equipment. Temporary screens, provided with locator tabs that remain visible from the outside when the screens are in place, shall be inserted in pipelines at the suction of pumps and compressors in conformance with the following table:

Equipment Suction or Piping Size (inches)	Maximum Screen Opening (inches)
0 to 1	1/16
1-1/4 to 3	1/4
3-1/2 to 6	1/2
Over 6	3/4

C. Maintain the screens during testing and initial start-up. In special cases, screens may be removed as required for performance tests. Remove the temporary screens and make the final piping connections after the screens have remained clean for at least 24 consecutive hours of operation.

3.2 HOT AND CHILLED WATER PIPE CLEANING

A. Requirements: Cutting oil, excess pipe joint compound, weld slag, mill scale, finely divided solids, and other similar foreign materials shall be removed from the piping systems before they are placed in operation. The cleaning materials used shall be supplied and applied by Contractor and circulation, draining flushing, and refilling Work shall be provided by Contractor. Chemical cleaning solutions shall not be harmful to the environment or materials of construction. After the systems has been drained, flushed and refilled, they shall be left slightly on the alkaline side (pH 7.5). If the systems are on the acid side, the cleaning and testing shall be repeated subject to the approval of Engineer. The cleaning of the piping systems shall include the cleaning of strainers. Tag each strainer after cleaning same. The tag shall contain the date and the name of the individual who actually cleaned the strainers.

B. Cleaning Procedure: After equipment and piping has been installed complete, the piping systems shall be cleaned as follows:

1. Provide 10 working days written notice prior to the cleaning of the system.

2. Provide chemicals for cleaning and pretreatment of heating water systems as specified within.

3. Systems shall be filled, operated, and drained repeatedly as described in General Piping Cleaning Article of this Section until clean and free from foreign materials. Strainers at pumps and control valves and wherever else they occur in a system shall have mesh elements removed and cleaned or replaced repeatedly until system can operate continuously with no buildup of foreign materials on strainer mesh elements.

C. Chemical Treatment: Notify Engineer 90 working days prior to the time water treating chemicals shall be introduced in the system by Contractor. Engineer shall witness application of chemicals and Contractor shall verify that initial concentrations have been reached as specified prior to system being accepted. Actual readings of treatment levels shall be documented and reported to Engineer in writing. Contractor shall coordinate addition of chemicals to systems requiring treatment in a 2 to 3 day time period if possible, to permit Engineer to be present.

1. Chemical supplier shall be by approved vendor and compatible with existing chemical supplier.

D. Closed Water Systems:

1. Cleaning (per 1,000 gallons of water):

a. Fill loop with City water and re-circulate for 1 hour.

b. System pumping velocity shall be sufficient to remove any loose debris.

c. Drain the loop.

d. Remove screens and strainers, clean, and replace.

e. Fill the entire system with water and add 5 to 10 gallons of alkaline cleaner, polyphosphate, and a copper inhibitor.

f. Re-circulate system for at least 4 hours.

g. If biofilm is present, or suspected, use a dispersant and biocides to facilitate the cleaning processes.

h. Drain system from its lowest point while flushing with water until pH and Total dissolved solids (TDS) match City water values.

i. Remove screens and strainers, clean and replace.

j. Fill system with water and immediately start pretreatment.

2. Pretreatment (per 1,000 gallons of water):

a. Add 5 gallons of nitrate and copper inhibitors to the loop and re-circulate for 48 hours.

b. Maintain nitrate level to minimum of 1,200 ppm NO2 during start-up.

c. Dump and flush the system from low point until City TDS levels are reached.

d. Check screens and strainers, clean if necessary.

e. Fill system loop 100 percent and add nitrate chemical to maintain minimum 1,000 parts per million (ppm) nitrogen dioxide (NO2).

f. If system is not to be put into service immediately, leave pumping system in place and circulate a minimum of 2 hours per day, until system is put into service.

3.3 POST FLUSHING LONG TERM INHIBITOR ADDITION

A. Long term inhibitor shall be added as soon as possible after flushing is complete to ensure the integrity of the passivation layer developed during the cleaning. The addition of the long term inhibitor shall not be delayed beyond 4 days.

3.4 TESTING

A. A sample of the system water shall be taken and analyzed by Contractor’s chemical company and Department’s chemical company (if any) and both reports submitted to Engineer for approval before the system shall be opened to the main loop.

B. Sample system water at 1 week intervals after start-up for period of 5 weeks and prepare certified test report for each required water performance characteristic.

C. Visit and test cooling and heating systems, at least once a month for 1 year from startup of system (from the point when there is a load on the system).

3.5 TRAINING OF DEPARTMENT PERSONNEL

A. Provide services of supplier's technical representative to instruct Department personnel in operation, maintenance, and testing procedures of water treatment system. Training shall be minimum 4 hours dedicated instruction time on-site or at a location of Department's choice.

3.6 MAINTENANCE SERVICE

A. Provide service and maintenance of treatment systems for 1 year from startup of system (from the point when there is a load on the system).

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Copper tube and fittings

B. Valves

C. Strainers

D. Moisture/liquid Indicators

E. Filter dyers

F. Refrigerants

1.2 RELATED SECTIONS

A. Section 23 05 17 - Sleeves and Sleeve Seals for HVAC Piping

B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

C. Section 23 05 53 - Identification for HVAC Piping and Equipment

D. Section 23 09 00 - Instrumentation and Controls for HVAC

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Refrigerant Piping bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers.

B. AHRI 750 (I-P) - Performance Rating of Thermostatic Refrigerant Expansion Valves.

C. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

G. ASME B31.5 - Refrigeration Piping and Heat Transfer Components.

H. ASME BPVC - Boiler and Pressure Vessel Code.

I. ASTM B32 - Standard Specification for Solder Metal.

J. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

K. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.

L. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

M. CDA A4015 - The Copper Tube Handbook.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

O. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

P. UL 429 - Electrically Operated Valves.

1.5 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty.

B. Shop Drawings:

1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

2. Show interface and spatial relationships between piping and equipment.

3. Shop Drawing Scale: 1/4 inch equals 1 foot.

C. Field quality control reports.

D. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance and operations manuals.

1.6 QUALITY ASSURANCE

A. Comply with ASHRAE Std 15.

B. Comply with ASME B31.5.

1.7 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-513:

1. Suction Lines for Air-Conditioning Applications: 115 pounds per square inch gage (psig).

2. Suction Lines for Heat Pump Applications: 225 psig.

3. Hot-Gas and Liquid Lines: 225 psig.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B280, Type L ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8M/A5.8

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned bronze wire reinforced protective jacket.

2. End Connections: Socket ends.

3. Offset Performance: Capable of minimum 3/4 inch misalignment in minimum 7 inch long assembly.

4. Working Pressure Rating: Factory test at minimum 500 psig.

5. Maximum Operating Temperature: 250 degrees Fahrenheit (F)

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Manufacturer: Danfoss, Inc.
2. Body and Bonnet: Forged brass or cast bronze; globe design with straight through or angle pattern.
3. Diaphragm: Phosphor bronze and stainless steel with stainless steel spring.
4. Operator: Rising stem and hand wheel
5. Seat: Nylon
6. End Connections: Socket, union, or flanged
7. Working Pressure Rating: 500 psig
8. Maximum Operating Temperature: 275 degrees F

B. Packed Angle Valves:

1. Manufacturer: Danfoss, Inc.
2. Body and Bonnet: Forged brass or cast bronze
3. Packing: Molded stem, back seating, and replaceable under pressure
4. Operator: Rising stem
5. Seat: Non-rotating, self-aligning polytetrafluoroethylene (PTFE)
6. Seal Cap: Forged brass or valox hex cap
7. End Connections: Socket, union, threaded, or flanged
8. Working Pressure Rating: 500 psig
9. Maximum Operating Temperature: 275 degrees F or 135 degrees Celsius (C).

C. Check Valves:

1. Manufacturer: Danfoss, Inc.
2. Body: Ductile iron, forged brass, or cast bronze; globe pattern.

3. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug
4. Piston: Removable PTFE seat
5. Closing Spring: Stainless steel
6. Manual Opening Stem: Seal cap, plated steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged
8. Maximum Opening Pressure: 0.50 psig
9. Working Pressure Rating: 500 psig
10. Maximum Operating Temperature: 275 degrees F

D. Service Valves:

1. Manufacturer: Danfoss, Inc.
2. Body: Forged brass with brass cap including key end to remove core.
3. Core: Removable ball type check valve with stainless steel spring.
4. Seat: PTFE
5. End Connections: Copper spring.
6. Working Pressure Rating: 500 psig

E. Solenoid Valves: Comply with AHRI 760 (I-P) and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).

1. Manufacturer: Danfoss, Inc.
2. Body and Bonnet: Plated steel.
3. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
4. Seat: PTFE
5. End Connections: Threaded.
6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2 inch (16-GRC) conduit adapter, and 24V ac coil.
7. Working Pressure Rating: 400 psig
8. Maximum Operating Temperature: 240 degrees F

F. Safety Relief Valves: Comply with ASME BPVC; listed and labeled by NRTL.

1. Manufacturer: Danfoss, Inc.
2. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
3. Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Seat: PTFE
5. End Connections: Threaded.
6. Working Pressure Rating: 400 psig
7. Maximum Operating Temperature: 240 degrees F

G. Thermostatic Expansion Valves: Comply with AHRI 750 (I-P).

1. Manufacturer: Danfoss, Inc.
2. Body, Bonnet, and Seal Cap: Forged brass or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Capillary and Bulb: Copper tubing filled with refrigerant charge.
6. Suction Temperature: 40 degrees F
7. Superheat: Adjustable
8. Reverse flow option (for heat pump applications).
9. End Connections: Socket, flare, or threaded union
10. Working Pressure Rating: 700 psig

H. Straight Type Strainers:

1. Manufacturer: Danfoss, Inc.
2. Body: Welded steel with corrosion resistant coating
3. Screen: 100-mesh stainless steel
4. End Connections: Socket or flare
5. Working Pressure Rating: 500 psig

6. Maximum Operating Temperature: 275 degrees F

I. Angle Type Strainers:

1. Manufacturer: Danfoss, Inc.
2. Body: Forged brass or cast bronze
3. Drain Plug: Brass hex plug
4. Screen: 100-mesh monel
5. End Connections: Socket or flare
6. Working Pressure Rating: 500 psig
7. Maximum Operating Temperature: 275 degrees F

J. Moisture/Liquid Indicators:

1. Manufacturer: Danfoss, Inc.
2. Body: Forged brass
3. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
4. Indicator: Color coded to show moisture content in parts per million (ppm).
5. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
6. End Connections: Socket or flare.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 degrees F

K. Replaceable Core Filter Dryers: Comply with AHRI 730 (I-P).

1. Manufacturer: Danfoss, Inc.
2. Body and Cover: Painted steel shell with ductile iron cover, stainless steel screws, and neoprene gaskets.
3. Filter Media: 10 micron, pleated with integral end rings; stainless steel support.
4. Desiccant Media: Activated alumina.

5. End Connections: Socket.
6. Access Ports: Nominal Pipe Size (NPS) 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: 100 tons.
9. Working Pressure Rating: 500 psig
10. Maximum Operating Temperature: 240 degrees F

L. Permanent Filter Dryers: Comply with AHRI 730 (I-P).

1. Manufacturer: Danfoss, Inc.
2. Body and Cover: Painted steel shell
3. Filter Media: 10 micron, pleated with integral end rings; stainless steel support.
4. Desiccant Media: Activated alumina
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Rated Flow: 100 tons.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 degrees F

2.3 REFRIGERANTS

A. ASHRAE Std 34, R-153a: 56 percent Tetrafluoro-1--propene and 44 percent Tetrafluoroethane

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-513A

A. Suction Lines: Copper, Type ACR, annealed temper tubing and wrought-copper fittings with brazed joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, annealed temper tubing and wrought-copper fittings with brazed joints.

C. Safety Relief Valve Discharge Piping: Copper, Type L, drawn temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

C. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

D. Install a full-size, 3-valve bypass around filter dryers.

E. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

F. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.

2. Secure bulb to clean, straight, horizontal section of suction line using 2 bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it shall reflect suction line pressure at bulb location.

G. Install safety relief valves where required by ASME BPVC. Pipe safety relief valve discharge line to outside conforming to ASHRAE Std 15.

H. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

I. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.

2. Thermostatic expansion valves.

3. Hot-gas bypass valves.

4. Compressor.

J. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

K. Install receivers sized to accommodate pump-down charge.

L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on shop drawings.

B. Install refrigerant piping conforming to ASHRAE Std 15.

C. Install piping in concealed locations unless otherwise indicated on Drawings and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise on Drawings.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to INSTRUMENTATION AND CONTROLS FOR HVAC Section for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

2. Install horizontal suction lines with a uniform slope downward to compressor.

3. Install traps and double risers to entrain oil in vertical runs.

4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves conformance to IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT Section.

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in SLEEVES AND SLEEVE SEALS FOR HVAC PIPING Section.

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in SLEEVES AND SLEEVE SEALS FOR HVAC PIPING Section.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints conforming to ASTM B828 or CDA A4015.

D. Brazed Joints: Construct joints conforming to AWS's Brazing Handbook, Chapter Pipe and Tube.

1. Use Type BCuP (copper phosphorus) alloy for joining copper socket fittings with copper pipe.

2. Use Type BAg (cadmium free silver) alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT Section.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.

2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

4. Spring hangers to support vertical runs.

5. Copper clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:

1. NPS 1/2 (DN 15): Maximum span, 60 inches; minimum rod, 1/4 inch.

2. NPS 5/8 (DN 18): Maximum span, 60 inches; minimum rod, 1/4 inch.

3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod,1/4 inch.

4. NPS 1-1/4 (DN 32): Maximum span, 96 inches; minimum rod, 3/8 inch.

5. NPS 1-1/2 (DN 40): Maximum span, 96 inches; minimum rod, 3/8 inch.

6. NPS 2 (DN 50): Maximum span, 96 inches; minimum rod, 3/8 inch .
7. NPS 2-1/2 (DN 65): Maximum span, 108 inches ; minimum rod, 3/8 inch .
8. NPS 3 (DN 80): Maximum span, 10 feet; minimum rod, 3/8 inch.
9. NPS 4 (DN 100): Maximum span, 12 feet; minimum rod, 1/2 inch.

D. Support multi-floor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high and low pressure side piping of each system separately at not less than the pressures indicated in Performance Requirements Article of this Section.
    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

4. Charge system with a new filter dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high and low pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, conforming to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.

2. Verify that compressor oil level is correct.

3. Open compressor suction and discharge valves.

4. Open refrigerant valves except bypass valves that are used for other purposes.

5. Check open compressor motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

3.9 PIPE SERVICE COLOR CODING

A. The following table indicates fluid category, pipe and pipe marker background color of each service:

Symbol	Service	Fluid Category	Background Color
RS	Refrigerant Suction	Refrigerant Gas	Black
RL	Refrigerant Liquid	Refrigerant Liquid	Black
HG	Refrigerant Hot Gas	Refrigerant Gas	Black

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Chemical feed systems

B. Chemical pot feeders

C. Chemicals

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 21 30 - Pipe Cleaning and Water Treatment

C. Section 23 63 33 - Evaporative Refrigerant Condensers

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in corresponding bid items of Bid Proposal Line Items that require HVAC water treatment.

1.4 REFERENCES

A. ISO 9000 - Quality Management Systems -- Fundamentals and Vocabulary.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide system sized and equipped to treat system and be effective in the inhibition and control of corrosion.

B. Except as indicated otherwise on Drawings, provide water treatment system, manufacturer’s standard materials and components as indicated by published product information, and as recommended by manufacturer for application indicated.

1. Condenser Water System (Open System):

    a. Provide 2 conductivity/pH controllers to match up with existing equipment in facility. Product shall be Model 2412-RTC-RS2L as manufactured by Lakewood Instruments, https://lakewoodinstruments.com/. This includes dual biocide feed, communication package with NEMA 4X closure.

    b. Chemical Feed Systems:

        1) Provide 1 inhibitor feed pump, Liquid Metronics LMI Model A151-92S, 0.24 to 24 gallons per day. Rated maximum pressure shall be 110 pounds per square inch (psi), PVC/TFE construction, and include injector assembly into 3/4 inch Schedule 80 PVC line (open system tower).

        2) Provide 1 inhibit feed pump, LMI Model P121-155S, 0.05 to 5 gallons per day. Rated maximum pressure: 150 psi, PP/TFE construction (closed system tower).

        3) Provide 2 non-oxidizing biocide pumps. Pumps shall be LMI Model A151-925, 0.24 to 24 gallons per day, and shall include injector assembly into 3/4 inch Schedule 80 PVC line (open and closed cooling tower).

        4) Supply 2 normally closed solenoid valves sized properly for bleed of each cooling tower. Refer to Drawings for sizing.

2. Heating Hot Water System: Provide one 2-gallon epoxy-lined pot feeder for hot water systems less than 5,000 gallons or one 5-gallons pot feeder for systems larger than 5,000 gallons.

3. Chilled Water System: Provide one 2-gallon epoxy-lined pot feeder for chilled water systems less than 5,000 gallons or one 5-gallon pot feeder for systems larger than 5,000 gallons.

C. Furnish water sample test kit, including carrying case and spare reagents, recommended by water treatment system manufacturer.

D. Furnish chemicals recommended by water treatment system manufacturer for treating water to meet required water quality.

E. Chemical Requirements:

1. Chemicals used shall be environmentally safe and acceptable to Environmental Protection Agency (EPA), U.S. Food and Drug Administration (FDA), United States Department of Agriculture (USDA), City of Los Angeles, and State of California.

2. Chemicals shall be produced at ISO 9000 certified manufacturing plants. Quality control of chemical formulations shall be monitored via statistical process control SPC charts which are downloaded into an SPC data management program.

3. Chemicals used shall be acceptable to various equipment manufacturers.

F. Manufacturers:

1. AquaServ Engineers, Inc., https://www.aqua-serv.com/

2. Nalco Chemicals

3. Chem Pro Lab Inc., https://chemprolab.com/index.shtml

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which water treatment systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.2 INSTALLATION OF WATER TREATMENT SYSTEM

A. Install water treatment system in conformance with manufacturer’s written instructions.

B. Coordinate the components of the water treatment system with HVAC and plumbing recirculating water systems.

C. Mount pressure gages and valves, in conformance with manufacturer’s written instructions.

D. Contractor shall coordinate with manufacturer’s drawings and requirements for installation, mounting, piping, electrical hook up, and control interface for equipment provided.

E. Coordinate installation of mechanical equipment, electrical hook-up, instrumentation and control equipment.

3.3 SYSTEM STARTUP

A. Contractor shall provide a licensed engineer as field supervision and Project manager for start up of these systems. This representative shall be a full time employee of the chemical supplier and have a minimum of 5 years of experience in the field of water treatment.

B. Start-up procedures: During system start-up, operate water treatment system (after charging with specified chemicals) to maintain required steady state characteristics of circulating water.

3.4 CLEANING

A. Cleaning and passivation of the condenser water open system:

1. Contractor shall provide chemicals for cleaning and pretreatment of condenser and closed chilled water systems as specified within this Section.

2. Chemical shall be compatible with existing chemical service.

B. Cleaning (per 1,000 gallons of water):

1. Condenser water systems (open systems):

a. Cleaning (cleaning and pretreatment shall be completed with no load):

1) Fill the entire system with domestic water and circulate for 1 hour.

2) Drain system.

3) Remove debris from the tower basin, screens, and strainers.

b. Cleaning and pretreatment (per 1,000 gallons of water):

1) Fill the system with water and adjust pH to 6.5 to 7.5 utilizing sulfuric acid (H2SO4).

2) Add 5 gallons of pretreatment to the system.

3) Circulate system for 24 to 48 hours. Check phosphate (PO4) level after 6 hours, adding pretreatment if absorption takes place. Maintain pH level of 6.5 to 7.5.

4) After 24 to 48 hour of recirculation, begin tower bleed off.

5) Blow down while adding fresh make up for a minimum of 4 hours to reduce the total inorganic phosphate level of 5 to 10 parts per million (ppm).

6) Drain the entire system.

7) Remove debris from the tower basin, screens, and strainers.

8) Hose out and flush the internals of the tower basin.

9) Fill the entire system with water and circulate for 1 hour.

10) Drain the system for the final time and inspect the tower internals, screens, and strainers. Refill the system with water and begin water treatment immediately. If the water treatment is not able to begin immediately, due to delay in the construction, contact chemical supplier for wet or dry lay down procedures.

C. Cleaning and passivation of the closed heating and chilled water systems:

1. Contractor shall provide chemicals for cleaning and pretreatment of heating water systems as specified in this Section.

2. Chemical Requirements:

a. Chemicals used shall be environmentally safe and acceptable to EPA, FDA, USDA, State of California, County of Los Angeles, and City of Los Angeles.

b. Chemicals shall be produced at ISO 9000 certified manufacturing plants. Quality control of chemical formulations shall be monitored via statistical process control (SPC) charts which are downloaded into an SPC data management program.

3. Cleaning (per 1,000 gallons of water):

a. Fill loop with city water and circulate for 1 hour.

b. System pumping velocity must be sufficient to remove any loose debris.

c. Drain the loop.

d. Remove screens and strainers, clean, and replace.

e. Fill the entire system with water and add 5 to 10 gallons of alkaline cleaner, polyphosphate, and a copper inhibitor.

f. Circulate system for at least 4 hours.

g. If bio-film is present, or suspected, use a dispersant and biocides to facilitate the cleaning processes.

h. Drain system from its lowest point while flushing with water until pH and TDS match City water values.

i. Remove screens and strainers, clean and replace.

j. Fill system with water and immediately start pretreatment.

4. Pretreatment (per 1,000 gallons of water):

a. Add 5 gallons of nitrate and copper inhibitors to the loop and circulate for 48 hours.

b. Maintain nitrate level to minimum of 1,200 ppm nitrogen dioxide (NO2) during start up.

c. Dump and flush the system from low point until City TDS levels are reached.

d. Check screens and strainers, clean if necessary.

e. Fill system loop 100 percent and add nitrate chemical to maintain minimum 1,000 ppm NO2.

f. System shall not be put into service immediately, leave pumping system in place and circulate a minimum of 2 hours per day, until system is put into service.

D. Contractor shall be responsible for coordination with chemical treatment company for safe application of cleaning compounds and safe operation of equipment during cleaning, flushing, and recharging of the above system and shall inform Engineer if any unsafe conditions arise while the systems are being cleaned.

3.5 TESTING

A. Sample system water at 1 week intervals after start up for period of 5 weeks and prepare certified test report for each required water performance characteristic.

3.6 TRAINING OF DEPARTMENT PERSONNEL

A. Provide services of supplier’s technical representative to instruct Department personnel in operation, maintenance, and testing procedures of water treatment system. Training shall include minimum 4 hours dedicated instruction time on-site or at a location of Engineer's choice.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Variable frequency motor controllers

B. Basic requirements for factory installed and field installed variable frequency drives (VFD)

1.2 RELATED SECTIONS

A. Section 01 91 13 - Commissioning

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC

C. Section 23 08 00 - Commissioning of HVAC

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under corresponding bid items of Bid Proposal Line Items that require variable frequency motor controllers.

1.4 REFERENCES

A. CEI EN 61800-3 - Adjustable Speed Electrical Power Drive Systems Part 3: EMC Requirements and Specific Test Methods.

B. IEEE 519 - IEEE Standard for Harmonic Control in Electric Power Systems.

C. UL 508 - Industrial Control Equipment.

1.5 DEFINITIONS

A. Factory Installed VFD: VFD installed by motorized equipment manufacturer as a component of equipment.

B. Field-Installed VFD: VFD installed at Project Site is not factory installed as an integral component of motorized equipment.

1.6 SUBMITTALS

A. Product Data for VFDs: Submit data for each type and size of VFD indicating compliance with specified requirements. Indicate nameplate data and ratings; shipping, installed, and operating weights; mounting arrangements; size, type, and location of wiring terminations; conduit entry and ground lug locations; and information on coatings or finishes.

B. Shop Drawings for Field Installed VFDs: Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Include the following:

1. Each installed unit's type and details.

2. Nameplate legends.

3. Diagrams of power and control wiring. Provide schematic wiring diagram for each type of VFD and for each control scheme.

C. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around field installed VFD's. Show VFD layout, mechanical power transfer link, driven load, and relationship between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

D. Manufacturer Seismic Qualification Certification: Submit certification that VFD's accessories, and components shall withstand seismic forces defined in VIBRATION AND SEISMIC CONTROLS FOR HVAC Section. Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. The term withstand means the unit shall remain in place without separation of any parts from the device when subjected to the seismic forces specified. In addition, units field wired to an emergency power source shall be fully operational after the seismic event.

3. Dimensioned outline drawings of VFD controlled motorized equipment: Identify center of gravity and locate and describe mounting and anchorage provisions.

4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For testing agency.

F. Test Reports: Written reports specified in PARTS 2 and 3 of this Section.

G. Operation and Maintenance Data: For field installed VFDs to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated.

B. Source Limitations: Obtain factory and field installed VFDs of a single type through one source from a single manufacturer.

C. Product Options for Field Installed VFDs: Drawings indicate size, profiles, and dimensional requirements of motors and are based on the specific system indicated.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in City of Los Angeles Electrical Code Article 100, by a testing agency acceptable to City of Los Angeles.

E. Comply with City of Los Angeles Electrical Code.

F. Comply with IEEE 519. VFD manufacturer shall submit calculations, specific for this installation, showing total harmonic voltage distortion is less than 5 percent. Input line filters shall be sized and provided as required by VFD manufacturer to ensure compliance with IEEE 519.

1.8 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Department or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer at least 5 days in advance of proposed utility interruptions. Identify extent and duration of utility interruptions.

2. Indicate method of providing temporary utilities.

3. Do not proceed with utility interruptions without Engineer's written permission.

B. Existing HVAC services shall not be interrupted during building normal working hours,

1.9 COORDINATION

A. Coordinate features of VFD installed units, and accessory devices. Provide VFDs that are:

1. Compatible with each motor.

2. Designed and labeled for use with each motor throughout speed range without overheating.

3. Matched to torque and horsepower requirements of the load.

4. Matched to ratings and characteristics of supply circuit and required control sequence.

B. Coordinate VFD support with requirements for driven load; access for maintenance and motor replacement; installation of accessories, belts guards; and adjustment of sliding rails for belt tensioning.

C. Comprehensive Shop Drawings: Coordinate requirements of this Section with comprehensive shop drawings required under BASIC MECHANICAL REQUIREMENTS Section. Submit a complete and comprehensive set of shop drawings in one package prior to material fabrication, order, and installation.

D. Commissioning: Comprehensive commissioning is an integral part of Work required. Provide comprehensive commissioning of mechanical systems in conformance with COMMISSIONING OF HVAC Section and COMMISSIONING Section. Work of this Section includes cooperation and assistance with Commissioning Authority to provide a fully commissioned system. Review the commissioning requirements of Project and provide required support, including but not limited to, systems operation and adjustment, material and equipment submittals and documentation, systems start-up and testing, attendance at regular commissioning meetings, cooperation with Commissioning Authority and other trades in addressing and solving questions, conflicts, and other issues that occur during the construction process.

1.10 WARRANTY

A. VFD shall be warranted by the manufacturer for a period of 36 months from date of shipment. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service.

1.11 START-UP AND COMMISSIONING SERVICE

A. The manufacturer shall provide start-up commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that provides the factory service and warranty repairs at the customer's site. Sales personnel and other agents who are not factory certified technicians for drive field repair shall not be acceptable as commissioning agents. Coordinate commissioning requirements with the Commissioning Authority and other requirements as specified under COMMISSIONING OF HVAC Section.

B. Start-up services shall include checking for verification of proper operation and installation for VFD, its options and its interface wiring to the building automation system. Included in this service shall be (as a minimum):

1. Verification of Contractor wire terminations to VFD and its optional circuitry.

2. Installation verification for proper operation and reliability of VFD, the motor being driven, and the building automation system.

3. VFD manufacturer's certified trainer shall provide up to 1-hour of customer operator training on operation and service diagnostics at the time of the equipment commissioning.

4. Measurement for verification of proper operation on each of the following items:

a. Motor voltage and frequency. Verification of proper motor operation.

b. Control input for proper building automation system interface and control calibration.

c. Calibration check for the following set points (and adjustment as necessary):

1) minimum speed

2) maximum speed

3) acceleration and deceleration rates.

a) VFD manufacturer technician shall document default and custom drive settings.

C. Submit Start-up and Commissioning Reports.

D. Verify that VFD is installed within 50 feet of the motor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ASEA Brown Boveri (ABB), https://global.abb/group/en

2.2 GENERAL

A. Furnish complete variable frequency drives as specified in this Section for the equipment designated as variable speed. Standard and optional features shall be included within VFD enclosure, unless otherwise specified. VFD enclosure shall be National Electrical Manufacturers Association (NEMA) 12 for interior applications and NEMA 3R for exterior applications. Include inlet air filters.

B. VFD shall convert 3 phase, 60 Hz utility power to adjustable voltage and frequency, 3 phase power for stepless motor speed control from 10 percent to 100 percent of the motor's 60 Hz speed. Input voltage shall be as specified on Drawing schedules.

C. VFD shall include a converter and an invertor section. The converter section shall convert fixed frequency and voltage AC utility power to DC voltage. VFDs shall include input line reactors.

D. The invertor section of VFD shall invert DC voltage into a quality output waveform, with adjustable voltage and frequency for stepless motor speed control. VFD shall maintain a constant V/Hz ratio.

E. VFD and options shall be tested to UL 508. The complete drive, including specified options, shall be UL listed.

F. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined in IEEE 519. The total voltage distortion shall not exceed 5 percent.

G. PWM type drives shall include EMI/RFI filters that meet CEI EN 61800-3 for First Environment restricted level.

H. Motor noise as a result of VFD shall be limited to three dB over across the line operation, measured at 3 feet from the motor's center line.

I. VFD's full load amp rating shall meet or exceed National Electrical Code (NEC) Table 430-150.

J. Protective Features:

1. Individual motor overload protection for each motor controlled.

2. Protection against input power undervoltage, overvoltage, and phase loss.

3. Protection against output current overload and instantaneous over current.

4. Protection against overtemperature within VFD enclosure.

5. Protection against overvoltage on DC bus.

K. Protect VFD from sustained power or phase loss. Undervoltage trip activates automatically when line voltage drops more than 10 percent below rated input voltage.

L. Automatically reset faults due to undervoltage, overvoltage, phase loss, or overtemperature.

M. Protection against output short circuit and motor winding shorting to case faults, as defined by UL 508 .

N. Status lights or digital display for indication of individual fault conditions.

O. Controller capable of operating without a motor or any other equipment connected to the drive output to facilitate start-up and troubleshooting.

P. Input line reactors with 5 percent impedance shall be provided to minimize harmonics introduced to AC line, and to provide additional protection to AC line transients. VFD shall withstand 40 percent voltage sag for 20 milliseconds.

Q. Interface Features:

1. Door mounted Hand/Off/Auto selector switch to start and stop VFD. In the auto position, VFD shall start/stop from a remote contact closure. In the hand position, VFD shall run regardless of the remote contact position.

2. Manual speed control capability.
3. Local selector switch, Motor speed is determined by the manual speed control.
4. Power/on light to indicate that VFD is receiving utility power.
5. Fault light to indicate that VFD has tripped on a fault condition.
6. Digital meter with selector switch to indicate percent speed and percent load.
7. A set of form-C, dry contacts to indicate when VFD is in the run mode.
8. A set of from-C, dry contacts to indicate when VFD is in the fault mode.
9. A 0 to 10VDC or 4-20 mA output signal to vary in direct proportion to the controller's speed.
10. VFD to have terminal strip to accept N.C. safety contacts. VFD to safety shut down in drive or by-pass mode when contacts open.
11. VFD to accept an additional N.C. contact to interface with the Hand-Off Auto switch for remote Stop/Start control.
12. VFD shall accept an external 0 to 10 VDC or 4-20 mA speed control signal.
13. VFD shall have Proportional Integral Derivative (PID) loop control for VFD operation and independent PID loop control for Department use.

R. Adjustments:

1. Maximum speed, adjustable 50 to 100 percent base speed.
2. Minimum speed, adjustable 0 to 50 percent base speed.
3. Acceleration time, adjustable 3 to 60 seconds.
4. Deceleration times, adjustable 3 to 60 seconds with override circuit to prevent nuisance trips if deceleration time is set too short.
5. Current limit, adjustable 0 percent to 105 percent.
6. Overload trip set point.
7. Offset and gain to condition the input speed signal.

8. Service Conditions:

9. Ambient temperature, 320 to 105 degrees Fahrenheit.

10. 0 percent to 95 percent relative humidity, non-condensing.

11. Elevation to 3,300 feet without derating.

12. AC line voltage variation, minus 35 to plus 30 percent of nominal.

S. Special Features:

1. The following special features shall be included in VFD enclosure. The unit shall maintain its UL Listing.

2. A door interlocked, pad lockable fused drive disconnect switch shall be provided to disconnect power from each of VFDs.

3. The fused disconnect switch or circuit breaker shall be provided as a means of disconnecting power to both VFD and bypass circuits, as well as providing short circuit and locked rotor protection to the motor while in the bypass mode.

4. The disconnect and switching functions may be accomplished via disconnects, contactors and overloads, or with a four position drive/off/line/test switch with motor starter and bypass fuses.

5. Each VFD shall include a communication port with standard protocols (LON/BACnet) to match installed DDC system. Coordinate with DDC manufacturer to provide a seamless interface between VFD and DDC system.

6. Reduced voltage starter shall be provided on bypasses for motors where bypasses are required as outlined in the application schedule below.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor to verify that jobsite conditions for installation meet factory recommended and code required conditions for VFD installation prior to start-up. These shall include as a minimum:

B. Clearance spacing.

C. Temperature, contamination, dust, and moisture of the environment.

D. Separate conduit installation of the motor wiring, power wiring, and control wiring.

E. Installation in conformance with the manufacturer's written instructions.

F. Measure voltage rise, time, and magnitude at motor.

G. Cover and protect VFD from installation dust and contamination until the environment is cleaned and ready for operation. VFD shall not be operated while the unit is covered.

3.2 INSTALLATION

A. Provide factory mounting brackets and attachments for VFDs. Field modification or drilling of enclosures is not permitted. Include mounting brackets and supports to maintain required access.

B. Install VFD within 50 feet of motor.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct materials

B. Sealant materials

C. Hangers and supports

D. Ductwork fabrication

E. Manufactured ductwork and fittings

F. Casings

1.2 RELATED SECTIONS

A. Section 01 78 39 - Project Record Documents

B. Section 23 05 01 - Basic Mechanical Requirements

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

1. Payment for Work of this Section shall be paid under the Ductwork and Air Distribution bid item of Bid Proposal Line items.

1.4 REFERENCES

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

D. ASTM G90 - Standard Practice for Performing Accelerated Outdoor Weathering of Materials Using Concentrated Natural Sunlight.

E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

H. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

1.5 QUALITY ASSURANCE

A. No variation of duct configuration or sizes permitted except by written permission. Upon written permission size round ducts installed in place of rectangular ducts in conformance with American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) table of equivalent rectangular and round ducts.

B. Perform in conformance with SMACNA (DCS).

C. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

D. Installer: Company specializing in performing Work of this Section with minimum 5 years documented experience.

E. Construct ductwork to NFPA 90A and NFPA 90B standards. Duct gages shall conform to City of Los Angeles Mechanical Code unless otherwise specified in this Section.

F. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

1.6 SUBMITTALS

A. Submit the following under provisions of BASIC MECHANICAL REQUIREMENTS Section:

1. Shop Drawings: Provide 1/4 inch = 1’-0” duct layout drawings indicating duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work as required by BASIC MECHANICAL REQUIREMENTS Section.

a. Product Data: Provide data for duct materials and joints.

b. Show details of fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work. Duct layout indicating pressure classifications and sizes on plans. Fittings. Reinforcement and spacing. Seam and joint construction. Penetrations through fire rated and other partitions. Terminal unit, coil installations. Hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.

c. Coordination Drawings: Ductwork plans drawn to scale and coordinating penetrations and ceiling mounted items. Show other systems installed in same space as ducts. Access doors and panels required to provide access to dampers duct cleanout. Coordination with ceiling mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

d. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.7 PROJECT RECORD DOCUMENTS

A. Submit in conformance with of PROJECT RECORD DOCUMENTS Section.

B. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Ducts: Lock-forming quality; ASTM A653/A653M, ASTM G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Fasteners: Rivets, bolts, or sheet metal screws shall be cadmium plated.

C. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with heavy mastic.

D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 SEALANT MATERIALS

A. Joint and Seam Sealants, General:

1. Joint and Seam Sealant: 1-part, nonsag, solvent release curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.

a. Flanged Joint Mastics: 1-part, acid curing, silicone, elastomeric joint sealants, complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

2.3 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder actuated fasteners, or structural steel fasteners appropriate for building materials.

B. Use powder actuated concrete fasteners for standard weight aggregate concretes or for slabs more than 4 inches thick.

1. Exception: Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

D. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, thread rod.

1. Straps and Rod Sizes: Comply with SMACNA (DCS) for sheet steel width and thickness and for steel rod diameters.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes complying with ASTM A36/A36M.

G. Supports for Galvanized Steel Ducts: Galvanized steel shapes and plates.

H. Supports for Stainless Steel Ducts: Stainless steel support materials, unless materials are electrolytically separated from ductwork.

2.4 DUCTWORK FABRICATION

A. Ductwork shall be constructed to meet SMACNA (DCS) requirements in Section 7. Unless otherwise indicated on Drawings, provide duct material, gages, reinforcing, and sealing for operating pressures indicated. Circular ducts shall be spirally seamed.

B. Transverse Joints: Ductmate or WDCI duct connection systems shall be accepted. Ductwork constructed using these systems shall refer to the manufacturer's written instructions for sheet gage, intermediate reinforcement size and spacing, and joint reinforcements.

C. Transverse duct connections and transverse duct flanges (TDC) (TDF) shall be constructed as a SMACNA T-24 flange. Use of these joint systems shall be limited as follows:

Duct Size	Operating Pressure
0 to 42 inches	0 to 2 inches water gage

D. Longitudinal Seams: Pittsburgh Lock shall be used on longitudinal seams. Longitudinal seams shall be sealed with mastic sealant. Snaplock is not acceptable.

E. Ductboard: Fiberglass duct board shall not be accepted.

F. Construct Tees, bends, and elbows with radius of not less than 1/2 times width of duct for the inside radius. Where not possible and where rectangular elbows are used, provide extended trailing edge turning vanes of 4.5 inches radius on 3.25 inches radius.

G. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

H. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard.

1. Joints: 0 inch to 20 inches diameter, interior slip coupling beaded at center, fastened to duct with screws and with sealing compound applied continuously around joint before assembling and after fastening. Wrap joints with 3 inch wide duct tape.

I. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.5 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in conformance with SMACNA (DCS), and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

2.6 CASINGS

A. Fabricate casings in conformance with SMACNA standards and construct for operating pressures indicated.

B. Mount floor mounted casings directly to concrete floor with application of duct sealer and low velocity shots and pins. At floor and ceiling fasten panels on 12 inch centers to fabricated channels.

C. Fabricate door frames from sheet metal Z section. Install hinged access doors where indicated on Drawings or required for access to equipment for cleaning and inspection.

D. Fabricate acoustic casings with reinforcing turned inward. Provide 18 gage back facing and 22 gage perforated front facing. Construct panels 3 inches thick packed with 0.75/cu ft minimum glass fiber media.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install manufactured ductwork and fittings in conformance with manufacturer's written instructions.

B. Install and seal ducts in conformance with SMACNA (DCS) and SMACNA (LEAK).

C. Contractor shall verify dimensions at Project Site, making field measurements and shop drawings necessary for fabrication and erection of sheet metal Work. Make allowances for beams, pipes and other obstructions in building construction and for Work of other Sections. Examine Drawings showing Work of other trades and consult with Engineer in the event of potential interference.

D. Duct sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use crimp joints with or without bead for joining round duct sizes 8 inches and smaller with crimp in direction of air flow.

H. Use double nuts and lock washers on threaded rod supports.

I. Fabricate ductwork with airtight joints, presenting smooth surfaces on inside, neatly finished on outside, construct with curves, bends, turning vanes to aid the easy flow of air.

J. Connect diffusers to low pressure ducts directly.

K. Provide seismic transverse and longitudinal bracing for ductwork in conformance with SMACNA.

L. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

M. Exposed ductwork and supports shall be primed and painted. Ductwork shall be considered exposed unless concealed in shafts or ceiling spaces. Color to be selected by Engineer.

N. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

3.2 SCHEDULES

A. Ductwork Material Schedule:

Air System	Material
Toilet Exhaust Systems	Galvanized Steel
Supply and Return Air	Galvanized Steel

B. Minimum Ductwork Pressure and Seal Classes:

SMACNA Rectangular/Round			
System Class	Pressure Class	Seal Class	Leakage
Exhaust	4 inch water gage	B	12 / 6
Supply/Return	2 inch water gage	C	24 / 12
High pressure mains	4 inch water gage	B	12 / 6

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Volume control dampers

B. Backdraft dampers

C. Air turning vanes

D. Flexible duct connections

E. Duct access doors

F. Duct test holes

G. Combination fire/smoke dampers

H. Intake ventilators

I. Air duct silencers

J. Flexible ducts

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

D. Section 23 07 13 - Duct Insulation

E. Section 23 31 13 - Metal Ducts

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Ductwork and Air Distribution bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

C. NFPA 92 - Standard for Smoke Control Systems.

D. NFPA 101 - Life Safety Code.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

F. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

G. UL 555 - Standard for Fire Dampers.

H. UL 555S - Standard for Smoke Dampers.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.5 SUBMITTALS

A. Submit shop drawings and product data as specified in BASIC MECHANICAL REQUIREMENTS Section.

B. Provide shop drawings for shop fabricated assemblies indicated, including volume control dampers and duct access doors. Provide product data for hardware used.

1.6 QUALITY ASSURANCE

A. The specified combination smoke/fire damper shall meet the requirements for fire dampers, smoke dampers and combination fire smoke dampers established by:

1. National Fire Protection Association (NFPA) NFPA 90A, NFPA 92, and NFPA 101.

2. UL 555 Listing No. R-13317

3. UL 555 Listing No. R-13447

4. California State Fire Marshall (CSFM) Fire Damper Listing No. 3225-0981:103

5. CSFM Leakage Smoke Damper Listing No. 3230-0981:104

PART 2 - PRODUCTS

2.1 VOLUME CONTROL DAMPERS

A. Fabricate in conformance with SMACNA (DCS), and as indicated on Drawings.

B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.

C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 12 inches by 48 inches.

E. Fabricate multi blade damper of opposed blade pattern with maximum blade sizes 12 inches by 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi blade dampers. Where rod lengths exceed 30 inches, provide regulator at both ends.

H. On insulated ducts, mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.2 BACKDRAFT DAMPERS

A. Manufacturers: Ruskin https://www.ruskin.com/ or Greenheck .

B. Gravity backdraft dampers, size 18 inches by 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.

C. Fabricate multi blade, parallel action gravity balanced backdraft dampers of extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure; Model BD6 as manufactured by Ruskin.

2.3 AIR TURNING VANES

A. Multi blade device with blades aligned in short dimension; blades shall have long trailing edges; steel or aluminum construction; with individually adjustable blades, mounting straps. Manufacturer: AeroDyne, (800) 522-2423.

2.4 FLEXIBLE DUCT CONNECTIONS

A. Manufacturer: Ventfabrics, https://ventfabrics.com/

B. Fabricate in conformance with SMACNA (DCS), and as indicated on Drawings.

C. UL listed fire retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 ounces per square yard, approximately 6 inches wide, crimped into metal edging strip.

D. Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 pounds per square foot, 10 dB attenuation in 10 to 10,000 Hz range.

2.5 DUCT ACCESS DOORS

A. Manufacturers: Ventfabrics, Ductmate Industries, Inc. https://ductmate.com/, or Pottorff https://www.pottorff.com/.

B. Fabricate in conformance with SMACNA (DCS) and as indicated on Drawings.

C. Review locations prior to fabrication.

D. Fabricate rigid and close fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum 1 inch thick insulation with sheet metal cover.

E. Access doors smaller than 12 inches square may be secured with sash locks.

F. Provide 2 hinges and 2 sash locks for sizes up to 18 inches square, 3 hinges and 2 compression latches with outside and inside handles for sizes up to 24 inches by 48 inches. Provide an additional hinge for larger sizes.

G. Access doors in round ducts shall be as manufactured by Ductmate Industries Inc., Ruskin or Duro Dyne.

H. Access doors with sheet metal screw fasteners are not acceptable.

2.6 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.7 COMBINATION FIRE/SMOKE DAMPERS

A. Manufacturers: Greenheck or Ruskin.

B. Combination smoke/fire dampers shall be furnished and installed at locations shown on Drawings.

C. Damper shall meet the requirements of NFPA 90A and NFPA 92 and further shall be tested, rated and labeled in conformance with UL 555 and UL 555S. Dampers shall have a UL 555 fire rating of 1-1/2 hours and be of low leakage design qualified to UL 555S Leakage Class I.

D. Damper actuator combination shall have a UL 555S elevated temperature rating of 350 degrees Fahrenheit (F) minimum and shall be operational and dynamic rated to operate at maximum design airflow rate at its installed location.

E. Damper shall be supplied with an appropriate actuator installed by the damper manufacturer at the time of damper fabrication. Damper actuator shall be electric type for 120 volt operation.

F. Damper blades shall be 16 gage galvanized steel 3 Vee type with 3 longitudinal grooves for reinforcement. Damper frame shall be galvanized steel formed into a structural hat channel shape with reinforced corners. Bearing shall be sintered bronze sleeve type rotating in extruded holes in the damper frame. Blade seals shall be silicone rubber designed to inflate and provide a tighter seal against leakage as pressure on either side of the damper increases. Jamb seals shall be stainless steel compression type with silicone rubber backing. Blades shall be completely symmetrical relative to their axle pivot point, presenting identical resistance to airflow in either direction or pressure on either side of the damper.

G. Damper shall be rated for mounting vertically (with blades running horizontally) or horizontally and be UL 555S rated for leakage and airflow in either direction through the damper.

H. Damper shall be supplied with a 165 degrees F fusible link. Provide access doors at either side of the combination smoke/fire damper for viewing of the fusible links.

2.8 INTAKE VENTILATOR

A. Manufacturers: Greenheck or Loren Cook Company https://lorencook.com/.

B. Unit shall be a hooded high efficiency roof mounted gravity intake ventilator.

C. Unit shall be of bolted and welded construction utilizing corrosion resistant fasteners. The hood shall be constructed of minimum 18 gage aluminum, bolted to minimum 8 gage aluminum support structure. A radius throat shall be provided for optimum performance. Lifting lugs shall be provided to help prevent damage from improper lifting. The base shall have continuously welded curb cap corners for maximum leak protection. Bird screen constructed of 1/2 inch galvanized mesh shall be mounted in the hood. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM and static pressure. Unit shall be shipped in International Safe Transit Association (ISTA) certified transit tested packaging.

2.9 AIR DUCT SILENCERS

A. Furnish and install Quiet-Duct (rectangular) and Conic-Flow (tubular) silencers of the types and sizes shown on Drawings or listed in the schedule. Silencers shall be the product of Industrial Acoustics Company.

B. Outer casings of rectangular silencers shall be made of 22 gage type No. G-90 lock former quality galvanized steel.

C. Outer casings of tubular silencers shall be made of Type No. G-90 lock former quality galvanized steel in the following gages:

Outside Diameter	Metal Gage
12 to 36 inches	22 gage
38 to 60 inches	18 gage

D. Interior partitions for rectangular silencers shall be not less than 26 gage type No. G-90 galvanized lock former quality perforated steel. Interior construction of tubular silencers shall be compatible with the respective outside casing.

E. Filler material shall be inorganic glass fiber of a proper density to obtain the specified acoustic performance and be packed under not less than 5 percent compression to eliminate voids due to vibration and settling. Material shall be inert, vermin, and moisture proof.

F. Combustion ratings for the silencer acoustic fill shall be not greater than the following when tested to ASTM E84 or UL 723:

Flame Spread Classification: 20

Smoke Development Rating: 20

G. Construction

1. Units shall be constructed in conformance with American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Guide recommendations for high pressure duct Work. Seams shall be lock formed and mastic filled. Rectangular casing seams shall be in the corners of the silencer shell to provide maximum unit strength and rigidity. Interior partitions shall be fabricated from single piece, margin perforated sheets and shall have die-formed entrance and exit shapes so as to provide the maximum aerodynamic efficiency and minimum self-noise characteristics in the sound attenuator. Blunt noses or squared off partitions shall not be accepted.

2. Attachment of the interior partitions to the casing shall be by means of an interlocking track assembly. Tracks shall be solid galvanized steel and shall be welded to the outer casing. Attachment of the interior partitions to the tracks shall be such that a minimum of 4 thickness of metal exist at this location. The track assembly shall stiffen the exterior casing, provide a reinforced attachment detail for the interior partitions, and shall maintain a uniform airspace width along the length of the silencer for consistent aerodynamic and acoustic performance. Interior partitions shall be additionally secured to the outer casing with welded nose clips at both ends of the sound attenuator.

3. Interior partitions for tubular silencers shall be secured with galvanized steel radial mounting brackets welded to the partition and the outer casing. The radial brackets shall be installed full length and at 120 degree angles to each other to ensure uniform spacing for consistent aerodynamic and acoustic performance.

4. Sound attenuating units shall not fail structurally when subjected to a differential air pressure of 8 inches water gage from inside to outside the casing. Ductwork shall be sealed air tight with duct sealing compound.

2.10 FLEXIBLE DUCTS

A. Furnish and install CASCO Model SF-181M (low pressure) and CASCO Model HP-25 (high pressure) flexible ducts of the sizes shown on Drawings. Low pressure model shall be utilized downstream of variable air volume boxes. High pressure model shall be utilized upstream of variable air volume boxes.

B. Insulated, Low Pressure Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire, fibrous glass insulation, metalized polyester vapor barrier film.

1. Pressure Rating: 2 inch water gage positive and 0.5 inch water gage negative.

2. Maximum Air Velocity: 4,000 feet per minute.

3. Temperature Range: 0 to plus 200 degrees F.

4. Insulation R-value: R-8

5. Maximum Length: 6 feet.

C. Insulated, High Pressure Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire, fibrous glass insulation, polyethylene vapor barrier film.

1. Pressure Rating: 16 inch water gage positive and 1 inch water gage negative.

2. Maximum Air Velocity: 4,000 feet per minute.

3. Temperature Range: plus 20 to plus 200 degrees F.

4. Insulation R-value: R-8

5. Maximum Length: 6 foot.

D. Flexible Duct Connectors

1. Clamps: Nylon strap in sizes 4 through 18 inches to suit duct size plus adhesive.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in conformance with manufacturer’s written instructions.

B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated on Drawings.

C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment such as air handling units and exhaust fans.

D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at combination fire/smoke dampers as required for access. Provide minimum 8 inches by 8 inches size for hand access, 18 inches by 18 inches size for shoulder access, and as indicated on Drawings

E. Provide duct test holes where indicated on Drawings and required for testing and balancing purposes.

F. Install fire and smoke dampers according to UL listing.

G. Connect terminal units to supply ducts directly or with maximum 6 foot lengths of flexible duct. Do not use flexible ducts to change directions.

H. Connect diffusers to ducts with maximum 6 foot lengths of flexible duct clamped or strapped in place.

I. Connect flexible ducts to metal ducts with draw bands plus adhesive.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat response device is installed.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Multiple fan arrays

B. Tubular inline fans

1.2 RELATED SECTIONS

A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC

C. Section 23 05 53 - Identification for HVAC Piping and Equipment

D. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

E. Section 23 31 13 - Metal Ducts

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment Procedures:

1. Payment for Work of this Section shall be paid under the Exhaust Fan bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. ISO 21940-11 - Mechanical Vibration -- Rotor Balancing -- Part 11: Procedures and Tolerances for Rotors with Rigid Behaviour.

1.5 SUBMITTALS

A. Product Data:

1. Include rated capacities, furnished specialties, and accessories for each fan.

2. Certified fan performance curves with system operating conditions indicated.

3. Certified fan sound power ratings.

4. Motor ratings and electrical characteristics, plus motor and electrical accessories.

5. Material thickness and finishes.
6. Dampers, including housings, linkages, and operators.
7. Fan total static pressure calculation that includes system effect for the submitted back flow prevention device as a line item.
8. Fan array system controller.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Coordination Drawings: Show fan layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.

D. Operation and Maintenance Data: For fans to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Air Movement and Control Association (AMCA) Compliance: Comply with AMCA performance requirements and bear AMCA-Certified Ratings Seal.

B. Capacities and Characteristics: As scheduled on Drawings.

2.2 FAN ARRAYS

A. Manufacturers:

1. Q-pac (basis of design)
2. Air Zone International
3. Huntair

B. Description:

1. Factory fabricated, assembled, tested, and finished, direct driven plenum fans consisting of wheel, fan shaft, motor, and support structure designed for application in multiple fan arrays.

2. Deliver fans as factory assembled units, to the extent allowable by shipping limitations.

3. Array shall deliver flow and pressure scheduled on Drawings with 1 fan out of service.

4. Array can be factory or field fabricated to suit Project constraints.

5. Contractor is responsible for submitting calculations and design of structural support and anchorage, stamped and signed by a structural engineer licensed in State of California, when deviating from the basis of design.

C. Housings:

1. Bulkhead wall shall be constructed of 14 gage G90 formed sheet metal. The bend profile at each panel’s seam shall provide vertical structural support for the bulkhead wall.

2. Mounting: Fan/motor assembly shall be mounted to the bulkhead wall.

D. Fans:

1. Composite impeller construction with backward inclined blades, fastened to shaft with set screws.

2. Fan assemblies shall be prewired with power and control cable wire whips and plug connectors.

E. Shafts:

1. Statically and dynamically balanced to meet ISO 21940-11 at the design operating speed and selected for continuous operation at maximum rated fan speed and motor horsepower.

F. Motors:

1. Motors shall be brushless direct current electronically commutated motors selected at the specified operating voltage, RPM, and efficiency as scheduled on Drawings.

2. Motors shall have external rotor and integrated maintenance free electronic circuitry and electronics.

3. Motors shall include permanently lubricated ball bearings and shaft grounding means to protect the motor bearings from electrical discharge machining due to stray shaft current. Motors provided with hybrid ceramic bearings, when specified, do not require shaft grounding devices.

4. Motors shall be closed, protection level Internation Protection (IP) IP-54, thermal class 155 with operating temperatures up to 140 degrees Fahrenheit (F).

5. Motors shall be super premium efficiency class.

G. Fan Airflow Monitoring:

1. Fans shall have non-invasive, zero pressure drop flow pressure sensing taps installed in the fan inlet cone for airflow monitoring capability.

H. Fan Isolation:

1. Each array shall be provided with a manual blank-off plate that prohibits recirculation of air in the event a fan becomes disabled.

I. Multiple Fan Array:

1. The fan array shall consist of multiple fans spaced in the air way tunnel cross section to provide a uniform air flow and velocity profile across the entire air tunnel cross section.

2. Each fan and motor assembly shall be removable through a 24 inches wide, free area, access door without removing the fan wheel from the motor.

J. Acoustical Performance:

1. Fan array shall meet the acoustical performance scheduled on Drawings.

K. Controller:

1. A dedicated factory assembled Underwriters Laboratories, Incorporated (UL) electrical enclosure shall be provided for each array and shall include an external disconnect. The enclosure shall house control devices, such as pressure transducers, array controller, main disconnecting means, recessed touch screen operator interface and other required devices for operation and programming of the array.

2. Controller shall be Building Automation and Control Network (BACnet) compatible and capable of monitoring array airflow, total static pressure, power consumption, speed, individual fan alarm status and specific cause of alarm.

3. Controller shall be configurable for fan speed control using BACnet interface (Multiple Spanning Tree Protocol (MSTP)), 0-10 volt direct current or 4-20 milliamp input.

4. Controller shall be equipped with relays for locking between other electrically driven components.

L. Warranty: Parts and labor for 24 months from date of shipment.

2.3 TUBULAR INLINE CENTRIFUGAL FANS

A. Description:

1. Factory fabricated, assembled, tested, and finished, belt driven tubular centrifugal inline fan.

B. Housing:

1. Spun aluminum constructed of minimum 11 gage marine alloy aluminum with inlet and outlet flanges.

2. Bolted and welded construction utilizing corrosion resistant fasteners.

C. Wheel:

1. Non-overloading design utilizing airfoil blades.

2. Aluminum airfoil blades shall be welded to spun aluminum dome.

3. Dome shall be bolted to an aluminum hub.

4. Hub shall be keyed and locked to the fan shaft utilizing two setscrews.

5. Wheel shall be balanced in conformance with AMCA 204 .

D. Grease Lubricated Shaft Bearings:

1. Heavy duty regreasable ball type in a cast iron housing, designed and tested for use in air handling applications.

2. Minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

3. Extended lube lines shall be furnished for bearing lubrication.

E. Belt Drives:

1. Factory mounted out of airstream, with adjustable alignment and belt tensioning.

2. Service Factor Based on Fan Motor Size: 1.5.

3. Fan Pulleys: Cast iron or cast steel, keyed and securely attached to wheel and dynamically balanced at factory.

4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

5. Belts: Oil and heat resistant.

6. Belt Guards: Fabricate to comply with Occupational Safety and Health Administration (OSHA) requirements of diamond mesh wire screen welded to aluminum angle frame or equivalent. Secure to fan or fan supports without short circuiting vibration isolation.

7. Motor Mount: Aluminum adjustable mounting plate utilizing threaded studs for positive belt tensioning. Adjustable mounting brackets shall be minimum 8 gauge aluminum with extruded rubber isolation between bracket and fan housing.

F. Motor: Premium efficiency motor with Class F insulation rated for variable speed duty.

G. Accessories:

1. Companion Flanges: Rolled flanges for duct connections of same material as housing.

2. Flexible Duct Connector: For duct connection to air system ductwork.

3. Spare Belts: 1 set

4. Spring Isolator: Set of 4 for ceiling mounted application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fans level and plumb.

B. Disassemble and reassemble units, as required for moving to the final location, conforming to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

D. Equipment Mounting:

1. Install fan arrays in conformance with manufacturer's written instructions. Comply with requirements for mounting as shown on the structural Drawings.

E. Unit Support: Install fan arrays level on bulkhead. Secure units to structural support with anchor bolts.

F. Install units with clearances for service and maintenance.

G. Label fans according to requirements specified in IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT Section.

3.2 CONNECTIONS

A. Install controls wiring from controller to fan array point of connection for factory assembled units and to each fan variable frequency drive for field assembled units.

B. Install power wiring from controller to fan array point of connection for factory assembled units and to each fan variable frequency drive for field assembled units.

C. Install air monitoring pressure tubing from low and high pressure points of connection to controller for factory assembled units and from individual fan inlet cone low and high pressure ports to controller for field assembled units.

D. Install static pressure measuring pressure tubing from low and high pressure points of connection to controller for factory assembled units and from one fan’s low and high pressure points of connection to controller for field assembled units.

E. Connections shall be made in conformance with manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory authorized service representative:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that the fan is secure on mountings and supporting devices and that connections to controls and electrical components are complete. Verify that proper thermal overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Verify proper motor rotation direction and verify fan wheel free rotation and smooth bearing operation.

5. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.

6. Refer to TESTING, ADJUSTING, AND BALANCING FOR HVAC Section for testing, adjusting, and balancing procedures.

7. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Controls and equipment shall be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Shutoff single duct air terminal units

1.2 RELATED SECTIONS

A. Section 23 21 13 - Hydronic Piping

B. Section 23 31 13 - Metal Ducts

C. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.3 REFERENCES

A. AHRI 880 (I-P) - Performance Rating of Air Terminals.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. NFPA 70 - National Electrical Code.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

E. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

F. UL 486A-486B - Wire Connectors.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

1. Include a schedule showing unique model designation, room location, model number, size, and accessories furnished.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension assembly members.

2. Method of attaching hangers to building structure.

3. Size and location of initial access modules for acoustical tile.

4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. Include the following:

1. Instructions for resetting minimum and maximum air volumes.

2. Instructions for adjusting software set points.

E. Test reports as specified in this Section.

1.5 QUALITY ASSURANCE

A. Drawings indicate size, profiles, and dimensional requirements of air terminal units and are based on the specific system indicated on Drawings.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to City of Los Angeles.

C. NFPA Compliance: Install air terminal units conforming to NFPA 90A.

1.6 COORDINATION

A. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in conformance with manufacturer's written instructions and do the following:

a. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.

b. Verify that controls and control enclosure are accessible.

c. Verify that control connections are complete.

d. Verify that nameplate and identification tag are visible.

e. Verify that controls respond to inputs as specified.

PART 2 - PRODUCTS

2.1 SHUTOFF SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers:

1. Environmental Technologies, Inc.; Enviro-Air Division

2. Krueger

3. Titus

B. Configuration: Volume-damper assembly inside unit casing with control components located inside a protective metal shroud.

C. Casing: 0.034 inch steel.

1. Casing Lining: Adhesive attached, 3/4 inch thick, polyurethane foam insulation in conformance with UL 181 erosion requirements, and having a maximum flame-spread index of 25 and a maximum smoke developed index of 50, for both insulation and adhesive, when tested in conformance with ASTM E84.

2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.

3. Air Outlet: S-slip and drive connections, size matching inlet size.

4. Access: Removable bottom panel for access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket.

D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from 0 to 140 degrees Fahrenheit; shall be impervious to moisture and fungus; shall be suitable for 10 inch water gage static pressure; and shall be factory tested for leaks.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: AHRI 880 (I-P) rated, 2 percent of nominal airflow at 6 inch water gage inlet static pressure.

2. Damper Position: Normally closed.

F. Attenuator Section: 0.034 inch steel sheet metal.

1. Lining: Adhesive attached, 3/4 inch thick, polyurethane foam insulation complying with UL 181 erosion requirements, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested in conformance with ASTM E84.

G. Hot Water Heating Coil: Copper tube, mechanically expanded into aluminum-plate fins; leak tested underwater to 200 psig; and factory installed.

2.2 SOURCE QUALITY CONTROL

A. Identification: Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory set airflow, coil type, and Air-Conditioning, Heating, and Refrigeration Institute (AHRI) certification seal.

B. Verification of Performance: Rate air terminal units conforming to AHRI 880 (I-P).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other HYDRONIC PIPING Section. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to air terminal units to allow service and maintenance.

C. Hot Water Piping: In addition to requirements in HYDRONIC PIPING Section, connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

D. Connect ducts to air terminal units in conformance with METAL DUCTS Section.

E. Ground units with electric heating coils in conformance with GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS Section.

F. Connect wiring in conformance with LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES Section.

G. Tighten electrical connectors and terminals conforming to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect, test, and adjust field assembled components and equipment installation, including connections. Report results in writing and furnish to Engineer.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.

2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified in this Article.

3.4 DEMONSTRATION

A. Engage a factory authorized service representative to train Department maintenance personnel to adjust, operate, and maintain air terminal units.

B. Record Department personnel raining sessions and provide a copy in video file and CD formats to Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pleated panel filters

B. Bag filters

C. Front and rear access filter frames

D. Filter gages

1.2 RELATED SECTIONS

A. Section 23 05 01 - Basic Mechanical Requirements

B. Section 23 82 19 - Fan Coil Units

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items that requires particulate air filtration.

1.4 REFERENCES

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency.

B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

F. UL 900 - Standard for Air Filter Units.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For air filters. Include plans, elevations, sections, details, and attachments to other Work.

1. Show filter rack assembly, dimensions, materials, and methods of assembly of components.

2. Include setting drawings, templates, and requirements for installing anchor bolts and anchorages.

C. Operation and maintenance data.

D. Furnish extra materials that match products installed and that are packages with protective covering for storage and identified with labels describing contents.

1. Pleated Panels Filters: Furnish spare filters as called for in FAN COIL UNITS Section.

2. Bag Filters: Furnish one set of spare filters for built-up filter bank in main air handler.

1.6 QUALITY ASSURANCE

A. ASHRAE Compliance:

1. Comply with applicable requirements in ASHRAE Std 62.1, Section 4 - Outdoor Air Quality; Section 5 - Systems and Equipment; and Section 7 - Construction and Startup.

2. Comply with ASHRAE Std 52.2 for minimum efficiency reporting value (MERV) for methods of testing and rating air filter units.

B. Comply with NFPA 90A and NFPA 90B.

PART 2 - PRODUCTS

2.1 PLEATED PANEL FILTERS

A. Description: Factory fabricated, self supported, extended surface, pleated, panel type, disposable air filters with holding frames.

1. Manufacturers:

a. AAF International, (888) 223-2003

b. Camfil US, (562) 906-2111

c. Filtration Group Inc., (877) 344-8326 (Aerostar Green Pleat)

d. Flanders, (800) 800-2210

B. Filter Unit Class: UL 900, Class 2.

C. Media: Interlaced glass or synthetic fibers coated with nonflammable adhesive.

1. Adhesive shall have a volatile organic compound (VOC) content of 80 g/L or less when calculated conforming to 40 CFR 59, Subpart D (EPA Method 24).

2. Media shall be coated with an antimicrobial agent.

3. Separators shall be bonded to the media to maintain pleat configuration.

4. Welded wire grid shall be on downstream side to maintain pleat.

5. Media shall be bonded to frame to prevent air bypass.

6. Support members on upstream and downstream sides to maintain pleat spacing.

D. Filter Media Frame: Cardboard frame with perforated metal retainer sealed or bonded to the media.

E. Mounting Frames: Frames provided by fan coil manufacturer.

F. Capacities and Characteristics:

1. MERV 13, tested in conformance with ASHRAE Std 52.2.

2. Nominal size of 2 inches in depth.

3. Initial pressure drop of 0.38 inches water column or less at 500 feet per minute.

2.2 BAG FILTERS

A. Description: Factory fabricated, self-supported, extended surface, pocket style, disposable air filters.

1. Manufacturers:

a. Camfil US, (562) 906-2111

b. AAF International, (888) 223-2003

c. Flanders, (800) 800-2210

B. Filter Unit Class: UL 900, Class 1.

C. Media: High density glass fibers bonded to synthetic mesh media.

1. Individual pockets shall have a minimum of 40 stitching support points per square foot of media area. Stitching centers shall be sealed using sealant that shall remain pliable throughout the life of the filter. Sides and ends of each pocket shall be sewn with a chain link over lock stitch.

2. Pockets shall be formed into tapered pleats to promote uniform airflow across the surface of the media. Pockets shall also have a conical configuration to minimize contact with HVAC system components.

3. Media shall be connected to filter media frame through a snap-to-seal pocket retainer to prevent air bypass between pockets.

4. Pocket flange and pocket-to-pocket partition shall be provided on downstream sides of air tunnels to maintain pocket integrity and separation.

D. Filter Media Frame: Acrylonitrile butadiene styrene (ABS) plastic header and ABS plastic pocket retainers. Header shall be joined to the media to prevent air bypass. Individual pocket retainers shall be attached to the header frame with anchor points that can be visually confirmed. Vertical members of the filter header shall have a filter-to-filter sealing gasket.

E. Mounting Frames: Built-up filter bank utilizing front access filter frames as specified in this Section.

F. Capacities and Characteristics: As scheduled on Drawings.

2.3 FRONT ACCESS FILTER FRAMES

A. Description: Type 316 stainless steel framing members with access for upstream (front) filter servicing, cut to size and prepunched for assembly into modules. Vertically support filters to prevent deflection of horizontal members without interfering with either filter installation or operation. Frame shall include integral corrosion resistant compression tabs to facilitate filter installation without the use of tools or other fasteners.

1. Manufacturers:

a. Camfil US. (FastFrame model)

b. AAF International.

c. Flanders

B. Sealing: Integral 3/4 inch sealing flange in holding frame. Factory installed, replaceable, gasket for each filter to ensure seal between filter and mounting frames and to prevent bypass of unfiltered air. Gasket shall include an overlapping configuration at each corner.

2.4 FILTER GAGES

A. Diaphragm type gage with dial and pointer in metal case, vent valves, black figures on white background, and front recalibration adjustment.

1. Manufacturers:

a. Airguard, (866) 247-4827

b. Dwyer Instruments, Inc., (800) 872-9141

2. Diameter: 4-1/2 inches

3. Scale Range for Filter Media Having a Recommended Final Resistance of 0.5 to 1.0 Inch water gage (125 to 250 Pa) or Less: 0 to 1.0 inch water gage (0 to 250 Pa).

B. Accessories: Static pressure tips, tubing, gage connections, and mounting bracket.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install built-up filter bank assemblies on cast in place concrete equipment base(s).

B. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.

C. Install filters in position to prevent passage of unfiltered air.

D. Install filter gage for each filter bank.

E. Do not operate fan system until filters (temporary) are in place. Replace temporary filters used during construction and testing with new, clean filters.

F. Install filter gage static pressure taps upstream and downstream from filters. Install filter gages on filter banks with separate static pressure taps upstream and downstream from filters. Mount filter gages on outside of filter housing or filter plenum in an accessible position. Adjust and level inclined gages.

G. Coordinate filter installations with duct and air handling unit installations.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Test for leakage of unfiltered air while system is operating.

C. Air filter shall be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 CLEANING

A. After completing system installation and testing, adjusting, and balancing of air handling and air distribution systems, clean filter housings and install new filter media. Spare filters required by this Section shall not be used for this purpose.

END OF SECTION

PART 1 - GENERAL

1.1 SECION INCLUDES

A. Boilers

B. Trim

C. Accessories for generating hot water

1.2 RELATED SECTIONS

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC

B. Section 23 09 00 - Instrumentation and Controls for HVAC

C. Section 23 09 93 - Sequence of Operations for HVAC Controls

D. Section 23 21 13 - Hydronic Piping

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be included in each corresponding bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. ASME BPVC-I - Boiler and Pressure Vessel Code, Section I: Rules for Construction of Power Boilers.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

C. NEMA FU 1 - Low Voltage Cartridge Fuses.

D. NFPA 70 - National Electrical Code.

E. UL 834 - Heating, Water Supply, and Power Boilers - Electric.

1.5 SUBMITTALS

A. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for boilers.

B. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Source quality control reports.

D. Field quality control reports.

E. Startup service reports.

F. Operation and Maintenance Data: For boilers, components, and accessories to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this Section, with minimum 3 years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace pressure vessels of boilers that fail in materials or workmanship within 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Manufacturer: LAARS, https://www.laars.com/

2.2 FABRICATION

A. Factory fabricated, assembled, and tested electric boilers with trim and controls necessary to generate hot water.

B. Pressure Vessel Carbon steel pressure vessel mounted on structural steel base.

C. Nozzles: Flanges for water inlet and outlet and heating element inserts; threaded connections for trim and controls.

D. Insulation: Minimum 3 inch thick, glass fiber insulation.

E. Jacket: Galvanized sheet metal casing with baked enamel or powder coated protective finish and removable panels with snap in or interlocking closures for access to pressure vessel.

F. Lifting Lugs: Welded to pressure vessel, extending above jacket.

G. Heating Elements: Incoloy sheathed, replaceable electric resistance element.

H. Mounting Base: For securing boiler to concrete base.

1. Seismic Fabrication Requirements: Fabricate mounting base and attachment to boiler, accessories, and components with reinforcement strong enough to withstand seismic forces in conformance with VIBRATION AND SEISMIC CONTROLS FOR HVAC Section when mounting base is anchored to building structure.

I. Electrical Components, Devices, and Accessories: Listed and labeled in conformance with NFPA 70, by a qualified testing agency, and marked for intended location and application.

J. Fabricate and label boilers in conformance with ASME BPVC-I Boiler and Pressure Vessel Code.

K. Design and fabricate boilers in conformance with NFPA 70, Article 424, Paragraphs G and H.

L. Test boilers in conformance with UL 834. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

2.3 TRIM FOR HOT WATER BOILERS

A. Aquastat Controllers: Operating auto reset high limit.

B. Safety Relief Valve: ASME rated.

C. Pressure and Temperature Gage: Minimum 3 1/2 inch diameter, combination water pressure and temperature gage. Gages shall have operating pressure and temperature ranges, so normal operating range is about 50 percent of full range.

D. Boiler Air Vent: Automatic.

E. Dip tube in water outlet.

F. Drain Valve: Minimum NPS 3/4 inch hose end ball valve sized according to requirements of authorities having jurisdiction.

2.4 CONTROLS

A. Controls shall be in conformance with INSTRUMENTATION AND CONTROLS FOR HVAC Section and SEQUENCE OF OPERATIONS FOR HVAC CONTROLS Section.

B. Boiler operating controls shall include the following devices and features:

1. Control transformer.

2. Step controller.

3. Recycling relay returns controller to off position after power failure.

4. Multistage thermostat.

5. Control circuit switch.

6. Visual indication for each step.

7. Supply voltage indicator.

8. Set Point Adjust: Set points shall be adjustable..

C. Safety Controls: To maintain safe operating conditions, safety controls limit boiler operation.

1. High Cutoff: Automatic reset stops boiler if operating conditions rise above set point or maximum boiler design temperature.

2. Low Water Cutoff Switch: Electronic probe shall prevent boiler operation on low water. Cutoff switch shall be manual reset type.

3. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

D. Building Management System Interface: Factory install hardware and software to enable building management system to monitor, control, and display boiler status and alarms.

1. A communication interface with building management system shall enable building management system operator to remotely control and monitor the boiler from an operator workstation. Control features available and monitoring points displayed locally at boiler control panel shall be available through building management system. Communications protocol shall be BACnet.

2.5 ELECTRICAL POWER

A. Single Point Field Power Connection: Factory installed and wired switches, transformers, and electrical devices necessary shall provide a single point field power connection to boiler.

1. Field power interface shall be to fused disconnect switch.

2. Interlock with door to de-energize power with door open.

B. Electrical Enclosures: NEMA 250, Type 3 enclosure with hinged door and key locking handle.

C. Install factory wiring outside of an enclosure in a metal raceway.

D. In conformance with NFPA 70.

1. Electrical Circuits: 48 A, maximum.

E. Connectors: Mechanical lugs bolted to copper bus bars or distribution blocks with pressure connectors.

F. Fuses: NEMA FU 1, Class J or K5; 60 A, maximum.

G. Contactors: Three-pole magnetic contactors, listed for 500,000 cycles at full load.

H. Factory wired internal control devices and heating elements.

1. Wiring shall be numbered and color coded to match wiring diagram.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect factory assembled boilers, before shipping, in conformance with UL 834.

B. Hydrostatic Test: Factory test assembled boiler, including hydrostatic test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for concrete equipment bases, anchor bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting performance of tWork.

B. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

C. Examine mechanical spaces, including required space for element removal, for suitable conditions where boilers shall be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

A. Equipment Mounting:

1. Install boilers on cast-in-place concrete equipment base(s).

2. In conformance with requirements included in VIBRATION AND SEISMIC CONTROLS FOR HVAC Section.

B. Install electrical devices furnished with boiler but not specified to be factory mounted.

3.3 CONNECTIONS

A. Install piping in conformance with HYDRONIC PIPING Section. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler with enough space to allow service and maintenance.

C. Connect hot water piping to supply and return boiler tappings with shutoff valve and union or flange at each connection.

D. Install piping from safety relief valves to nearest floor drain.

E. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide a factory authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory authorized service representative:

1. Perform installation and startup checks according to manufacturer's written instructions.

2. Leak Test: Perform ydrostatic test. Repair leaks and retest until no leaks exist.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

a. Check and adjust initial operating set points and high and low limit safety set points of water level and water temperature.

b. Set field adjustable switches and circuit breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

D. Boiler shall be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Air source modular heat pumps

B. Trim accessories for generating hot water

1.2 RELATED SECTIONS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment

B. Section 23 21 13 - Hydronic Piping

C. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid for under the Heating Water Pump bid item fo the Bid Proposal Line Items.

1.4 REFERENCES

A. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment.

B. AHRI 550/590 (I-P) - Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

D. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E. UL 1995 - Heating and Cooling Equipment.

1.5 DESIGN REQUIREMENTS

A. Heat pump manufacturer shall have a factory trained and supported service organization.

1.6 SUBMITTALS

A. Submit complete Drawings including cabinet dimensional details and anchor point locations, required clearances, location and sizes of field connections, performance data, electrical wiring diagrams, dry and operation weights, and required electrical data.

B. Submit manufacturer’s written instructions, including any remote panel installation instructions.

C. Operating and Maintenance Manuals: Provide 2 copies of current commercial manuals.

1.7 QUALITY ASSURANCE

A. Heat pump modules shall be constructed in conformance with UL 1995 UL 1995, NEC standards, and UL.

B. Heat pump modules shall be rated and tested in conformance with AHRI 550/590 (I-P).

C. Heat pump modules shall meet the safety standards of ASHRAE Std 15.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer’s installation instructions for rigging, unloading, and transporting heat pump modules.

B. Protect heat pump modules on site from physical damage after unloading.

1.9 WARRANTY

A. Manufacturer shall warrant all heat pump system parts against defects in workmanship and material for a period of 5 years from date of initial start up.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Trane (Basis of Design)

B. York

C. LG

2.2 HEAT PUMP

A. General: Each heat pump module shall be assembled on a galvanized steel, formed sheet metal frame and be enclosed with epoxy painted sheet galvanized sheet metal panels. The heat pump modules shall be shipped as individual modules and assembled on site. Each module shall be fully charged with refrigerant and factory tested for capacity and controller functions prior to shipment.

1. The electrical supply conduit for each module shall be factory assembled and shipped with each module for field connection into the power distribution panel on the primary heat pump module. This provides a single point of power connection for the modules.

B. Frame: Frame shall be constructed of formed galvanized 12 gauge sheet metal externally coated with white painted finish. The coating provides a minimum of 1000 hours of salt spray protection.

C. Cabinet: Cabinet panels are made of formed galvanized sheet metal externally coated with painted finish. The cabinet enclosure shall include easily removable access panels for service. Access panels shall be removable via stainless steel fasteners and retaining clips. Module shall not require access via sheet metal screws or protruding threaded fasteners.

D. Electrical Panels: Each module shall have a high voltage electrical panel where power to each module is connected and a low voltage electrical panel for the module’s controller and communication wiring. In addition, if the system has single point power, a power distribution panel shall be provided containing a system lug for the incoming single power supply, a circuit breaker for each module for branch circuit over-current protection and a phase monitor wired back to the primary module for protection against low voltage, phase imbalance, phase loss, and phase reversal.

E. Electronic control valves: Each module’s heat exchanger branch line shall include an electronic isolation valve that allows system flow to the active modules to match the cooling or heating requirements to the system load. The valves shall have a minimum opening cycle time of not less than 35 seconds between the fully closed and open position. The valves shall have a minimum close off pressure of not less than 75 pouns per square inch (psi).

F. The factory controls shall monitor the number of active modules and provide the corresponding control signal to the pump microprocessor (if pumps are factory provided) to vary the pump speeds based on the number of active modules (the number of electronic valves open to flow).

G. Filters: A 40 mesh industrial grade filter strainer shall be factory installed between the header system and each brazed plate heat exchanger inlet. The strainer shall be serviceable by closing the electronic and manual valves to remove each strainer for cleaning without shutting down fluid flow or power to the entire system and allowing the remaining modules to continue to operate. In-line strainers that require complete system shutdown for service and isolation are not acceptable.

H. Air Coil Fan Motors: Comply with NEMA designation, temperature rating and service factor requirements for motors in conformance with COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT Section. The air coil fan motors shall be maintenance free and highly efficient Electronically Commutated Motors (ECM) with energy reduction capabilities of up to 35 percent. These variable speed fan assemblies shall vary fan motor revolutins per minute (rpm) to maintain the refrigeration pressure while in cooling mode. Heating mode fan speed shall be constant.

I. Air Coil: Aluminum fins mechanically bonded to coppers tube with integral subcooling circuits. Fin spacing shall not exceed 16 fins per inch. The air coil shall operate as a condenser in cooling mode and as an evaporator in heating mode. The coils shall be factory tested to a minimum of 600 pounds per square inch gauge (psig).

J. Expansion Valves: Each refrigerant circuit shall have 2 expansion valves, one dedicated for heating mode operation and one dedicated for cooling mode operation.

K. Reversing Valve: Each module shall contain a refrigeration reversing valve on each refrigeration circuit to allow the refrigeration system to operate in either heating mode or cooling mode

L. Refrigerant piping: Piping shall be Type K seamless copper, and shall have an insulated suction line using closed cell pipe insulation, compressor rotalock service valves, solenoid valves for compressor pumpdown, and Schrader service valves in the suction, discharge, and liquid lines. Each module shall contain 2 independent refrigerant circuits. If dual circuits are not provided, additional modules must be provided for redundancy.

M. Fluid Piping: The fluid piping shall be Schedule 40 steel, and be insulated using closed cell pipe insulation to maintain fluid temperature. The heat pump shall have service valves for the independent isolation of each heat exchanger, without affecting the fluid flow to the remaining modules. Each heat pump module shall connect to the adjacent module using roll grooved steel couplings and neoprene gaskets. Any type of module to module connection external to the modules is unacceptable.

N. Flow switches: Factory installed and tested thermal dispersion flow sensor on each load heat exchanger.

2.3 COMPRESSORS

A. Hermetically sealed vapor injected scroll compressor on each circuit each with service valves, crankcase heater, oil level sight glass, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and in-line circuit breaker. There shall be two, independent compressors and two refrigeration circuits per module. Compressors shall be mounted to the steel frame with rubber-in-shear isolators. Liquid injected scroll compressors are not acceptable.

B. The vapor injection scroll compressor is for use with an economized vapor compression cycle heat pump offering more heat delivered and a better COP than with a conventional cycle. The cooling provided by inter stage injection allows the operation of the compressor over a larger operating envelope providing higher heat delivery temperatures at low evaporating temperatures and resulting in larger heating capacities and higher efficiency.

2.4 HEAT EXCHANGERS

A. Each dual circuit, brazed plate load heat exchanger in each module shall perform as an evaporator or condenser depending on the system cooling or heating demand.

B. Each is constructed of 316 stainless steel plates and copper brazing and shall be insulated with ¾ inch closed cell insulation.

C. The supply and return fluid piping connections to each heat exchanger shall include an electronic and manual isolation valve to allow servicing of each module individually while the remaining modules continue to operate and to allow for variable flow.

D. The fluid connections to each heat exchanger shall use roll grooved couplings for service convenience and ease of installation.

2.5 INSULATION

A. Material: Closed cell, flexible, UV protected, thermal insulation for preformed flexible elastomeric cellular thermal insulation in sheet and tubular form.

B. Factory applied insulation over cold surfaces of liquid heat pump components including brazed plat heat exchanger, water pipe on heat pump, and suction line.

C. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface including seams and joints

2.6 ACOUSTICAL DATA

A. Provide acoustical sound power or sound pressure level data in decibels (dB) at the scheduled 8 octave band center frequencies.

B. Supplied equipment shall not exceed scheduled sound power or sound pressure level data at any load point. Any additional costs associated with equipment deviation shall be at the sole cost and expense of Contractor.

C. Acoustical performance ratings shall be in conformance with AHRI 270 (SI/I-P).

2.7 CONTROLS

A. General

1. Provide automatic control of heat pump and waterside economizer operation including compressor start/stop and load/unload, antirecycle timers, condenser fans, evaporator pump, evaporator heater, waterside economizer bypass value, unit alarm contacts and run signal contacts.

2. The primary heat pump module shall incorporate the primary microprocessor controller. The primary microprocessor shall communicate with the remaining secondary microprocessors in each module via a local network communications protocol. The primary microprocessor shall include a phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. The primary controller shall read analog and fault port values from secondary module controllers.

3. Each heat pump control system shall include operational switches for each compressor; high and low pressure transmitters to provide indication of refrigeration pressures in each circuit; high and low refrigeration pressure alarms including shutting shut down the responsible compressor(s); anti short cycling compressor timers; minimum compressor run timers; connection to Building Automation System.

B. Programmable Logic Controller (PLC):

1. PLC shall provide the following minimum functions and alarms:

a. Adjustable fluid temperature set point.

b. Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.

c. Reset temperature control set point based on decreased load.

d. High and low fluid temperature alarm set points.

e. Fluid inlet and outlet temperature.

f. Suction and discharge refrigeration pressures on each refrigeration circuit.

g. Compressor run status.

h. Current alarm status.

i. Demand load.

j. Compressor run hours.

1) Number of compressors starts.

k. Alarm logging with minimum of previously 100 logged alarms with time and date of each occurrence.

l. Remote start/stop input.

m. Dry contact for general alarm.

n. Smart compressor demand distribution algorithm across heat pump bank, which seamlessly allows unavailable modules to be placed out of sequence and available modules to be placed back in sequence.

o. Provide building management system (BMS) with the information for automatic variable flow control.

p. Maintaining minimum flow for fluid loop even with no compressors running.

q. Smart compressor rotation algorithm within a module which accounts for compressor availability and safety timers.

r. Stand alone fail safe mode for each module should Primary module fail, allowing the heat system to remain operating.

C. Interface Panel.

1. Provide full touch screen HMI display that is both viewable in direct sunlight and night time viewing.

2. HMI display shall be accessible through hinged enclosure door. Display shall provide a minimum of unit setpoints, status, electrical data, temperature data, pressures, safety lockouts and diagnostics.

3. Primary microprocessor controller provides current alarm status, alarm logging of the previous 100 alarms, fluid temperatures for each module, refrigeration pressure on each refrigeration circuit, compressor run hours, current status display, remote on/off, and general alarm contacts.

D. BAS Communications: BACnet MS/TP capabilities as standard.

2.8 COASTAL PACKAGE

A. Manufacturer shall provide epoxy coating that effectively repels water and inhibits dust and bacteria accumulation on the air cooled condenser coils and unit cabinet. Expoxy coating shall meet ASTM B117 5,000 hours salt spray test.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The heat pump system shall be installed in conformance with the manufacturer's written instructions, where shown on Drawings and other provided installation documents. Installation piping in conformance with HYDRONIC PIPING Section.

B. Examine heat pump units before installation. Reject units that are damaged.

C. Each heat pump module is shipped individually for field assembly. Field assembly of heat pump system shall consist of the following minimum steps:

1. Manifold fluid piping with factory supplied roll grooved connections. Insulate roll grooved connections after assembly.

2. Connect factory supplied power supply wiring harnesses to the load distribution panel. Install wires to the proper terminals for proper phasing. Unit is wired for A, B, C phase right to left in the load distribution panel. Each wire on the wire harness is identified as to its respective phase.

3. Connect all microprocessors together to form the local communication network. Wiring must be 20 gauge minimum, single twisted pair, shielded wiring.

D. Install heat pump modules on level concrete housekeeping pad.

E. Units installed above grade shall be mounted on a vibration isolation frame with minimum 2 inch deflection springs.

F. Install piping adjacent to unit to allow service and maintenance.

G. Ground equipment conforming to GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS Section

H. connect wiring conforming to LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES Section.

3.2 PIPING FLUSHING PROCEDURE

A. Prior to connecting the heat pump to the building fluid loop, the piping shall be flushed with a detergent and hot water (110-130 degrees Fahrenheit) mixture to remove previously accumulated dirt and other organic residue. In old piping systems with heavy encrustation of inorganic materials, consult a water treatment specialist for proper passivation and/or removal of these contaminants.

B. Prior to flushing, install a 30 mesh or finer Y-type strainer or equivalent in the system piping. During the flushing process, examine and clean the strainer periodically as necessary to remove collected residue. The flushing process shall take not less than 6 hours or until the strainers, when examined after each flushing, are clean. Old systems with heavy encrustation shall be flushed for a minimum of 24 hours or until the strainers run clean. Detergent and acid concentrations shall be used in strict accordance with the respective chemical manufacturer’s instructions. After flushing with detergent and/or dilute acid concentrations, the system loop shall be purged with clean water for at least one hour to ensure that residual cleaning chemicals have been flushed out.

3.3 REFRIGERATION SYSTEM START UP AND TESTING

A. Provide a factory supervised authorized service representative to perform start up service and owner training.

B. Inspect field assembled components, equipment installation and piping and electrical connections for proper assembly, installation and connection.

C. Checkout with start up report shall be provided by factory representative for each modular heat pump system.

D. Provide a factory authorized service representative to conduct an 8 hour training session for Department maintenance personnel to adjust, operate and maintain the heat pump modules. Record Department personnel training sessions and provide a copy in video file and CD formats to Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Screw compressors

B. Compressor controller

1.2 RELATED SECTIONS

A. Section 23 05 48 - Vibration and Seismic Controls for HVAC

B. Section 23 23 00 - Refrigerant Piping

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Refrigerant Compressors bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. AHRI 550/590 (I-P) - Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. ISO 2151 - Acoustics Noise Test Code for Compressors and Vacuum Pumps Engineering Method.

E. NFPA 70 - National Electrical Code.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

C. Wiring Diagrams: For power, signal, and control wiring.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency approved by Engineer, and marked for intended location and application.

B. Fabricate and label refrigeration system conforming to ASHRAE Std 15.

C. Capacity shall be rated in conformance with AHRI 550/590 (I-P).

D. Efficiency shall meet or exceed ASHRAE Std 90.1 I-P or California Energy Code, whichever is more restrictive.

E. Provide UL label for complete unit including factory mounting and wiring of required options.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of compressor that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Compressor failure.

2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCREW COMPRESSOR

A. Products:

1. Hanbell RC2 Series with Micro Control Systems (MCS) controls.

B. Description: Hermetic, positive displacement, twin rotor screw compressor with infinite capacity control designed for service with crankcase sight glass, crankcase heater, discharge check valve and backseating service access valves on suction and discharge ports.

1. Capacity Control: Variable-frequency controller.

C. Refrigerant: R-513a.

D. Operating and safety controls shall include the following:

1. Manual-reset, high-pressure cutout switches.
2. Automatic-reset, low-pressure cutout switches.
3. Low-oil-pressure cutout switch.
4. Compressor-winding thermostat cutout switch.
5. Three-leg, compressor-overload protection.
6. Control transformer.
7. Timer to prevent excessive compressor cycling.

E. Accessories:

1. Oil level switch.
2. Oil drain valve.
3. Liquid injection system including solenoid valve and expansion valve.
4. Oil filter differential switch connector.
5. Safety valve.
6. Motor coil temperature monitoring temperature sensors, Pt1000.

F. Capacities and Characteristics: As scheduled on Drawings.

2.2 CAPACITY CONTROL

A. Microcomputer based controller shall modulate the compressor variable frequency drive to match the demand requirements of the system. The capacity control range shall be 100 percent to 33 percent at the specified conditions.

B. Display shall be 15 inch touch screen, 64K color, 1024 by 768 VGA screen resolution with embedded operating system, anti-virus software and 10/100 Base-T Ethernet port.

C. System shall include:

1. Supply air temperature transmitter.
2. Return air temperature transmitter.
3. Compressor suction pressure transmitter.

4. Compressor discharge pressure transmitter.
5. Oil temperature transmitter.
6. Electronic expansion valves with refrigerant temperature transmitter. Valves are shipped loose for installation by Contractor.
7. Variable frequency drive for each compressor.

D. Microcomputer unit control:

1. Staging of compressors, variable frequency drives and hot gas bypass.
2. Activating fans and pump for the evaporative condenser.
3. Automatic pump down before compressor shut down and automatic pump out before liquid line opens on start-up.
4. Proactive control of compressor cycling and hot gas bypass to help prevent high or low pressure trips.
5. Proactive control providing safeties for high pressure, low pressure and freeze protection to eliminate nuisance trips.
6. Proactive compressor staging to eliminate overloading during start-up to reduce compressor cycling.
7. Continuous evaluation of sensors.
8. Control of hot gas bypass.

E. Microcomputer Safeties:

1. Low pressure cutout with proactive safety.
2. High pressure cutout with proactive safety
3. Automatic re-start from power outage with event posting.
4. Flash memory that does not require a back-up battery.
5. Sateties for temporary shutdown as well as lockout protection that requires manual reset.
6. Anti-recycle timing.
7. Sensor error.

8. Pump down/pump out failure.

F. Microcomputer Display:

1. Sensor inputs.
2. Compressor suction pressure.
3. Compressor discharge pressure.
4. Compressor ampere draw.
5. Suction pressure for each circuit.
6. Discharge pressure for each refrigerant circuit.
7. Unit control contacts.
8. Digital outputs.
9. Compressor control status.
10. Liquid line solenoid valve control and status.
11. Status for alarms.
12. Electronic expansion valve data.

G. Microcomputer Setpoint Access (with proper authorization):

1. High discharge pressure.
2. Low suction pressure.
3. Freeze protection temperature.
4. Pump down/pump out settings.
5. High/low compressor amperes.
6. Low suction circuit limiting.
7. High discharge circuit limiting.
8. Anti-recycle delay setting.

H. Microcomputer Alarm History:

1. Provide 50 most recent alarms.

2. Low suction pressure of circuits.
3. High discharge pressure of circuits.
4. Freeze protection cutout.
5. Pump down/pump out failure of circuits.
6. External shutdown of each compressor.
7. Communication failure.
8. Battery failure.
9. Time/date invalid.
10. Memory failure.
11. Power failure.

I. Microcomputer remote monitoring: System shall have data port for Modbus IPor BacNet IP.

2.3 SOURCE QUALITY CONTROL

A. Testing Requirements: Factory test sound-power-level ratings conforming to ISO 2151.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, firmly anchored in locations indicated on Drawings.

B. Equipment Mounting:

1. Install compressor on cast-in-place concrete equipment pads.
2. Comply with requirements for vibration isolation and seismic control devices specified in VIBRATION AND SEISMIC CONTROLS FOR HVAC Section.

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

C. Connect refrigerant piping to compressor; maintain required access to unit. Install furnished field-mounted accessories. Refrigerant piping and specialties are specified in REFRIGERANT PIPING Section.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

2. Leak Test: After installation, charge system with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor operation and unit operation, product capability, and compliance with requirements.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Forced draft evaporative refrigerant condensers

1.2 RELATED SECTIONS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC

C. Section 23 09 00 - Instrumentation and Controls for HVAC

D. Section 23 23 00 - Refrigerant Piping

E. Section 23 31 13 - Metal Ducts

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Evaporative Condenser bid item of Bid Proposal Line Item.

1.4 REFERENCES

A. ASCE 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. ASME BPVC - Boiler and Pressure Vessel Code.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. NEMA MG 1 - Motors and Generators.

F. NFPA 70 - National Electrical Code.

1.5 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Evaporative refrigerant condenser shall withstand the effects of earthquake motions determined conforming to ASCE 7-16.

1. The term withstand means the unit shall remain in place without separation of any parts from the device when subjected to the seismic forces specified.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated include rated capacities, pressure drop, fan performance data, installation instructions, furnished specialties, and accessories.

B. Shop Drawings: For evaporative refrigerant condensers include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field piping and wiring connection.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Seismic Qualification Certificates: For evaporative refrigerant condensers, accessories, and components, from manufacturer.

D. Warranties.

E. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency approved by Engineer, and marked for intended location and application.

B. ASME Compliance: Fabricate and label heat exchanger coils to comply with ASME BPVC Section VIII, Division 1.

C. Comply with NFPA 70.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of evaporative refrigerant condensers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Fan, motor, drive shaft, bearings, and motor supports.

b. Tube bundle.

c. External circuit circulating pump.

2. Warranty Period: 5 years from date of Substantial Completion.

1.9 STARTUP SERVICE

A. Inspect field assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.

B. Obtain performance tables from manufacturer.

C. Engage a factory authorized service representative to perform startup service.

1. Complete installation and startup checks conforming to manufacturer's written instructions.

2. Clean entire unit including basins.

3. Verify that accessories are properly installed.

4. Check makeup water float.

5. Verify clearances for airflow and for evaporative refrigerant condenser servicing.

6. Check for vibration isolation and structural support.

7. Lubricate bearings on fans and shafts.

8. Verify fan wheel rotation for correct direction and for vibration or binding. Correct vibration and binding problems.

9. Adjust belts to proper alignment and tension.

10. Operate variable speed fans through entire operating range and check for harmonic vibration imbalance. Set motor controller to skip speeds resulting in abnormal vibration.

11. Check vibration switch setting and verify operation.

12. Verify water level in basin. Fill to proper startup level. Check makeup water level control and valve.

13. Start external circuit circulating pumps.

14. Verify operation of evaporative refrigerant condenser basin, makeup line, and controlling device. Replace defective and malfunctioning units.
15. Verify that evaporative refrigerant condenser discharge is not recirculating into air intakes. Recommend corrective action.
16. Check HVAC water treatment system for proper operation, and measure chemical treatment levels. Verify operation of evaporative refrigerant condenser basin automatic blowdown and of controlling device.

PART 2 - PRODUCTS

2.1 FORCED DRAFT EVAPORATIVE REFRIGERANT CONDENSERS

A. Manufacturers:

1. EVAPCO, https://www.evapco.com/
2. Baltimore Air Coil, https://baltimoreaircoil.com/home
3. Marley

B. Fabricate evaporative refrigerant condenser mounting base with reinforcement strong enough to resist evaporative refrigerant condenser movement during a seismic event when evaporative refrigerant condenser is anchored to field support structure.

C. Casing and Frame:

1. Casing and Frame Material: Type 316 stainless steel.
2. Fasteners: Type 316 stainless steel.
3. Joints and Seams: Sealed watertight.
4. Welded Connections: Continuous and watertight.

D. Collection Basin:

1. Material: Type 316 stainless steel.
2. Strainer: Removable stainless steel strainer with openings smaller than nozzle orifices.
3. Overflow and drain connections.
4. Makeup water connection.

5. Welded basin seams

E. Mechanically Operated, Collection Basin Water Level Control: Manufacturer's standard adjustable, mechanical float assembly and valve.

F. Water Distribution Piping: Main header and lateral branch piping designed for even distribution over heat exchanger coil throughout the flow range without the need for balancing valves and for connecting individual, removable, nonclogging spray nozzles.

1. Pipe Material: Polyvinyl Chloride (PVC)

2. Spray Nozzle Material: PVC

3. Piping Supports: Corrosion resistant hangers and supports designed to resist movement during operation and shipment.

G. Spray Pump: Close coupled, end-suction, single stage, bronze fitted centrifugal pump; with suction strainer and flow balancing valve, and mechanical seal suitable for outdoor service.

1. General Requirements for Spray Pump Motor: Comply with National Electrical Manufacturers Association designation and temperature-rating requirements specified in COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT Section and not indicated below.

2. Motor Enclosure: Totally enclosed.

3. Energy Efficiency: NEMA Premium Efficient.

H. Heat Exchanger Coils:

1. Tube and Tube Sheet Materials: Type 316 stainless steel tube with stainless steel sheet.

2. Heat Exchanger Arrangement: Serpentine tubes; and sloped for complete drainage of fluid by gravity.

I. Drift Eliminator:

1. Material: Fiber reinforced plastic (FRP); with maximum flame spread index of 25 conforming to ASTM E84.

2. Ultraviolet (UV) Treatment: Inhibitors to protect against damage caused by UV radiation.

3. Configuration: Multipass, designed and tested to reduce water carryover to achieve performance indicated.

J. Centrifugal Fan: Double width, double inlet fan with forward curved blades; and statically and dynamically balanced at the factory after assembly.

K. Belt Drive:

1. Service Factor: 1.5 based on motor nameplate horsepower.

2. Sheaves: Fan and motor shafts shall have taper lock sheaves fabricated from corrosion resistant materials.

3. Belt: 1 piece, multigrooved, solid back belt.

4. Belt Material: Oil resistant, nonstatic conducting, and constructed of neoprene polyester cord.

5. Belt Drive Guard: Comply with Occupational Safety and Health Administration (OSHA) regulations.

L. Fan Motor:

1. General Requirements for Fan Motors: Comply with NEMA designation and temperature rating requirements specified in COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT Section and not indicated below.

2. Motor Enclosure: Totally enclosed.

3. Energy Efficiency: NEMA Premium Efficient.

4. Variable Speed Motors: Inverter duty rated in conformance with NEMA MG 1, Section IV, Performance Standard Applying to All Machines, Part 31, Definite Purpose, Inverter Fed, Polyphase Motors.

M. Vibration Switch: For each fan drive.

1. Enclosure: NEMA 250, Type 4.

2. Provide switch with manual reset button for hardwired connection to fan motor electrical circuit.

3. Switch shall, on sensing excessive vibration, shut down the fan.

N. Controls: Comply with requirements in INSTRUMENTATION AND CONTROLS FOR HVAC Section.

O. Personnel Access Components:

1. Doors: Large enough for personnel to access evaporative refrigerant condenser internal components from evaporative refrigerant condenser end walls.

P. Capacities and Characteristics: As scheduled on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Install evaporative refrigerant condensers on cast in place concrete equipment bases.

2. Comply with requirements for vibration isolation and seismic control devices specified in VIBRATION AND SEISMIC CONTROLS FOR HVAC Section.

B. Maintain manufacturer's recommended clearances for service and maintenance.

C. Loose Equipment: Install electrical components, devices, and accessories that are not factory mounted.

D. Install piping adjacent to evaporative refrigerant condensers to allow service and maintenance.

E. Install flexible pipe connectors at final connection of evaporative refrigerant condensers mounted on vibration isolators.

F. Run overflow, drain, and bleed lines to sanitary sewage system.

G. Industrial Water Piping: Connect to water level control with shutoff valve and union or flange at each connection.

H. Refrigerant Piping: Comply with requirements in REFRIGERANT PIPING Section. Connect to evaporative refrigerant condenser coil with isolation valves at each connection.

I. Ducts: Comply with requirements in METAL DUCTS Section. Connect ducts to evaporative refrigerant condenser inlet and outlet, full size of outlet, with flexible duct connection.

3.2 ADJUSTING

A. Adjust water level control for proper operating level.

3.3 DEMONSTRATION

A. Engage a factory authorized service representative to train Department maintenance personnel to adjust, operate, and maintain evaporative refrigerant condensers.

B. Record Department personnel training sessions and provide a copy in video file and electronic formats to Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Air cooled chiller package

B. Charge of refrigerant

C. Controls

D. Chilled water connections

E. Starters

F. Electrical power connections

1.2 RELATED SECTIONS

A. Section 23 21 13 - Hydronic Piping

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurent and Payment:

1. Payment for Work of this Section shall be paid under the Air Cooled Chiller bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. AHRI 550/590 (I-P) - Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems.

C. ASHRAE Std 180 - Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems.

D. ASME BPVC - Boiler and Pressure Vessel Code.

E. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

F. UL 1995 - Heating and Cooling Equipment.

1.5 DEFINITIONS

A. IPLV: Integrated part load value. A single number part load efficiency figure of merit calculated in conformance with the method defined by AHRI 550/590 (I-P) and referenced to Air-Conditioning, Heating and Refrigeration Institute (AHRI) standard rating conditions.

B. kW/Ton: The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons (kW) at any given set of rating conditions.

C. NPLV: Nonstandard part load value. A single number part load efficiency figure of merit calculated in conformance with the method defined by AHRI 550/590 (I-P) and intended for operating conditions other than AHRI standard rating conditions.

1.6 SUBMITTALS

A. Submit and include a written statement that the submitted equipment, hardware, or accessory complies with the requirement of that particular Section. Next to each item, indicate the following:

1. No exceptions taken.

2. Exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: For each type of product indicated.

1. Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.

2. Performance at AHRI standard conditions and at conditions indicated including IPLV and NPLV.

3. Performance at AHRI standard unloading conditions including IPLV and NPLV.

4. Minimum evaporator flow rate.

5. Refrigerant capacity of chiller.

6. Fluid capacity of evaporator.

7. Characteristics of safety relief valves.

8. Performance at varying capacities with constant design condenser fluid temperature. Repeat performance at varying capacities for different condenser fluid temperatures from design to minimum in 5 degrees Fahrenheit (F) increments.

9. Chiller sound levels.

10. Five year chiller warranty.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, load distribution, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

D. Coordination Drawings:

1. Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Structural supports.

b. Piping roughing-in requirements.

c. Wiring roughing-in requirements, including spaces reserved for electrical equipment.

d. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

2. Coordination drawings showing plan, section, and elevation views, drawn to 1/4 inch per foot.

3. Each view to show screened background with the following:

a. Column grids, beams, columns, and concrete housekeeping pads.

b. Room layout with walls, floors, and roofs, including each room name and number.

c. Equipment and products of other trades that are located in vicinity of chillers and part of final installation, such as lighting, fire suppression, and plumbing systems.

E. Certificates: For certification required in Quality Assurance Article.

F. Seismic Qualification Certificates: For chillers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Source quality control reports.

H. Startup service reports.

I. Operation and Maintenance Data: For each chiller to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. AHRI Certification: Certify chiller in conformance with the latest version of AHRI 550/590 (I-P) AHRI 550/590 certification program.

B. Construct chiller in conformance with UL 1995 with listing.

C. Construct chiller in conformance with ASME BPVC.

D. Conform to ASHRAE Std 15 for construction and operation of water chillers.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Ship each chiller with a full charge of refrigerant. Charge each chiller with nitrogen if refrigerant is shipped in containers separate from chiller.

B. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

C. Protect units from physical damage. Factory coil shipping covers shall be kept in place until installation.

D. Unit controls shall be capable of withstanding 203 degrees Fvstorage temperatures in the control compartment for an indefinite period of time.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Anchor into bases in conformance with Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chillers that fail in materials or workmanship within specified warranty period.

1. Extended warranties include, but are not limited to, the following:

a. Complete chiller including refrigerant charge.

b. Parts and labor.

c. Loss of refrigerant charge for any reason due to manufacturer product defect and product installation.

2. Warranty Period: 5 years from date of Substantial Completion.

1.11 MAINTENANCE AGREEMENT

A. Provide 5 Year Service Agreement for chillers. Service agreement shall be performed by the chiller manufacturer, and shall include:

1. Provide and report quarterly, annual, and bi-annual maintenance in compliance with or better than ASHRAE Std 180.

2. Include maintenance items as recommended in manufacturer's operating and maintenance data.

3. Submit copy of service call work orders and summary report to the Engineer, including description of Work performed, operating performance status, and noted exceptions.

4. Chiller manufacturer shall provide factory training for Department’s technicians.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL WATER CHILLERS

A. Manufacturers:

1. Smardt Chillers, Inc., (518) 324-5741, https://smardt.com/

2.2 MANUFACTURED UNIT

A. Description: Factory assembled and tested air cooled water chiller complete with compressor, compressor motor, compressor motor controller, evaporator, condenser, controls, variable speed drive, interconnecting unit piping and wiring, indicating accessories, and mounting frame.

B. Fabricate chiller mounting base with reinforcement strong enough to resist chiller movement during a seismic event when chiller is anchored to field support structure.

2.3 COMPRESSORS

A. Compressors shall be of hermetic centrifugal design and operate 100 percent oil free with 2 2-stages of compression, magnetic bearings, and integrated variable frequency drive system.

B. Automatically positioned and controlled inlet guide vanes shall operate with compressor speed controls to provide optimum unit efficiency and stable operation at part loads.

C. The compressor shall be capable of coming to a controlled stop in the event of a power failure. The unit shall be capable of initializing an automatic restart in the case of power failure.

D. Unit shall include mechanical and electrical isolation to allow service of 1 compressor while the other runs.

2.4 EVAPORATOR

A. Evaporator shall be shell and tube type and be designed, constructed, tested and stamped conforming to the requirements of the ASME BPVC Section 8. Refrigerant shall be in the shell and water inside the tubes. The water sides shall be designed for a minimum of 145 pounds per square inch gage pressure (psig) or as specified. Vents and drains shall be provided. The refrigerant side shall bear ASME Code stamp. Vessels shall pass a test pressure of 1.1 times the working pressure but not less than 100 pounds per square inch gauge pressure. Provide intermediate tube supports spaced to enable equal liquid and gas flow across multiple compressor suction ports.

B. A perforated plate designed for vapor disengagement shall be installed inside the evaporator above the tubing to assure effective liquid droplet removal to prevent liquid damage to compressors and equalized suction pressure across evaporators with multiple compressors.

C. Tubes shall be individually replaceable and have internally and externally enhanced surfaces designed for refrigeration duty. Tubes shall have smooth full tube wall landings at the tube sheet ends and at intermediate tube supports. Tubes shall be mechanically roller expanded into steel tube sheets containing a minimum of three concentric grooves.

D. The evaporator, including chilled water boxes, compressor suction line, and other components subject to condensing moisture shall be insulated with Underwriters Laboratories, Incorporated (UL) recognized 3/4 inch closed cell insulation. Joints and seams shall be sealed to form a vapor barrier.

E. The evaporator shall be provided with spring loaded reseating type pressure relief valves conforming to ASHRAE Std 15. Rupture disks are not acceptable.

2.5 CONDENSER AND FANS

A. Air cooled packaged chillers and controls shall be capable of reliable operation between 32 degrees F and 105 degrees F ambient air temperature.

B. Air cooled condensers shall utilize epoxy coated aluminum fins which shall meet ASTM B117 5,000 hour salt spray test. The coating shall be epoxy based type and shall effectively repel water and inhibits dust and bacterial accumulation. Condenser coils shall be arranged in a W-configuration to reduce equipment footprint.

C. Condenser coils and fans shall be arranged such that 1 fan operates with 1 coil section so that the failure of a fan shall not affect the CFM across any coil beyond that fan.

D. Condenser coils frame shall be made of Marine Grade Aluminum alloy 5052 to offer corrosion resistance to marine atmospheres. Frame shall have fully dipped epoxy coating meeting ASTM B117 5,000 hour salt spray test.

E. Condenser shall be equipped with an oversized liquid line and mechanical float to assure liquid sub-cooling necessary for effective cooling of the compressor.

F. Condenser shall be equipped with packaged low sound variable speed fans capable of delivering specified air flowrate according to AHRI standard operating conditions.

G. Condenser fan motors shall be electronically commutated type high efficiency, direct drive, 3-phase, insulation Class F, current protected, totally enclosed air over, double sealed and with permanently lubricated ball bearings.

H. Chiller shall utilize Axitop low sound fans

I. Chiller shall utilize flow grids for reduced fan noise

2.6 CHILLER LIQUID CONTROL

A. Control of refrigerant flow shall utilize a 6,000 step electronic expansion valve, to operate within the full range from full load to the lowest loading capacity for the chiller. Fixed orifice metering devices or float controls using hot gas bypass are not acceptable. The electronic expansion valve liquid line shall include a sight glass with moisture indicator.

B. Provide field installed water flow switches on the evaporator to prevent unit operation with no water flow.

C. Condenser shall be equipped with a mechanical stainless steel float for electronic actuation of the electronic expansion valve to provide a positive liquid seal to assure effective cooling of the compressor.

2.7 PRIME MOVER

A. Permanent magnet, synchronous hermetically sealed motor of sufficient size to effectively provide compressor horsepower requirements. Motor shall include soft start capabilities with an inrush current of no more than 2 amps. Motor shall be liquid refrigerant cooled with internal thermal overload protection devices embedded in the winding of each phase.

B. Compressor motor and chiller unit shall include variable frequency speed controls to match cooling load demand to compressor speed and inlet guide vane position.

C. Each compressor shall be equipped with a line reactor.

2.8 CHILLER FRAME AND HOUSING

A. Components shall be mounted onto a unitized construction having a Marine Grade Aluminum alloy 5052 frame suitable for outdoor installation. Frame shall have fully dipped epoxy coating meeting ASTM B117 5,000 hour salt spray test.

B. Electrical and controls shall be contained within a stainless steel metal enclosure to protect critical components from weather. Enclosure shall be NEMA-3R rated.

2.9 CONTROLS

A. The controller fitted to the oil free centrifugal chiller package shall be an embedded real time microprocessor device that utilizes control software written specifically for the manufacturer’s chiller applications. User operation shall be accomplished using a panel mounted color touch screen interface. The status of the compressors and system parameters including compressor alarms and temperature trends shall be viewable.

1. Chiller control system shall have the capability to store 1 year of operational data. No less than 60 points of information shall be sampled at a maximum of 15 minute intervals.

2. Chiller control system shall have full web based remote control capability including the capability for remote operation and software updates.

3. There shall be a backup superheat control on inlet of the compressor in order to control the electronic expansion valve in the event of a failure of the primary level sensing device.

B. Controller features must include the following:

1. Selectable control mode - leaving chilled water, entering chilled water or suction pressure control.
2. 12 inch, 65,000 colors, touch panel operator interface operating Windows 10 embedded.
3. Chiller documentation shall be viewable via touch panel in pdf format.
4. Operator interface shall be capable of connecting directly to compressors via serial communication protocol and display compressor information using Turbocor compressor monitoring/ commissioning software.
5. Chiller control panel shall contain a minimum of 3 processors; control functionality shall be carried out on a dedicated real time processor and data served to a remote graphical user interface via an open Ethernet protocol. Proprietary protocols between any pc based or micro based processor strictly prohibited.
6. Native BacNet capable via IP.
7. Chiller control shall be capable of controlling up to 8 Turbocor compressors on up to 8 individual refrigerant circuits serving the same chilled water stream.
8. Chiller control panel user interface shall be capable of remote control via an internet connection without the use of any third party gateway device or additional hardware or software.
9. Chiller control shall be able to operate in headless mode (no touch panel connected) and utilize standard Windows 10 or higher computer to display user interface via Ethernet connection.
10. Ability to place outputs in a manual state (hand, off, auto) via graphical user interface.
11. Alarm screen shall be capable of filtering faults into specific categories such as compressor, chiller and system faults in order to provide rapid diagnosis and separation of failure modes.
12. Ability to turn on/off duty standby chilled water pumps.
13. Ability to operate chiller isolation valves for evaporator.

14. Multiple compressors staging algorithm shall operate at the optimized power curves of each compressor simultaneously and shall reset automatically every second during operation. Compressor staging methods that operates using simple incremental percent of demand shall not be accepted.
15. Continuous data logging for operational trending and bin analysis shall be exportable to comma separated values format. (12 months data stored).
16. Built-in stepper motor controls for electronic expansion valves
17. Controls lockup protection
18. Ramp rate control - Peak energy demand limiting algorithms.
19. Three levels of alarm safety for minimum chiller down time
20. Chiller control software shall employ an active fault avoidance algorithm to reduce chiller capacity or power level in the case the chiller approaches within 10 percent of any trip limit value such as suction pressure, discharge pressure, chiller amp limit, leaving chilled water temperature limit and the like.
21. Store up to 32,000 alarm and fault events stored with date / time stamp.
22. Real time data trending viewable via touch panel.
23. Chiller load profile charts viewable via touch panel.
24. Chiller control graphical user interface shall be capable of displaying data in metric or english units without affecting control or building automation system (BAS) protocol units.
25. Controls shall identify within 60 seconds a compressor that is not starting or ramping properly. Upon this identification, the compressor shall be disabled, the remaining compressors shall be operated in an optimized fashion and an alarm shall be sent to alert the operator.
26. Chiller faults: 14 possible conditions.
27. Each compressor alarm: 9 possible conditions.
28. Each compressor fault: 13 possible conditions.
29. Each compressor bearing fault: 16 possible conditions.

30. Data on Main Display Screen shall be as follows:
    a. Entering and leaving chilled water temperatures.
    b. Ambient air temperature
    c. Seven states available
    d. Active timers
    e. Chiller enable status
    f. Chiller water flow proof status
    g. Indication of compressor readiness
    h. Indication of clearance to run
    i. Chiller set point
    j. Total chiller kilowatts
    k. Total chiller current input
    l. Three pages of data trends with zoom functionality
    m. Graphical dial indicators that clearly indicate safe and unsafe operating values
    n. Graphical representation of evaporator and condenser showing gas movement when chiller is running.
    o. Current alarms (announce and manual reset provision)
    p. Compressor actual rpm, maximum rpm, minimum rpm
    q. Compressor alarm description and fault description
    r. Compressor percentage motor demand.
    s. Compressor safety interlock status
    t. Compressor modbus communication health status
    u. Compressor suction and discharge pressures
    v. Compressor suction and discharge temperatures
    w. Compressor internal cooling system temperatures and status.

x. Compressor motor kilowatts and amps.

y. Compressor pressure ratio.

2.10 CHILLER SOUND DATA

A. Chiller sound pressure levels in dB and db(A) ratings shall not exceed the following levels:

Octave Band Center Frequency (Hz)								
	63	125	250	500	1,000	2,000	4,000	8,000
Lw dB	86.8	83.7	83.5	84.0	87.0	81.7	74.5	74.7
Lw dB(A)	60.6	67.6	74.9	80.8	87.0	82.9	75.5	73.6
Lp dB(A) at 3.3 feet	42.9	49.9	57.2	63.1	69.3	65.2	57.8	55.9
Sound data to be performed at full load conditions.								

2.11 CAPACITIES AND CHARACTERISTICS

A. Refer to Drawings for specific requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine chillers before installation. Reject chillers that are damaged.

B. Before chiller installation, examine roughing-in for equipment support, anchor bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting chiller performance, maintenance, and operations before equipment installation.

1. Final chiller locations indicated on Drawings are diagrammatic and approximate. Determine exact locations before roughing-in for piping and electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CHILLER INSTALLATION

A. Equipment Mounting: Install chiller on concrete base. Refer to structural Drawings for pad and anchorage details.

1. Maximum Deflection: 1/4 inch.

2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Maintain manufacturer's recommended clearances for service and maintenance.

C. Charge chiller with refrigerant if not factory installed.

D. Install separate devices furnished by manufacturer and not factory installed.

3.3 ELECTRICAL

A. Provide necessary accessory for equipment connection.

3.4 CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems.

B. Comply with requirements for piping specified in HYDRONIC PIPING Section. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to chiller to allow service and maintenance.

D. Evaporator Fluid Connections:

1. Comply with applicable requirements in HYDRONIC PIPING Section.

2. Connect to evaporator inlet and outlet with trim as detailed on Drawings.

E. Connect each chiller drain connection with a union and drain pipe, and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection.

3.5 STARTUP SERVICE

A. Engage a factory authorized service representative to perform startup service.

1. Complete installation and startup checks conforming to manufacturer's written instructions.
2. Verify that refrigerant charge is sufficient and chiller has been leak tested.
3. Verify that pumps are installed and functional.
4. Verify that thermometers and gages are installed.
5. Operate chiller for run-in period.
6. Verify proper motor rotation.
7. Verify static deflection of vibration isolators, including deflection during chiller startup and shutdown.
8. Verify and record performance of fluid flow and low temperature interlocks for evaporator and condenser.
9. Verify and record performance of chiller protection devices.
10. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

B. Inspect field assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.

C. Prepare test and inspection startup reports.

3.6 DEMONSTRATION

A. Engage a factory authorized service representative to provide one 8-hour training session for the Department maintenance personnel to adjust, operate, and maintain chillers.

B. Record Department personnel training sessions and provide a copy in video file and electronic formats to Engineer.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Floor-mounted units and computer room air conditioners

1.2 RELATED SECTIONS

A. Section 22 13 00 - Facility Sanitary Sewerage

B. Section 23 05 13 - Common Motor Requirements for HVAC Equipment

C. Section 23 05 48 - Vibration and Seismic Controls for HVAC

D. Section 23 21 13 - Hydronic Piping

1.3 PRICE AND PAYMENT PROCUEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Lump Sum Construction bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. ASCE 7-16 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality.

D. ASME BPVC - Boiler and Pressure Vessel Code.

E. NFPA 70 - National Electrical Code.

1.5 SUBMITTALS

A. Submit a written statement that the submitted equipment, hardware or accessory complies with the requirement of that particular Section. Next to each item, indicate the following:

1. No exceptions taken.

2. Exceptions shall be clearly identified by referencing respective paragraph and other requirements along with proposed alternative.

B. Product Data: Include the following for each type of product:

1. Material descriptions, dimensions of individual components and profiles, and finishes for computer room air conditioning units.

2. Rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: Include the following for computer room air conditioners:

1. Plans, elevations, sections, and attachment details.

2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

3. Diagrams for power, signal, and control wiring.

D. Color Samples: For unit cabinet, discharge grille, and exterior louver and for each color and texture specified.

E. Coordination Drawings: Plans, elevations, and other details, drawn to scale, using input from installers of the items involved.

F. Seismic Qualification Data: Certificates, for computer room air conditioners, accessories, and components, from manufacturer.

G. Field quality-control reports.

H. Sample warranty.

I. Operation and maintenance data: For inclusion in emergency and operation and maintenance manuals.

J. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Furnish 1 set of spare filters for each unit installed.

1.6 WARRANTY

A. Manufacturer’s Warranty: Manufacturer agrees to repair or replace components of computer room air conditioners that fail in materials or workmanship within 1 year from documented product warranty inspection performed by manufacturer’s personnel.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Liebert, a brand of Vertiv, https://www.vertiv.com/en-us/products/brands/liebert/

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Computer room air conditioners shall withstand the effects of earthquake motions determined conforming to ASCE 7-16.

1. The term "withstand" means "the unit shall remain in place without separation of any parts when subjected to the seismic forces specified and the unit shall be fully operational after the seismic event."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency, and marked for intended location and application.

C. ASME Compliance: Fabricate and label water cooled condenser shell to comply with ASME BPVC Division 1.

2.3 MANUFACTURED UNITS

A. Description: Self contained, factory assembled, prewired, and pre-piped; consisting of cabinet, fan, filters, and controls; for vertical floor mounting in upflow or downflow configuration.

B. Cabinet and Frame:

1. Welded tubular-steel frame with removable steel panels with baked enamel finish, insulated with 1 inch thick, 1.5 pound duct liner.

2. Seismic Floor Stand:

a. Units 6 tons and smaller: Galvanized steel, 24 inch high, with powder coated panels, air filter, adjustable legs and vibrations isolation for upflow return air configuration.

b. Units 7 tons and larger: Welded tubular steel, 30 inch high, with adjustable legs and vibration isolation pads for downflow configuration.

3. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE Std 62.1.

C. Supply-Air Fan:

1. 6 tons and smaller: Backward curved, centrifugal, direct drive, electronically commutated, and variable speed.

2. 7 tons and larger: Plug/plenum, single inlet, direct drive, electronically commutated, and variable speed.

D. Hydronic Cooling Coil: Seamless copper tubes expanded into aluminum fins with modulating two-way control valve and flow switch

1. Cooling Medium: Water.

2. Mount stainless steel drain pan complying with ASHRAE Std 62.1 and having a condensate pump unit with integral float switch, pump motor assembly, and condensate reservoir under coil assembly.

E. Filter:

1. 6 tons and smaller: 2 inch thick, disposable, pleated, glass fiber media

2. 7 tons and larger: 4 inch thick, disposable, pleated, glass-fiber media.

3. Filter Minimum Efficiency Reporting Value (MERV):

a. MERV Rating: MERV 13 conforming to ASHRAE Std 52.2.

F. Disconnect Switch: Locking disconnect with handle accessible with the door closed.

G. Control System:

1. Microprocessor unit mounted panel.

2. Fan contactor.

3. Control transformer with circuit breaker.

4. Solid-state temperature control modules.

5. Time delay relay.

6. Smoke sensor.

7. High temperature thermostat.

8. Ethernet/RS 485 ports for connection to building control system.

H. Fan Motors:

1. Comply with National Electrical Manufacturers Association (NEMA) designation, temperature rating, service factor, and efficiency requirements for motors specified in COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT Section.

2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load does not require motor to operate in service factor range above 1.0.

3. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

4. Type: Open dripproof.

5. Electronically commutated and variable speed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

B. Examine roughing-in for hydronic piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls, floors, and roofs for suitable conditions where computer room air conditioners shall be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Layout and install computer room air conditioners coordinated with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

B. Install computer room air conditioners coordinated with computer room access flooring Installer.

C. Install computer room air conditioners level and plumb, maintaining manufacturer's recommended clearances.

D. Computer Room Air Conditioner Mounting: Install using elastomeric pads. Comply with requirements for vibration isolation devices specified in VIBRATION AND SEISMIC CONTROLS FOR HVAC Section.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other heating, ventilating, and air conditioning Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to computer room air conditioners, allow space for service and maintenance.

C. Drainage Connections: Comply with applicable requirements in FACILITY SANITARY SEWERAGE Section. Provide adequate connections for condensate drain.

D. Hydronic Piping: Comply with applicable requirements in HYDRONIC PIPING Section. Provide shutoff valves and piping.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory authorized service representative:

1. Inspect for and remove shipping bolts, blocks, and tie down straps.

2. After installing computer room air conditioners and after electrical circuitry has been energized, test for compliance with requirements.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Computer room air conditioners shall be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

D. After startup service and performance test, change filters. Spare filters required by this Section shall not be used for this purpose.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Set field-adjustable switches and circuit breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on site assistance in adjusting system to suit actual occupied conditions. Provide up to 2 visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory authorized service representative to train Department's personnel to adjust, operate, and maintain computer room air conditioners.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Refrigerant air coils

B. Coil frames

C. Coatings

1.2 RELATED SECTIONS

A. Section 23 23 00 - Refrigerant Piping

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the DX Cooling Coils bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

B. ASHRAE Std 33 - Methods of Testing Forced-Circulation Air-Cooling and Air-Heating Coils.

C. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

D. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

E. ASTM B743 - Standard Specification for Seamless Copper Tube in Coils.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

1.5 SUBMITTALS

A. Product Data: For each type of product specified.

B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 REFRIGERANT AIR COILS

A. Manufacturers:

1. Precision Coils, https://www.precision-coils.com/

2. Heat Craft, https://www.heatcraftrpd.com/

B. Performance Ratings: Tested and rated conforming to AHRI 410 and ASHRAE Std 33.

C. Minimum Working Pressure Rating: 300 pounds per square inch gage (psig).

D. Source Quality Control: Factory tested to 450 psig.

E. Tubes: ASTM B743 copper, minimum 0.020 inch thick.

F. Fins: Copper, minimum 0.006 inch thick.

G. Suction and Distributor Piping: ASTM B88, Type L ACR copper tube with brazed joints.

H. Frames: Galvanized steel channel frame, minimum 0.052 inch thick for slip-in mounting.

I. Coating: Electro-coil coating.

1. Provide consistent film build averaging 1 mil (0.001 inch) dry film thickness over entire coil assembly.

2. Durability: Coating shall allow combing out of damaged or bent fins without adhesion loss or flaking of coating.

3. Thermal Conductivity: Maximum heat transfer loss of 1 percent compared to new uncoated clean coils.

4. Corrosion Protection: Exceeds 3,000 hours salt spray testing in conformance with ASTM B117.

5. Temperature Resistance: Up to 400 degrees Fahrenheit (F).

J. Capacities and Characteristics: As scheduled on mechanical Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install coils level and plumb.

B. Install coils in metal ducts and casings constructed conforming to SMACNA (DCS).

C. Install stainless steel drain pan under each cooling coil.

1. Construct drain pans with connection for drain.

2. Construct drain pans to extend beyond coil length and width and to connect to condensate trap and drainage.

3. Extend drain pan upstream and downstream from coil face.

4. Extend drain pan under coil headers and exposed supply piping.

D. Straighten bent fins on air coils.

E. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.

F. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

G. Install piping adjacent to coils to allow service and maintenance.

H. Connect refrigerant piping conforming to REFRIGERANT PIPING Section.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Ducted fan coil units

B. Ductless fan coil units

1.2 RELATED SECTIONS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC

C. Section 23 07 16 - HVAC Equipment Insulation

D. Section 23 21 13 - Hydronic Piping

E. Section 23 33 00 - Air Duct Accessories

F. Section 23 41 00 - Particulate Air Filtration

G. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

H. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Fan Coil Units bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. AHRI 440 (I-P) - Performance Rating of Fan-Coil Units.

B. ASHRAE Std 33 - Methods of Testing Forced-Circulation Air-Cooling and Air-Heating Coils.

C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

E. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

F. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

G. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

H. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation.

I. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

J. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

L. NFPA 70 - National Electrical Code.

M. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.

N. UL 1995 - Heating and Cooling Equipment.

1.5 DEFINITIONS

A. CWP: Cold working pressure

B. DDC: Direct digital controls

C. MERV: Minimum efficiency reporting value

D. PSC: Permanent split capacitor

E. psig: Pounds per squre inch gage

F. PTFE: Polytetrafluroethylene

G. TFE: Tetrafluroethylene

1.6 SUBMITTALS

A. Product Data: For each type of product include the following:

1. Rated capacities, nominal performance, operating characteristics, and furnished specialties and accessories.

2. Data on electrical requirements and connections points, recommended wire and fuse sizes or minimum circuit amps (MCA), and safety and start-up instructions.

3. Overall dimensions as well as installation, operation, and service clearances.

4. Unit shipping, installation, and operating weights.

B. Shop Drawings:

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Include diagrams for power, signal, and control wiring.

C. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.

2. Structural members to which fan coil units shall be attached.

3. Method of attaching hangers to building structure.

4. Size and location of initial access modules for acoustical tile.

5. Items penetrating finished ceiling, including the following:

a. Lighting fixtures.

b. Air outlets and inlets.

c. Speakers.

d. Sprinklers.

e. Access panels.

D. Sample Warranty: For special warranty.

E. Operation and Maintenance Data: For fan coil units to include in emergency, operation, and maintenance manuals.

1. Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

F. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Coil Unit Filters: Furnish one set of spare filters for each filter installed.

2. Fan Belts: Furnish one set of spare fan belts for each unit installed.

1.7 QUALITY ASSURANCE

A. Comply with NFPA 70.

1.8 COORDINATION

A. Coordinate layout and installation of fan coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition assemblies.

B. Coordinate size and location of wall sleeves for outdoor air intake.

1.9 WARRANTY

A. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory packaged and tested units rated conforming to AHRI 440 (I-P), ASHRAE Std 33, and UL 1995.

2.2 DUCTED FAN COIL UNITS

A. Manufacturers:

1. Williams

2. ENVIRO-TEC, https://www.enviro-tec.com/

3. Carrier

B. Coil Section Insulation: 1 inch thick, coated glass fiber complying with ASTM C1071 and attached with adhesive complying with ASTM C916.

1. Surface Burning Characteristics: Insulation and adhesive shall have a combined maximum flame spread index of 25 and smoke developed index of 50 when tested conforming to ASTM E84 by a qualified testing agency.

C. Coil Section Insulation: Insulate coil section conforming to HVAC EQUIPMENT INSULATION Section.

1. Surface Burning Characteristics: Insulation and adhesive shall have a combined maximum flame spread index of 25 and smoke developed index of 50 when tested conforming to ASTM E84 by a qualified testing agency.

D. Drain Pans: Type 316 stainless steel. Fabricate pans and drain connections to comply with ASHRAE Std 62.1.

E. Chassis: Galvanized steel where exposed to moisture with powder coat finish and removable access panel. Floor mounting units shall have leveling screws.

F. Cabinets: Steel with baked enamel finish in manufacturer's standard paint color.

1. Supply Air Plenum: Sheet metal plenum finished and insulated to match the chassis with mill finish.

2. Return Air Plenum: Sheet metal plenum finished to match the chassis.

3. Mixing Plenum: Sheet metal plenum finished and insulated to match the chassis with outdoor and return air, formed steel dampers.

4. Dampers: Galvanized steel with extruded vinyl blade seals, flexible metal jamb seals, and interlocking linkage.

G. Filters: Pleated panel type conforming to PARTICULATE AIR FILTRATION Section.

1. MERV Rating: 13 when tested conforming to ASHRAE Std 52.2.

2. Filtration group model Aerostar Green Pleat.

H. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig and a maximum entering water temperature of 220 degrees Fahrenheit (F). Include manual air vent and drain. Coat coil with flexible epoxy polymer electrocoating uniformly applied to coil surface areas with no material bridging between fins. The coating process shall ensure complete coil encapsulation and a uniform dry film thickness of 0.6 to 1.2 mils on surface areas including fin edges and meet 5B rating cross hatch adhesion per ASTM D3359. Corrosion durability shall be tested to 5,000 hours salt spray resistance per ASTM B117.

I. Direct Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum or painted steel wheels, and painted steel or galvanized steel fan scrolls.

J. Belt Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, single speed motor installed on an adjustable fan base resiliently mounted in the cabinet. Aluminum or painted steel wheels, and painted steel or galvanized steel fan scrolls.

1. Motors: Comply with requirements in COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT Section.

K. Factory, Hydronic Piping Package: ASTM B88, Type L copper tube with wrought copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.

1. 2-way, modulating control valve for chilled water coil.

2. 2-way, modulating control valve for heating coil.

3. Hose Kits: Minimum 400 psig working pressure and operating temperatures from 33 to 211 degrees F. Tag hose kits to equipment designations.

4. Length: 24 inches.

5. Minimum Diameter: Equal to fan coil unit connection size.

6. 2-Piece Ball Valves: Bronze body with full port, chrome plated bronze ball; PTFE or TFE seats; and 600 psig minimum CWP rating and blowout proof stem.

7. Calibrated Orifice Balancing Valves: Bronze body, ball type; 125 psig working pressure, 250 degrees F maximum operating temperature; with calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, threaded ends, and a memory stop to retain set position.

8. Automatic Flow Control Valve: Brass or ferrous metal body; 300 psig working pressure at 250 degrees F; with removable, corrosion resistant, tamperproof, self-cleaning piston spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig.

9. Y-Pattern Hydronic Strainers: Cast iron body (ASTM A126, Class B); 125 psig working pressure; with threaded connections, bolted cover, perforated stainless steel basket, and bottom drain connection. Include minimum NPS 1/2 hose end, full port, ball type blowdown valve in drain connection.

10. Wrought Copper Unions: ASME B16.22.

L. Control devices and operational sequence are specified in VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT Section.

M. Interface with DDC System for HVAC Requirements:

1. Interface relay for scheduled operation.

2. Interface relay to provide indication of fault at the central workstation.

3. Provide BACnet interface for central DDC system for HVAC workstation for the following functions:

a. Adjust set points.

b. Fan coil unit start, stop, and operating status.

c. Data inquiry, including outdoor air damper position, supply and room air temperature.

d. Occupied and unoccupied schedules.

N. Electrical Connection: Factory wire motors and controls for a single electrical connection.

2.3 DUCTLESS FAN COIL UNITS

A. Manufacturers:

1. Multiaqua, https://multiaqua.com/

B. General: Factory assembled and tested chilled and hot water fan coil.

C. Cabinet: Internally insulated high impact polymer.

D. Fan motor: Swing motor to modulate the discharge air, three speed, direct drive, PSC type, totally enclosed with internal overload protection.

E. Blower wheel: Dynamically balanced.

F. Water coil: 3/8 inch copper tubing mechanically bonded to aluminum fins, factory tested to 300 pounds per square inch gage pressure.

G. Drain pan: Molded high impact polymer, exterior shall be insulated with closed cell insulation.

H. Filters: Washable type.

I. Controls: Completely factory wired and tested. Includes circuit board, room sensor, indoor coil thermistor, transformer and wireless remote.

J. Safties: Non reusable fuse on the secondary voltage side of the transformer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, to receive fan coil units for compliance with requirements for installation tolerances and other conditions affecting performance of tWork.

B. Examine roughing-in for piping and electrical connections to verify actual locations before fan coil unit installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fan coil units level and plumb.

B. Install fan coil units to comply with NFPA 90A.

C. Suspend ducted fan coil units from structure with elastomeric hangers. Vibration isolators are specified in VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT Section.

D. Wall mount ductless fan coil units using manufacturer provided mounting plate.

E. Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation.

F. Install new filters in each fan coil unit within 2 weeks after Substantial Completion. Spare filters required by this Section shall not be used for this purpose.

3.3 CONNECTIONS

A. Piping installation requirements are specified in HYDRONIC PIPING Section. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.

2. Connect piping to fan coil unit factory hydronic piping package. Install piping package if shipped loose.

3. Connect condensate drain to indirect waste.

    a. Install condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

B. Connect supply air and return air ducts to ducted fan coil units with flexible duct connectors specified in AIR DUCT ACCESSORIES Section. Comply with safety requirements in UL 1995 for duct connections.

C. Ground equipment conforming to GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS Section.

D. Connect wiring conforming to LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES Section.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Train Department personnel to adjust, operate, and maintain fan coil units.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic electrical materials, methods, and requirements to perform electrical Work.

B. Enclosures

C. Field quality control

D. Cleaning

1.2 RELATED SECTIONS

A. Section 02 00 01 - Basic Site Materials and Methods

B. Section 23 64 16 - Centrifugal Water Chillers

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems

D. Section 26 05 29 - Hangers and Supports for Electrical Systems

E. Section 26 05 33 - Raceways and Boxes for Electrical Systems

F. Section 26 05 34 - Outlet, Junction, and Pull Boxes

G. Section 26 24 16 - Panelboards

H. Section 31 23 33 - Trenching and Backfilling

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Electrical System bid item of Bid Proposal Line Items.

1.4 SUBMITTALS

A. Complete list of materials and equipment proposed for use in Project prior to purchase and installation of materials or equipment.

1. Submittals shall include manufacturer's names and material descriptions or equipment identification such as styles, types, and catalog numbers. Submittal data shall show published ratings or capacity data, detailed equipment drawing for fabricated items, panel diagrams, wiring diagrams, installation instructions, and other pertinent data. Where literature is submitted covering a group or series of similar items, clearly indicate or identify the applicable items. Drawings shall be drawn to scale indicating exact dimensions.

B. Review of materials shall be based on the manufacturer's latest published data and such physical tests as may be performed by Department Testing Laboratory.

C. Prior to start of construction, submit to Engineer proposed equipment layout drawings for each equipment room or area containing items of equipment furnished under Division 26. Layout drawings shall consist of plan view of room, to scale, showing projected outlines of equipment, complete with dotted indication of required clearances including those needed for removal of service. Indicate location of conduit and pull boxes.

D. Operation and Maintenance Manuals: Provide 1 copy of indexed operation and maintenance manual which shall include test reports, service instructions, and renewal parts lists of equipment installed in Project. Submit in hard copy and electronic file or compact disc (CD) format.

1. Submit operation and maintenance manuals at least 30 Calendar Days before final inspection. Include the following information together with any pertinent data:

a. Renewal part numbers of replaceable items.

b. Manufacturer’s specific product data.

c. Serial numbers of principal pieces of equipment.

d. Supplier’s name, address, and phone number.

e. Final settings for breakers, relays, and control devices.

E. Submit resume of full-time quality assurance person.

F. Project Records:

1. In addition to the requirements of PROJECT RECORD DOCUMENTS Section, the make and model of equipment installed in Project shall be indicated on Project Record Drawings.

1.5 QUALITY ASSURANCE

A. Provide at Project Site, a full time quality assurance person with minimum 5 years of electrical construction experience. This person shall lay out on plans the installation of electrical equipment, conduit alignments, terminations, wiring, and Work pertaining to electrical construction, which shall be used by the electricians for field installations.

B. Jobsite Workers:

1. Apprentices and Journey Level Electricians:

a. Apprentices shall be registered in a State of California approved apprenticeship program.

b. The use of Journey level electricians shall comply with State of California labor laws.

2. Project Workforce for Compliance with Electrical Safety Policy:

a. 70 percent of Journey Level electricians shall be graduates of a State of California Approved Electrical Apprenticeship Program.

b. 20 percent of Project Site electrical workers shall be Occupational Safety and Health Administration (OSHA) 10-hour General Industry Safety And Health certified.

c. At least 1 Project Site electrical worker shall be OSHA 30-hour General Industry Safety And Health Certified.

d. The workforce ratios indicated in Quality Assurance Article, Jobsite Workers Paragraph, subparagraphs 2a through c shall be determined by verifying the workforce composition on a daily basis.

3. Contractor shall complete Electrical Safety Policy-Implementation Plan form, located in Appendix "E" of Specifications and submit at the time required in NOTICE INVITING BIDS Section.

4. Prior to start of electrical Work, Contractor or subcontractor shall provide proof of compliance to Inspector.

5. Contractor shall continue to monitor and comply with Jobsite Workers Paragraph of this Article requirements for the duration of Contract. Electrical Work may be terminated at any time Contractor is found to be out of compliance.

1.6 MAINTENANCE

A. Spare Parts: Deliver the following spare parts to Engineer and obtain receipts. Submit at same time as operating instructions.

1. Spare fuses: 2 sets for each size combination fused breaker.

2. Spare fuses for low voltage fused switch: 2 sets for each size used on Project.

3. Spare pilot light lamps of each type used on Project, in quantity of 10 percent, but not less than 2 percent.

4. Overload heater elements: 2 sets for each size used on Project.

5. Spare fuses for medium voltage switches: 2 sets for each size fuse used on Project.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and equipment to be installed shall be standard cataloged products of companies regularly engaged in the manufacture of such products, Underwriters Laboratories, Incorporated (UL) listed, and meet the requirements of City of Los Angeles Electrical Code. The products shall be the latest standard designs in accordance with Drawings and unless otherwise noted.

B. Equipment and devices of the same rating shall be new, interchangeable, and of the same manufacturer. Fixtures and fittings of one classification shall be of the same manufacturer and model.

C. Materials and equipment shall have National Electrical Manufacturers Association (NEMA) NEMA 1 rating for indoor use and NEMA 3R rating for outdoor use.

2.2 ENCLOSURES

A. Indoor: NEMA 1

B. Outdoor: NEMA 3R

C. Switch enclosures shall be clearly marked for maximum voltage, current, and horsepower rating.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform trench Work and vault excavations as shown on Drawings and in conformance with BASIC SITE MATERIALS AND METHODS and TRENCHING AND BACKFILLING Sections.

3.2 INSTALLATION

A. Perform Work in conformance with City of Los Angeles Electrical Code, American Insurance Association (AIA) regulations, regulations of Industrial Safety Commission of the State of California, and any other legally constituted regulating authority having jurisdiction.

B. Install Work in conformance with NEMA 3R rating for weather resistance.

C. Locate and route new electrical conduits without penetrating through new or existing roof decks or electrical equipment roofs.

D. Exposed conduit, fittings, and straps shall be PVC coated steel conduit unless noted otherwise.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Conduct tests at portions of the installation as may be necessary to ensure full compliance with Drawings and Specifications. Perform tests in presence of Engineer. Costs of tests shall be at sole cost and expense of Contractor. Provide instruments, equipment, labor, and materials to complete tests. Tests may be required on any item between installation of Work and end of 1 year warranty period. Should tests detect defective materials, poor workmanship, or variance with requirements of Specifications, Contractor shall make changes necessary and remedy defects at no additional cost to Department.

2. System Acceptance:

    a. Notify Engineer for final inspection prior to system acceptance upon:

        1) Completion of installation of systems required under Contract Documents.

        2) Submission and acceptance of operating and maintenance data.

        3) Completion of identification markers, tags, nameplates, directory cards, and other identification mechanisms as specified in Specifications.

    b. Acceptance is contingent upon the following:

        1) Completion of final review and correction of deficiencies.

        2) Satisfactory completion of acceptance tests which demonstrate compliance with performance and technical requirements of Contract Documents.

        3) Satisfactory completion of training program and submission of Operation and Maintenance Manuals and As-Built Drawings required by Contract Documents.

3.4 CLEANING

A. Upon completion, and at other times during the progress of Work, remove surplus materials, trash, and debris resulting from Work.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conductor and cable general requirements

B. Wiring connectors

C. Installation

1.2 RELATED SECTIONS

A. Section 26 00 01 - Basic Electrical Materials and Methods

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems

C. Section 23 61 23 - Rotary-Screw Refrigerant Compressors

D. Section 26 05 34 - Outlet, Junction, and Pull Boxes

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Electrical System bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

B. NFPA 70 - National Electrical Code.

C. UL 44 - Thermoset-Insulated Wires and Cables.

D. UL 83 - Thermoplastic-Insulated Wires and Cables.

E. UL 486A-486B - Wire Connectors.

F. UL 486C - Splicing Wire Connectors.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide required conduit, boxes, wiring, connectors, and the like, as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. Provide 600 volt or less rated low voltage wire and cable with conductors of soft drawn annealed copper. Unless otherwise noted on Drawings, 600 volt or less rated wire No. 8 AWG and larger shall be stranded and No. 10 AWG and smaller shall be solid.

2. Wire and cable insulation shall be Type THWN-2/THHN (90 degrees Celsius wet or dry), single conductor, for general use as branch circuits and control wiring. No. 12 American Gage Wire (AWG) minimum for branch circuits; No. 16 AWG minimum for control wiring, unless indicated otherwise on Drawings.

H. Connectors and Terminals:

1. For Conductors used in Systems other than Communication and Control Wiring: For connectors sizes No. 10 AWG and smaller, make splices and terminal connections using 1 or 2 piece insulated crimp type wire joints, splices and terminals manufactured by one of the following:

   a. Burndy Engineering Company (Hylugs and Hylinks)

   b. Ideal Industries, Incorporated (connectors, terminals, and the like)

   c. Thomas & Betts (Sta-Kons)

2. Use ring tongue lugs on strap screw device terminals. Do not use crimping tools not specifically designed for the application.

3. For conductor sizes No. 8 AWG and larger, make splices, taps, and terminal connections using City of Los Angeles Department of Building and Safety listed cast or machined high conductivity copper alloy connectors of the circular clamp type with multiple socket head cap screws manufactured by T & B, OZ Electrical Manufacturing Company, Incorporated, Types L, LM, TW, TWC, T, TC. Except where insulated covers are provided, fill voids and irregularities on connections with Scotchfill insulation putty and cover with 2 half lapped layers of Scotch No. 88 insulating tape and 1 half lapped layer of friction tape.

2.2 IDENTIFICATION

A. Color Coding:

1. Provide color coding as follows:

Insulated Equipment ground - Green		
Control wiring – Purple		

2. For insulations and jackets not manufactured by the selected vendor with integral colors, use Scotch No. 35 color coding tape on each conductor entering every bow, trough, cabinet, and wireway and at intervals not exceeding 5 feet in wireways, trench duct, and other locations where conductors are continuously accessible.

B. Conductor Identification:

1. Other than color coding, identify conductor with panel and circuit number and additional numbering systems shown on Drawings. Identify circuits by means of numbered tape markers.

2.3 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Do not pull wire or cable through box fitting or enclosure where change of raceway alignment or direction occurs.

2. Do not cut strands from conductors to fit lugs or terminals.

3. Do not bend conductors to less than recommended radius.

4. Use temporary guides, sleeves, rollers and other hardware to protect cable from excess tension or abrasion during installation.

5. Splices are not allowed on control and communication wiring when pulling through junction boxes or pull boxes. Conductors shall be terminated only at their origination and final terminal blocks. Terminations shall be made with terminal blocks; splicing with wire nuts is not acceptable.

B. Wiring in Enclosures:

1. Form and tie conductors in panelboards, cabinets, control panels, wireways and wiring troughs, providing circuit and conductor identification, using T & B Ty-Raps of appropriate size and type.

2. Limit spacing between ties to 15 centimeters and provide circuit and conductor identification at least once in each enclosure.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding for electrical systems to:

1. Prevent transient over-voltages and the energization of conductive machine frames, enclosures, appliances, and structures due to lightning.

2. Improve the capability of overcurrent devices to sense and interrupt ground fault currents by minimizing the impedance of ground current return paths to transformer neutrals.

1.2 RELATED SECTIONS

A. Section 26 00 01 - Basic Electrical Materials and Methods

B. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables

C. Section 26 05 34 - Outlet, Junction, and Pull Boxes

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Electrical System bid item of Bid Proposal Line Items.

1.4 SUBMITTALS

A. Two copies of certified test reports.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Grounding electrodes shall be 3/4-inch diameter by 10-feet long copper jacketed stainless steel.

B. Ground clamp onto grounding electrode shall be as shown on Drawings.

C. Concrete box shall be as shown on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Grounded service equipment, motor frames, switchgear and equipment enclosures, lighting and power panel boards, transformers, raceways, fences and gates, building or structure steel frames, lighting standards, floodlight poles, power/light pull boxes/maintenance holes, in conformance with the applicable requirements of City of Los Angeles Electrical Code. At buildings and substations, ground connection shall be made to buried ground bus consisting of a 4/0 softdrawn, annealed, bare stranded copper cable connected to 3/4-inch diameter, 10-foot long stainless steel ground rods, spaced 6 feet minimum. Resistance of the ground bus with rods connected but without supplementary connection shall be less than 25 ohm at any point. Ground rods shall be stainless steel clad.

2. Ground bus shall also be connected at 2 or more points to water main if same is within practical distance.

3. Underground connections, including ground rod connections to structural steel, shall be made by Cadweld or other exothermic process, or Burndy Compression System.

4. Coat cadweld connections with an epoxy resin compound for protection against corrosion.

5. Above ground, Code-approved copper ground clamps, connectors, and lugs shall be used whenever another method of connections is not specified. Ground connectors shall be of the multiple bolt type. Bolts, washers, and stop nuts shall be of high copper alloy, Everdur, Durium, Duronze, or silicon bronze. Ferrous hardware is not acceptable. Size of grounding conductors shall have a minimum current carrying capacity in conformance with City of Los Angeles Electrical Code or the size indicated on Drawings.

6. Length of grounding conductors or jumpers shall be kept to a minimum. Where flexible conduit is used, provide a bonding jumper between conduit ends.

B. Connection of Equipment to the Structural Steel:

1. If the grounding conductors connected to the structural steel are No. 2 AWG or larger, make the connection to the steel using Cadweld or Burndy Compression System process using proper molds and charges. If conductors are smaller than No. 2 AWG, install a stud in the steel using a high-velocity powder actuated tool and bolt the conductor lug to the stud.

2. Provide a connection to the direct ground for transformer neutrals when the transformer rating is 9 kVA or larger. Use an insulated conductor sized in conformance with City of Los Angeles Electrical Code but not smaller than No. 2 AWG.

3. Provide a connection to the direct ground for the ground bus in switchgear assemblies, and power panel boards, except where the power panel boards are directly mounted and bolted to a steel structure. Use an insulated conductor sized in conformance with City of Los Angeles Electrical Code but not smaller than No. 6 AWG.

4. Install an insulated No. 2 AWG conductor from each set of lightning arrestors or surge capacitors to the nearest direct ground.

C. Equipment Grounding:

1. Provide an electrically continuous copper equipment grounding conductor, color-coded green, and sized in conformance with City of Los Angeles Electrical Code, pulled into electrical raceways containing conductors of systems rated higher than 30 V. Bond to grounding lugs, equipment, fixtures, enclosures, and transformer neutrals.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. General:

a. Measure the ground resistance employing Fall-of-Potential method using a Biddle Megger Earth Tester with 2 electrodes after complete erection of the structural steel and installation of grounding system.

2. Test Reports:

    a. Submit to Engineer 2 copies of the test reports certified by the testing technician and Engineer's representative authorized to witness the test.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hangers and supports for electrical systems

B. Support systems for conduit and cable.

1.2 RELATED SECTIONS

A. Section 26 00 01 - Basic Electrical Materials and Methods

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems

C. Section 23 61 23 - Rotary-Screw Refrigerant Compressors

D. Section 26 05 34 - Outlet, Junction, and Pull Boxes

1.3 REFERENCES

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel.

E. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

F. MFMA-4 - Metal Framing Standards Publication.

G. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction.

I. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT).

J. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit.

K. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC).

L. NECA NEIS 105 - Standard for Installing Metal Cable Tray Systems.

M. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer registered in the State of California. For fabrication and installation details for electrical hangers and support systems and shall be:

1. Hangers. Include product data for components.

2. Slotted support systems.

3. Equipment supports.

4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel conformance to the following:

1. AWS D1.1/D1.1M

2. AWS D1.2/D1.2M

PART 2 - PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in conformance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

6. Zinc-Plated Steel: Electroplated in conformance with ASTM B633.

7. Galvanized Steel: Hot dip galvanized after fabrication in conformance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, and the like, suitable for the conduit or cable to be supported.

1. Conduit Straps: 1 hole or 2 hole type; steel or malleable iron.

2. Conduit Clamps: Bolted type unless otherwise indicated on Drawings.

C. Outlet Box Supports: Hangers, brackets, and the like suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory fabricated continuous slot metal channel (strut) and associated fittings, accessories, and hardware required for field assembly of supports.

1. Comply with MFMA-4.

E. Hanger Rods: Threaded zinc plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated on Drawings and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1

2. NECA 101

3. NECA 102

4. NECA NEIS 105

5. NECA 111

B. Comply with requirements for raceways and boxes specified in RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS Section.

C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

D. Multiple Raceways or Cables: Install trapeze type supports fabricated with metal channel sized for 1.25 times present loads without exceeding manufacturer's design load limits.

1. Secure raceways and cables to these supports with 2-bolt conduit clamps

E. Spring steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch (38 mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, electrical metallic tubing (EMT) may be supported by openings through structure members, conforming to NFPA 70.

C. Strength of Support Assemblies: Where not indicated on Drawings, select sizes of components so strength shall be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 pounds (90 kg).

D. Mounting and Anchorage of Surface Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by City of Los Angeles Building or Electrical Code:

1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.

5. Instead of expansion anchors, powder actuated driven threaded studs provided with lock washers and nuts may be used in existing standard weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight aggregate concrete or for slabs less than 4 inches (100 mm) thick.

6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-58.

7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements on Structural Drawings for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit raceways and fittings

1.2 RELATED SECTIONS

A. Section 26 00 01 - Basic Electrical Materials and Methods

B. Section 32 13 14 - Concrete for Exterior Improvements

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Electrical System bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC).

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S).

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit.

D. ASTM D3485 - Standard Specification for Coilable High Density Polyethylene (HDPE) Cable in Conduit (CIC).

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.

G. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.

H. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT).

I. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series.

J. NFPA 70 - National Electrical Code.

K. UL 1 - Flexible Metal Conduit.

L. UL 6 - Electrical Rigid Metal Conduit-Steel.

M. UL 360 - Liquid-Tight Flexible Metal Conduit.

N. UL 514B - Conduit, Tubing, and Cable Fittings.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings.

P. UL 651A - Schedule 40 and 80 High Density Polyethylene (HDPE) Conduit.

Q. UL 797 - Electrical Metallic Tubing-Steel.

R. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings.

S. UL 1242 - Electrical Intermediate Metal Conduit-Steel.

T. UL 1653 - Electrical Nonmetallic Tubing.

U. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit.

1.5 SUBMITTALS

A. Submit catalog cuts of conduit products, accessories, and fittings.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers:

1. Allied Tube & Conduit; a Tyco International Ltd. Co.

2. Republic Conduit.

3. Robroy Industries.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be UL listed and labeled as in conformance with NFPA 70, and marked for intended location and application.

C. Galvanized Rigid Conduit (GRC): Conform with ANSI C80.1 and UL 6.

D. Intermediate Metallic Conduit (IMC): Conform with ANSI C80.6 and UL 1242.

E. PVC Coated Rigid Steel Conduit:

1. Comform with NEMA RN 1.

2. Coating Thickness: 0.040 inch, minimum.

F. Electrical Metallic Tubing (EMT): Comform with ANSI C80.3 and UL 797.

G. Flexible Metallic Conduit (FMC): Conform with UL 1; zinc coated steel.

H. Liquidtight Flexible Metallic Conduit (LFMC): Flexible steel conduit with PVC jacket and complying with UL 360.

I. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous Locations: Conform with UL 886 and NFPA 70 .

2. Fittings for EMT:

a. Material: Steel.

b. Type: Compression.

3. Expansion Fittings: PVC or steel to match conduit type, conforming with UL 651, rated for environmental conditions where installed, and including flexible exteranal bonding jumper.

4. Coating for Fittings for PVC Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threated joints.

J. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricated and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING AND FITTINGS

A. Manufacturers:

1. Cantex Inc.

2. Raco; a Hubbell Company.

3. Thomas & Betts Corporation.

B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled in conformance with NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Refer to Evaluations for descriptions of nonmetallic conduit types???

D. Electrical Nonmetallic Tubing (ENT): Conform with NEMA TC 13 and UL 1653.

E. Liquidtight Flexible Nonmetallic Conduit (LFNC): Conform with UL 1660.

F. Rigid High Density Polyethylene (HDPE): Conform with UL 651A.

G. Continuous HDPE: Conform with UL 651B.

H. Coilable Hight Density Polyethylene (HDPE): Preassembled with conductors or cables, and conforming with ASTM D3485.

I. Reinforced Thermosetting Resin Conduit (RTRC): Conform with UL 1684A and NEMA TC 14 (SERIES).

J. Fittings for ENT and RNC: Conform with NEMA TC 3; match to conduit or tubing type and material.

K. Fittings for LFNC: Conform with UL 514B.

2.3 METAL WIREWAYS AND AUCILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.

2. Hoffman; a Pentair company.

3. Square D; a brand of Scheider Electric.

B. Description: Sheet metal, conforming with UL 870 and NEMA 250, Type 1 and Type 3R unless otherwise indicated on Drawings, and sized conforming to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled in conformance with NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

3. Wireway Covers: Screw cover type unless otherwise indicated on Drawings.

4. Finish: Manufacturer's standard enamel finihs.

2.4 RIGID GALVANIZED STEEL CONDUIT

A. Conduit shall be City of Los Angeles Department of Building and Safety approved or meet requirements of a recognized testing laboratory approved by City of Los Angeles Department of Building and Safety.

B. Couplings, fittings, and adapters shall be of the same materials and size as the conduit.

C. Plastic spacers for direct burial or concrete encasement shall be of size required to fit conduit and as manufactured by Carlon Products.

D. Zinc Coating:

1. Galvanized steel conduit, bends, and couplings shall be coated by the hot-dip process. Other processes, such as metal spray, high zinc coatings, and cold galvanizing, can not be substituted for hot-dipped galvanizing, either in whole or in part.

2. Galvanizing shall be applied to produce a smooth, uniform coating with no flaws or thin spots.

3. The weight of zinc coatings shall not be less than 1.0 ounce per square foot on the outside and 1.0 ounce per foot of zinc on the inside of the conduit, conduit bends, and couplings.

4. Outside and inside surfaces shall be tested separately by Department Testing Laboratory.

5. The determination of the weight of zinc coating shall be done in conformance with ASTM A90/A90M.

6. The conduit after galvanizing shall be uniformly pliable and free from brittleness. When a sample is bent to a semi-circle with an inner radius of six times normal internal diameter, the steel shall not crack, the welded joints shall not open, nor the zinc coating crack, flake, or be removable by rubbing with the bare fingers.

E. PVC Coated Conduit:

1. Where indicated on Drawings, use Plasti-Bond Red PVC coated rigid galvanized conduit as manufactured by Robroy Industries.

2. PVC coated conduit shall conform with NEMA RN 1 with a urethane interior coating.

3. Conduit threads shall be factory made and galvanized. No field threading permitted.

4. Fittings, couplings, elbows, and adapters shall be of the same materials and manufacturer as the conduit.

2.5 PVC CONDUITS

A. Conduit, fittings, and bends shall be Schedule 80 unless noted otherwise on Drawings.

B. Conduit color is not important, except that any system installed in the open, where it is visible, shall be of the same color materials.

C. Couplings, fittings, and adapters shall be of the same materials as the conduit.

D. Sealing and joining compounds shall be as recommended by the conduit manufacturer.

E. Conduit and fittings shall be made from clean, virgin, Type II, Grade I, polyvinyl chloride.

F. Dimensions and tolerances shall conform to City of Los Angeles Electrical Code requirements for rigid PVC.

G. Materials shall contain labels as may be required by City of Los Angeles Electrical Code.

H. Joints between PVC and PVC, or between PVC conduit and PVC-coated steel conduit shall be socket-type solvent weld or threaded fittings.

I. Plastic spacers for direct burial or concrete encasement shall be of size required to fit conduit and as manufactured by Carlon Products.

2.6 ELECTRIC METALLIC TUBING (EMT)

A. Electric metallic tubing shall be City of Los Angeles Department of Building and Safety approved and standard for electrical metallic tubing applying to conduit galvanized by the hot-dip process.

B. Couplings, fittings, and adapters shall be of the same material and size as the conduit.

C. Flexible conduits shall be an approved type and shall be spanned by a bonding assembly meeting City of Los Angeles Electrical Code requirements.

D. Zinc coating requirements: Refer to Zinc Coating Paragraph of Rigid Galvanized Steel Conduit Article of this Section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install conduit raceways in a neat and orderly manner. Raceways shall run true and be aligned plumb vertically and horizontally. Fasteners shall be factory designed and supports installed at spacing prescribed in City of Los Angeles Electrical Code.

2. Conduits shall be cut square and rigid galvanized steel joint shall be painted with a rust resisting paint. Fittings shall be factory-approved, and 1 1/4 inch ELLs and larger shall be factory ELLs.

3. Branch circuits and feeders are shown schematically on Drawings. Provide conduits with junction boxes, condulets, expansion fittings, ELLs, and supports as required by City of Los Angeles Electrical Code. Routing of conduit shall be field engineered unless otherwise noted on Drawings.

4. Conduit sizes indicated or specified on the wiring diagram and floor plans on Drawings are for copper conductors in steel conduit without a grounding conductor. Conduit sizes shall be increased by Contractor if ground wires are installed.

5. Where conduit home runs to panels are grouped and exposed, coordinate the exact routing of the hanger system with Engineer.

6. Minimum size of conduits shall be 3/4 inch.

7. Install conduit in compliance with City of Los Angeles Electrical Code and in the following manner:

    a. Concealed in Finished Areas: EMT with set screw fittings or compression fittings.

    b. Surface mounted parallel with building lines in warehouse or plant areas shall be EMT with set screw fittings or compression fittings. Diagonal runs shall not be allowed.

    c. Rigid Plastic Conduit for Telephone Work: Schedule 40.

8. Conduits shall be flashed and sealed at locations where the conduit pierces exterior walls or roofs.

9. Conduits in structural concrete slab shall not exceed 1/3 the thickness of the concrete: Maintain a clearance of 3 inches where installed parallel to the reinforcing bars.

10. The cutting of structural building members of the routing of conduit shall not be permitted unless approved by Engineer.

11. Install conduit stub-ups in tilt-up buildings with a coupling flush in the ground floor slab in order that stub-ups shall not interfere with pouring of tilt-up concrete panels.

12. Install conduit trapeze hangers with 3/8 inch rod minimum and supported by thru-bolts at roof structural members. Lag screws not allowed.

13. In office areas and other finished areas where concrete panels are not furred, install conduit and outlets concealed in wall.

14. Rigid plastic conduit shall be supported at 4 feet spacing.

15. Provide grounding conductor in non-metallic conduits. Conduits are sized on Drawings for metallic conduit and copper cables. Increase conduit capacity if required.

    a. Install circuits rated above 600 volts in rigid galvanized conduits above ground.

16. Install grounding conductor in conformance with City of Los Angeles Electrical Code.

17. Conduits shall be installed in fill below slab without reducing thickness of slab or vapor seal.

B. Rigid Galvanized Steel:

1. Exercise care in bending conduit to prevent damage to the conduit.

2. The radius of the curve of the inner edge of a field bend shall not be less than 6 times the internal diameter of the conduit. The internal diameter of the conduit at the bend shall not be reduced.

3. A run of conduit between box and box, between fitting and fitting, or between box and fitting shall not contain more than the equivalent of four 90 degree bends (360 degrees total), in compliance with City of Los Angeles Electrical Code requirements.

4. End of conduit shall be reamed to remove rough edges and where a conduit enters a box or other fittings. Use approved hot-dipped galvanized bushing and locknut to protect the wire from the abrasion unless the design of box and fitting accomplishes the equivalent purposes.

5. Install conduit as a complete, continuous system, mechanically and electrically connected to boxes and fittings. Connect boxes and fitting to provide electrical continuity.

6. Conduit shall be jointed with approved couplings and unions. Right angle bends, offsets and change-in-direction bends shall be made with hickey or power bends, standard elbows, conduit fittings, or pull boxes. Conduit runs shall be uniform and symmetrical. Joints in conduit installed in concrete or earth, or exposed to the weather shall be liquid and gas tight.

7. Install conduit runs which extend through areas of different temperature or atmospheric conditions, or which are partially indoors and partially outdoors, in a manner which shall prevent drainage of condensed or entrapped moisture into pull boxes, cabinets, or equipment. Drill overhead fittings at point of entry to box or cabinet.

8. Conduit runs for direct burial or concrete encasement shall have plastic spacers at not more than 5'-0" on centers. Install spacers on firm bearing surfaces before backfilling or concrete encasement.

9. Conduit runs which cross concrete structure joints shall have conduit expansion fittings, approved by Engineer, at structural joints.

10. Install PVC coated conduit with tools specifically designed to prevent damage to PVC coating.

11. Repair damage to PVC coatings to the satisfaction of Engineer or replace the component parts with undamaged components.

12. Cleaning: Conduit runs shall be cleaned and swabbed to remove foreign matter and moisture prior to pulling in wire or cable. Boxes in which conduits terminate shall be cleaned of foreign matter and threads. Boxes shall be left broom clean upon completion.

C. PVC Conduit:

1. PVC conduit shall be jointed by socket type solvent weld or threaded fittings.

2. Conduit shall be cut square and externally chamfered approximately 10 to 15 degrees. Remove burrs and fins.

3. Exercise care not to place stress on previously made joints. Allow joints to set before handling according to air temperature as follows:

Air Temperature	Minimum Set Time
60 degrees to 100 degrees Farenheit	30 minutes
below 60 degrees Farenheit	60 minutes

4. Apply solvent in such a manner that no material is deposited on the interior surface or extruded into the interior during jointing. Excess cement on the exterior of the joint shall be wiped clean immediately after assembly.

5. Threads for plastic conduit shall be as specified in ASME B1.20.1. Install a plug in the bore to prevent distortion prior to threading.

6. Threaded joints shall be made using teflon tape or other approved jointing material. Solvent shall not be used with threaded joints.

7. Protect conduit from tool damage during assembly. Vises shall have padded jaws and strap wrenches shall be used for installation of fittings and nipples.

8. Conduit which has been nicked, scarred, or otherwise damaged shall be removed and replaced at no additional cost to Department.

9. Conduit runs for direct burial or concrete encasement shall have plastic spacers spaced at nor more than 5'-0" on center. Spacers shall be installed on firm bearing (surfaces) before backfilling or placing concrete.

10. Bends and transitions from buried or encased runs to exposed runs shall be made with PVC coated steel conduit. The transition shall include as a minimum the last 5 feet of the buried or encased conduit and the first 3 feet of exposed conduit.

11. PVC conduit runs shall contain a grounding conductor.

D. Electrical Metallic Tubing (EMT):

1. Exercise care in bending conduit to prevent damage to the conduit.

2. The radius of the curve of the inner edge of a field bend shall not be less than 6 times the internal diameter of the conduit. The internal diameter of the conduit at the bend shall not be reduced.

3. A run of conduit between box and box, between fitting and fitting, or between box and fitting shall not contain more than the equivalent of four 90 degree bends (360 degrees total), in compliance with City of Los Angeles Electrical Code requirements.

4. Terminations of conduit shall be reamed where a conduit enters a box and other fittings and to remove rough edges.

5. Continuous runs shall be installed as a complete, continuous system, mechanically and electrically connected to boxes and fittings. Boxes and fittings shall be connected to provide electrical continuity.

6. Coupling and unions shall be joined with approved couplings and unions. Right angle bends, offsets and change-in-direction bends shall be made with hickey or power bends, standard elbows, conduit fittings, or pull boxes. Conduit runs shall be uniform and symmetrical. Joints in conduit installed in concrete or earth, or exposed to the weather shall be liquid and gas tight.

7. Conduit runs shall be cleaned and swabbed to remove foreign matter and moisture prior to pulling in wire to cable. Boxes in which conduits terminate shall be cleaned of foreign matter and threads. Leave boxes broom clean upon completion.

8. Conduit runs for concrete encasement shall have plastic spacers at not more than 5'-0" on centers. Install spacers on firm bearing surfaces before backfilling or concrete encasement.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Outlet boxes

B. Junction boxes

C. Pull boxes

1.2 RELATED SECTIONS

A. Section 05 05 14 - Treating Damaged Galvanizing

B. Section 26 00 01 - Basic Electrical Materials and Methods

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under the Electrical System bid item of Bid Proposal Line Items.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Boxes shall be pressed steel or cast iron unless otherwise noted on Drawings.

B. Hot-dip galvanized steel and cast iron outlet boxes.

C. Boxes shall be sized in conformance with City of Los Angeles Electrical Code and space requirements, but in no case less than 4 inch by 4 inch by 1 1/2 inches deep. Conduit penetration shall be located so that the cable can be installed without bending it to a radius less than the recommended as a minimum by the cable manufacturer.

D. Boxes installed outside or in wet locations shall have taper threaded conduit hubs and gasket covers. Boxes listed for use in wet locations shall be National Electrical Manufacturers Association (NEMA) 3R weather rated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install boxes to be accessible after completion of the structures; securely mounted and plumb with surrounding structural members. Boxes shall be secured in place independently of conduits entering them.

3.2 REPAIR OF DAMAGED GALVANIZING

A. Repair damaged galvanizing in conformance with TREATING DAMAGED GALVANIZING Section.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Panelboards:

1. Branch circuit

2. Distribution

B. Circuit breakers

1.2 RELATED SECTIONS

A. Section 09 90 01 - Painting for Exterior Improvements

B. Section 26 00 01 - Basic Electrical Materials and Methods

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for work of this Section shall be paid under the Electrical System bid item of the Bid Proposal Line Items.

1.4 SUBMITTALS

A. In addition to the requirements of BASIC ELECTRICAL MATERIALS AND METHODS Section, submit descriptive data for products and materials, breaker layouts drawing with dimensions, component list, short circuit rating, voltage, and continuous current.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Square D by Schneider Electric, (909) 612-5400

B. Eaton, https://www.eaton.com/us/en-us.html

2.2 DISTRIBUTION PANELBOARDS

A. Dead front, dead rear, equipped with automatic circuit breakers for each circuit and paneled for accessibility. Provide minimum 8 inch gutter space at top and bottom of panelboard. Provide circuit breaker with individual engraved laminated plastic nameplate stating trip value and load supplied, screwed to interior trim. Include breaker frame size and type on nameplate if not readily identifiable without removing trim. Breakers shall be of the size and arrangement as shown on Drawings. Panels shall be fully bused, drilled, and tapped; copper busing. Voltages and ratings shall be as shown on Drawings. Provide lock-offs for each breaker.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Interior: Shall consist of automatic circuit breakers (one for each branch circuit) properly secured and mounted in a dead front, dead rear code gage, galvanized steel cabinet with wiring gutter of sufficient width to provide ample space for branch circuit wires and feeders; in no case less than 4 inches wide. Provide barriered wireway for feedthrough panels. Provide minimum 8 inches gutter space at top and bottom of panelboard. Panels shall be fully bused; copper busing. Furnish each panel with 42-20 ampere 1-pole circuit breakers unless shown otherwise on Drawings or panel schedules.

B. Exterior: Shall consist of trim with hidden mounting screws for flush mounted panelboards, and door constructed of code gage sheet steel with factory finish. Door shall be fitted with hidden hinges and spring catch latch with cylinder lock. Provide directory cardholder on inside of door. Mounting screws shall allow adjustable alignment of trim and interior panel.

2.4 CIRCUIT BREAKERS

A. Circuit breakers shall be automatic trip-free, quick-make, quick-break, thermal-magnetic type; with handles clearly indicating tripped position. Multi-pole breakers shall have common trip and single handle. Breaker sizes, trip ratings, and arrangement in panelboards shall be in conformance with panel schedules. Breaker sizes shall be clearly stamped on handles or on laminated plastic nameplate attached to trim. Spaces for future breakers shall have bus drilled and tapped. Multi-pole breakers shall not be used for lighting or 120 volt receptacle circuits except where specifically required by the City of Los Angeles Electrical Code. Provide lock-off or lock-on devices, where required.

B. Breakers for Distribution Panels: Square D Type I-Line; minimum interrupting rating 18,000 ampere, symmetrical at 480 volt. Provide high-interrupting rated breakers where noted or required. Breakers shall be plug-on to busing.

C. Breakers for 480Y/277 Volt Lighting Panelboards: Square D Type NF; minimum interrupting rating 18,000 ampere symmetrical at 277 volt, bolted to busing. Provide lock-off device for each breaker.

D. Breakers for 208Y/120 volt or 120/240 volt Receptacle Panelboards: Square D Type NQ; minimum interrupting rating 10,000 ampere, symmetrical at 240 volt, bolted to busing. Panelboards shall have amps interrupting capacity (AIC) rating as specified on Drawings. Provide sub-feed breakers where indicated on schedules.

2.5 IDENTIFICATION

A. Nameplates: Provide identification nameplates on panelboards. Nameplates shall be engraved black lamicoid with minimum 1/4 inch high white letters. Nameplate shall state panel designation, voltage and bus ampere rating, and shall be riveted or screwed to panelboard housing. Provide engraved branch circuit breaker numbering strip, screwed or riveted, on panelboard internal trim.

B. Schedules: Provide load schedules for branch circuit panelboards identifying type, size, and location of load. Schedules shall be typewritten and protected by transparent plastic cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. In general, support panels on building structure. Provide auxiliary supports where required. Auxiliary supports shall be Unistrut.

B. Mount panels so that the tops of trims are at 6’-6” above finished floor, unless noted otherwise on Drawings.

C. Install panelboards as indicated on Drawings and in conformance with the manufacturer’s written instructions.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Trench excavation and backfill operations

1.2 RELATED SECTIONS

A. Section 02 00 01 - Basic Site Materials and Methods

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Costs for trench excavating, backfilling, and surfacing including but not limited to sewer, storm drain, water, electrical, communications, gas, and oil pipeline trenches, shall include pavement sawcutting; asphalt concrete and concrete removals; excavation; soil backfill; slurry where used as backfill; removal and disposal of excavation spoils off of Department property; compaction; repeated compaction tests after failures; and asphalt concrete and concrete trench resurfacing, and shall be payable as follows:

a. Trenches in areas of existing pavement: Trench excavation, backfill, and surfacing shall be paid under the Lump Sum Construction bid item of Bid Proposal Line Items.

1.4 REFERENCES

A. Reference Specifications (RS):

Section 306 - Open Trench Conduit Construction

B. Standard Plan – City of Los Angeles Department of Public Works:

S-251-1 - Pipe Laying in Trenches

1.5 QUALITY ASSURANCE

A. Engineer reserves the right to approve each material to be used in construction. Do not use material which, after approval, in any way becomes unfit for use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Slurry backfill shall be as specified in BASIC SITE MATERIALS AND METHODS Section.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Pavement removals shall conform to BASIC SITE MATERIALS AND METHODS Section.

1. Except as noted otherwise on Drawings, existing asphalt concrete thickness varies throughout Project Site. Assume for bid purposes 12 inches for existing pavement thickness.

B. Excavation shall conform to RS Subsection 306-3 unless otherwise specified or shown on Drawings.

C. Perform excavations for pipe laying or conduit in accordance with Standard Plan S-251-1 unless otherwise detailed on Drawings.

D. Excavate to the depths shown on Drawings or as necessary for the installation. After the excavation is completed, notify Engineer for approval of excavation subgrade.

E. Remove interfering portions of abandoned substructures and abandon remaining substructures in place in conformance with BASIC SITE MATERIALS AND METHODS Section.

F. Trench excavation spoils not used as backfill shall become property of Contractor and shall be disposed of off Department property regardless of type of backfill material specified.

3.2 REPAIR AND RESTORATION

A. Refer to BASIC SITE MATERIALS AND METHODS Section for surface improvements not designated to be permanently removed but which were removed or damaged as a result of Contractor's operations.

3.3 FIELD QUALITY CONTROL

A. Refer to BASIC SITE MATERIALS AND METHODS Section Field Quality Control Article, for Engineer's determination of maximum dry density and optimum moisture content, and for field-testing of compacted backfill.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Site Work Concrete:

1. Cast-in-place concrete
2. Patching or overlay of interior or exterior horizontal surfaces
3. Portland cement rapid setting

1.2 RELATED SECTIONS

A. Section 02 00 01 - Basic Site Materials and Methods

B. Section 26 00 01 - Basic Electrical Materials and Methods

C. Section 26 05 26 - Grounding and Bonding for Electrical Systems

1.3 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:

1. Payment for Work of this Section shall be paid under each corresponding bid item of Bid Proposal Line Items that requires concrete for exterior improvents.

1.4 REFERENCES

A. Reference Specifications (RS):

Section 200 - Rock Materials

Section 201 - Concrete, Mortar, and Related Materials

Section 302 - Roadway Surfacing

Section 303 - Concrete and Masonry Construction

1.5 SUBMITTALS

A. Submit 1 copy of manufacturer's literature, to include: Product Data Sheets, and appropriate Material Safety Data Sheets (MSDS).

1.6 QUALITY ASSURANCE

A. Manufacturing Qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in exitence a recognize ongoing quality assurance program independently audited on a regular basis.

B. Contractor Qualifications: Contractor shall be qualifed in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a mnufacturer's representative.

C. Install materials in conformance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state, and federal authorities having jurisdiction. Follow Material Safety Data Sheets for complete handling recommendations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material shall be removed from the site immediately.

B. Store material off the ground and protect from rain, freezing or excessive heat until ready for use.

C. Condition the spedified product as recommended by the manufacturer.

1.8 JOB CONDITIONS

A. Environmental Conditions: Do not apply material if it is raining or if conditions appear to be imminent. Minimum application temperature shall be 45 degrees Fahrenheit or 7 degrees Cenigrade and rising.

B. Protection: Pecautions shall be taken to avoid damage to any furface near the work zone due to mixing and handling of the specified material.

1.9 WARRANTY

A. Provide a written warranty from the manufacturer against defects of materials for a minimum of 1 year, beginning with date of Substantial Completion of the Project.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. SikaQuick 1000, as manufactured by Sika Corporation.

2.2 MATERIALS

A. General:

1. The material shall be a blend of selected portland cements, specially grade aggregates, adminstures for controlling settling time, water reducers for workability and an organic accelerator.

2. The materials shall be noncombustible, both before and after cure.

3. The materials shall be supplied in a factory-blended bag.

4. The rapidsetting cement mortar shall be placeable from 1/4 inch to 1 inch in depth per lift for horizontal applications.

B. To prepare a rapidsettling portland cement concrete: Aggregate shall conform to ASTM C33. The material shall be extended with 25 pounds of a 3/8 inch (No.8 distribution in conformance with ASTM C33, Table II) clean, wellgraded, saturated surface dry aggregate, having low absorption, high density and nonreactive (conforming with ASTM C1260, C227, C289). Aggregate shall be approved by Engineer.

1. Materials shall comply with City of Los Angeles Green Building Code requirements.

a. Enter pertinent product data in VOC Content Verification Checklist form and provide product specification sheets. Make checklist and specifications available to City of Los Angeles Department of Building and Safety inspector through Engineer upon request. VOC Content Verification Checklist form can be found here: https://www.ladbs.org/docs/default-source/forms/green-building-2023/grn_2_voc_content_verification_checklist-01.17.23.pdf?sfvrsn=19f4c153_10

2.3 PERFORMANCE CRITERIA

A. Typical Properties of the Material:

1. Working Time: Approximately 30 minutes.

2. Color: Concrete gray.

B. Typical Properties of the Cured Material (mortar):

1. Compressive Strength in conformance with ASTM C109:

a. 3 hours: 1,250 psi

b. 1 day: 4,000 psi minimum

c. 7 days: 5,000 psi minimum

d. 28 days: 7,000 psi minimum

2. Flexural Strength in conformance with ASTM C78 at 28 dyas: 1,000 psi.

3. Splitting Tensile Strength in conformance with ASTM C496 at 28 days: 500 psi.

4. Bond Strength in conformance with ASTM C882 at 28 days: 2,500 psi.

5. The portland cement mortar shall not produce a vapor barrier.

6. Density (wet mix): approximately 136 pounds per cubic feet.

7. Permeability in conformance with ASTM C1202 at 28 days: less than 1,000 Coulombs approximately.

8. Drying Shrinkage in conformance with ASTM C596 at 28 days: 0.06 percent.

9. Freeze/Thaw resistance in conformance with ASTM C66 at 28 days: 98 percent.

C. Test above were performed with the material and curing conditions at 71 degrees Fahrenheit to 75 degrees Fahrenheit and 45 to 55 percent relative humidity.

PART 3 – EXECUTION

3.1 PREPARATION

A. Where concrete is to be cast against existing concrete older than 60 days, clean and roughen existing concrete by sandblasting, exposing the aggregate, and apply bonding agent.

3.2 PROTECTION

A. Protect finished concrete surfaces from stains, abrasions, and other damage.

END OF SECTION

APPENDIX "A"

PROJECT LABOR AGREEMENT (PLA) AND POLA CONSTRUCTION CAREERS POLICY

Harbor Department
Agreement 17-3520
City of Los Angeles

CITY OF LOS ANGELES

Harbor Department

THE PORT
OF LOS ANGELES

2017-2027

Project Labor Agreement (PLA)

WITH

LOS ANGELES/ORANGE COUNTIES
BUILDING AND CONSTRUCTION TRADES COUNCIL
Affiliated with the Building & Construction Trades Department (AFL/CIO)
Craft International Unions and any other craft labor Unions signatory to this Agreement

PROJECT LABOR AGREEMENT
CITY OF LOS ANGELES HARBOR DEPARTMENT

TABLE OF CONTENTS

Introduction and Findings 2
I. Definitions 5
II. Scope of Agreement 10
III. Effect of Agreement 14
IV. Work Stoppages, Strikes, Sympathy Strikes and Lockouts 15
V. No Discrimination 22
VI. Union Security 22
VII. Referral 23
VIII. Wages and Benefits 32
IX. Employee Grievance Procedure 34
X. Department Policies And Procedures 34
XI. Compliance 35
XII. Joint Administrative Committee 36
XIII. Grievance Arbitration Procedure 37
XIV. Jurisdictional Disputes 40
XV. Management Rights 41
XVI. Safety, Protection of Person and Property 43
XVII. Savings Clause 44
XVIII. Steward 45
XIX. Term 46

Attachment "A" - Letter of Assent
Attachment "B" – Los Angeles/Orange Counties Building and Construction Trades Council Approved Drug and Alcohol Testing Policy
Attachment "C" - Craft Request Form
Attachment "D" - Trade Union Contact Numbers
Attachment "E" – Five-Year Capital Improvement Program ("CIP") Project List

Harbor Department
Agreement 17-3526
City of Los Angeles

PROJECT LABOR AGREEMENT
CITY OF LOS ANGELES

HARBOR DEPARTMENT

INTRODUCTION AND FINDINGS

The purpose of this Project Labor Agreement ("Agreement") is to promote efficiency of construction operations during the construction of various projects within the Harbor Department's Capital Improvement Program (CIP) and provide for the orderly settlement of labor disputes and grievances without strikes or lockouts, thereby promoting the public interest in assuring timely and economical completion of these Projects.

WHEREAS, the Port of Los Angeles is among the world's premier ports and is a critical hub for global trade; and

WHEREAS, the Port of Los Angeles is the nation's busiest container port, and the Port's 7,500 acres, 43 miles of waterfront, 270 berths and 26 cargo terminals represent a critical segment of the U.S. trade infrastructure and the global supply chain; and

WHEREAS, in addition to containerized cargo, the Port's diverse maritime operations handle bulk products, scrap metal, steel, and cruise passengers, with regularly scheduled vessel calls increasing the need for more terminal acreage and more efficient operations, as well as transforming the Port into a model environmental-friendly gateway through the implementation of the San Pedro Bay Ports Clean Air Action Plan; and

WHEREAS, the Harbor Department is responsible for construction, renovation, maintenance and operation of the facilities and infrastructure of the Port of Los Angeles, including capital improvement projects throughout the Port; and

WHEREAS, the safe, timely and successful completion of these projects with a trained workforce is of utmost importance to the Harbor Department and the general public in the City; and

WHEREAS, the work to be done will require maximum cooperation from the many Parties who will be involved; and

WHEREAS, it is recognized that projects of a certain magnitude with multiple contractors and bargaining units on the job site at the same time over an extended period of time create the potential for work disruption without there being an overriding commitment to maintain continuity of work; and

WHEREAS, the interests of the Harbor Department, the general public, the City, the Unions, contractors, subcontractors, employers and workers would be best served if the construction work proceeded in an orderly manner free of disruption because of strikes, sympathy strikes, work stoppages, picketing, lockout, slowdowns or other interferences with work; and

WHEREAS, large numbers of workers of various skills will be required in the performance of the construction work, including those to be represented by the Unions affiliated with the Los Angeles/Orange Counties Building and Construction Trades Council and any other craft labor organization which are signatory to this Agreement, employed by contractors and subcontractors who are signatory to agreements with said labor organizations; and

WHEREAS, the Contractor/Subcontractor/Employer(s) (C/S/E) and the Unions desire to mutually establish and stabilize wages, hours and working conditions for the workers employed on these Projects by the C/S/Es, and further, to encourage close cooperation among the C/S/Es, and the Unions to the end that a satisfactory, continuous and harmonious relationship will exist among the Parties to this Agreement; and

WHEREAS, this Agreement is not intended to replace, interfere with, abrogate, diminish, or modify existing local or national collective bargaining agreements in effect during the duration of this Agreement, insofar as a legally binding agreement exists between the C/S/Es and the affected Unions, except to the extent that the provisions of this Agreement are inconsistent with said collective bargaining agreements, in which event, the provisions of this Agreement shall prevail; and further, it is understood that C/S/Es are bound and shall remain bound, for the duration of this Agreement by the terms of this Agreement and applicable local and national collective bargaining agreements for the craft work performed, established between the signatory Unions and C/S/Es, in effect and covering the area of these Projects; and

WHEREAS, this Agreement is not intended to have an adverse impact on the policy of the City to maximize business opportunities for minority, women and other business enterprises in City contracts; and

WHEREAS, increasing access to employment opportunities with prevailing wages is one way for the Harbor Department to directly combat poverty and stimulate economic reinvestment; and

WHEREAS, the Harbor Department has adopted a departmental Agreement which will provide construction employment and training opportunities in ways calculated to mitigate the harms caused by poverty, unemployment and underemployment; and

WHEREAS, this Agreement reflects a commitment by all parties to the diversity in the workforce hiring that reflect levels of minority, women and other worker utilization at levels which are representative of the relevant workforce of these groups in the Greater Los Angeles Area as determined by the U.S. Census Bureau; and

WHEREAS, the contracts for the construction of Projects will be awarded in accordance with the applicable provisions of the Harbor Department's Administrative Policies and Procedures; and

WHEREAS, the Parties signatory to this Agreement pledge to work towards a mutually satisfactory completion of Projects;

NOW, THEREFORE, IT IS AGREED BETWEEN AND AMONG THE PARTIES HERETO, AS FOLLOWS:

ARTICLE I

DEFINITIONS

1.1 "Agreement" means this Project Labor Agreement and its applicability to all Projects.

1.2 "Apprentice" means any worker who is indentured in a bona fide Labor/Management construction apprenticeship program, registered and approved by the State of California Department of Industrial Relations (DIR) Division of Apprenticeship Standards (DAS) or in the case of Projects with federal funding,

indentured in a bona fide Labor/Management construction apprenticeship program, approved by the US Department of Labor (DOL) and California DAS.

1.3 "Apprenticeship Program" means any Labor/Management construction apprenticeship program certified and approved by the California Division of Apprenticeship Standards (DAS) or in the case of Projects with federal funding, approved by the US DOL and California DAS.

1.4 "Awarding Authority" means the City of Los Angeles, acting by and through the Board of Harbor Commissioners, or any employee or officer of the Board that is authorized to award or enter into any contract on behalf of the Board.

1.5 "Board" means the Los Angeles Board of Harbor Commissioners.

1.6 "Bureau of Contract Administration" (BCA) means the designated bureau within the City's Department of Public Works which may provide support services to the Harbor Department in administering this Agreement.

1.7 "City" means the City of Los Angeles, a municipal corporation, and all City awarding authorities.

1.8 "Committee" means the Joint Administrative Committee as described in Article XII of this Agreement.

1.9 "Construction contract" means a City contract which has been awarded by the Board, and is necessary to complete the Harbor Department Project.

1.10 "Contractor/Subcontractor/Employer(s)" (C/S/E) means any individual firm, partnership, owner operator, or corporation, or combination thereof, including joint ventures, which is an independent business enterprise and has entered into a contract with the Harbor Department or any of its contractors or subcontractors/owner operators

of any tier, with respect to the construction of any part of the Project(s) under contract terms and conditions approved by the Board and which incorporate this Agreement.

1.11 "Core Worker" means a verifiable member of a C/S/E's core workforce for the purpose of this Agreement if the worker's name appears on the C/S/E's active payroll for 60 of 100 working days immediately prior to the award of the construction contract and meets all standards required by applicable local, state or federal law or regulation.

1.12 "Covered Project(s)" or "Project" means a project or projects which have been included within the Ten-Year Capital Improvement Program ("CIP") Project List and covered by this Agreement or so designated by the Board. The Board may identify additional projects that are appropriate for coverage by the Agreement for inclusion under the CIP and include such projects by Board Resolution. The Board shall request an annual review of the Harbor Department Capital Improvement Program to identify any new projects appropriate for inclusion with in the CIP.

1.13 "Department" means the Harbor Department of the City of Los Angeles.

1.14 "Employment Hiring Plan" (EHP) means a C/S/E's detailed hiring plan as described in BCA's Targeted Hiring Guidelines for Contractors and the Policy or other applicable Department policy.

1.15 "Engineer" means the Chief Harbor Engineer of the City of Los Angeles Harbor Department, Construction Division, or its authorized representative.

1.16 "FHWA Project" means a Harbor Department Project that is funded in whole or in part by the Federal Highway Administration (FHWA).

1.17 "Ten year (10) Capital Improvement Program ("CIP") Project List" means the list of Harbor Department projects included as Attachment E hereto that will operate under

the Harbor Department PLA, as well as other projects that may be added in the sole discretion of the Department.

1.18 "Jobs Coordinator" means the Prime Contractor's designated person, agent or agency that will facilitate the local hire referral process with the C/S/E, Unions and other referral organization, as described in the Construction Careers Policy. The Jobs Coordinator must be able to demonstrate or document to the Department or its designee that it has the requisite qualification and/or experience to fulfill the duties and responsibilities as outlined in the Policy.

1.19 "LA/OCBTC" (Trades Council) means the Los Angeles/Orange Counties Building and Construction Trades Council.

1.20 "Letter of Assent" means the document that each C/S/E (of any tier) must sign and submit to the Engineer or designated administrator, which formally binds them to adherence to all the forms, requirements and conditions of this Agreement and Policy.

1.21 "Local Resident" means an individual whose primary residence is within the Tier 1 or 2 zip code areas.

1.22 "Long-Term Unemployment" as defined by the Bureau of Labor Statistics means being jobless for 21 weeks or more, or as defined.

1.23 "Plan" means the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry as referenced in Article XIV of this Agreement.

1.24 "Policy" means the Harbor Department Construction Careers Policy.

1.25 "Subscription Agreement" means the contract between a C/S/E and a Union's Labor/Management Trust Fund(s) that allows the C/S/E to make the appropriate fringe benefit contributions in accordance with the terms of the contract.

1.26 "Targeted Hiring Guidelines for Contractors" means the document provided by the Department to assist C/S/E's in implementing the targeted hiring procedures.

1.27 "Tier 1" means the zip codes identified in Article 7.4 of the PLA, which fall within an approximate ten mile radius of the Port and in which the rate of unemployment is in excess of 105% of the County of Los Angeles' unemployment rate at the time of application and/or are within the area of Port-related operations and activity and/or are within the area of Port-related operations and activity.

1.28 "Tier 2" means the zip codes within the City, identified in Article 7.5 of this Agreement, that includes at least 2 census tracts (or a portion thereof) in which the median annual household income is less than $62,627 per and/or where the rate of unemployment is in excess of 100% of the County of Los Angeles' unemployment rate at the time of application.

1.29 "Transitional Worker" means any individual whose primary place of residence is within a Tier 1 or Tier 2 zip code of the City of Los Angeles, and who prior to commencing work on a Project has been certified as satisfying at least one of the following criteria:

(1) having Veteran status; having a documented history of involvement with the criminal justice system; being homeless; or,

(2) is an individual facing two or more of the following barriers to employment: having a household income less than 50% of the Los Angeles County median annual household income, receiving public assistance, lacking a GED or high school diploma, being a custodial single parent, suffering from long term unemployment, being emancipated from the foster care system, or being an apprentice, in a program

described in Section 1.3 above, with less than 15% of the apprenticeship hours required to graduate to journey level.

(3) If the Jobs Coordinator or Employer is not able to identify anyone using criteria (1), criteria (2) may be used.

1.30 "Union(s)" or "Signatory Unions" means the Los Angeles/Orange Counties Building and Construction Trades Council affiliated with the Building & Construction Trades Department (AFL/CIO) Craft International Unions or any other craft labor organization signatory to this Agreement, acting in their own behalf and on behalf of their respective affiliates and member organizations whose names are subscribed hereto and who have through their officers executed this Agreement.

ARTICLE II

SCOPE OF AGREEMENT

2.1 Parties: The Agreement shall apply and is limited to all C/S/Es performing construction on a Harbor Department Project, the Board, and the Unions (signatory Unions or otherwise).

2.2 Project Description: The Agreement shall apply to all CIP construction contracts awarded by the Board. The Board has the absolute right to combine, consolidate or cancel contracts or portions of contracts identified as part of the Project. Should the Board remove any contract from the Project and thereafter authorize that construction work be commenced on the contract, the contract may, at the discretion of the Board, be performed under the terms of the Agreement.

2.3 Project Labor Disputes: The provisions of this Agreement, including the Schedule A Agreements, (which are the local collective bargaining agreements of the signatory

Unions having jurisdiction over the work on the Project, as such may be changed from time-to-time and which are incorporated herein by reference) shall apply to the work covered by this Agreement. It is understood that this is a self-contained, stand alone Agreement and that by virtue of having become bound to this Agreement, neither the Prime Contractor, Employer, nor the Subcontractor (of any tier) or owner-operator will be obligated to sign any other local, area, or national agreement, except as may be provided under Section 8.2, below. It is further agreed that, where there is conflict, the terms and conditions of this Agreement shall supersede and override terms and conditions of any and all other national, area, or local collective bargaining agreements (Schedule A Agreements) except for all work performed under the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, all instrument calibration work and loop checking shall be performed under the terms of the UA/IBEW Joint National Agreement for Instrument and control systems Technicians, and the National Agreement of the International Union of Elevator Constructors, with the exception of Article IV (Work Stoppages, Strikes, Sympathy Strikes and Lockouts), Article XIII (Grievance and Arbitration Procedure) and Article XIV (Jurisdictional Disputes) of this Agreement, which shall apply to such work. All disputes relating to the interpretation or application of this Agreement shall be subject to resolution by the grievance arbitration procedure set forth in Article XIII of this Agreement except for those disputes exempted from the grievance procedure pursuant to Article 13.1. Where a subject is covered by a provision in a Schedule A Agreement and not covered by this Agreement, the provision of the Schedule A Agreement shall prevail. Any dispute as to the applicable source between this Agreement and any

Schedule A Agreement for determining the wages, hours of working conditions of employees on a Project shall be resolved under the grievance procedures established in this Agreement.

2.4 Exclusions:

(1) This Agreement shall be limited to construction work on a Project which is approved by the Board, and is not intended to, and shall not apply to any construction work performed at any time prior to the effective date, or after the expiration or termination of the Agreement, or on other City projects.

(2) This Agreement is not intended to, and shall not, affect or govern the award of contracts by the Board, which are outside the approved scope of the Project.

(3) This Agreement is not intended to, and shall not, affect the operation or maintenance of any facilities whether related or not to Projects.

(4) This Agreement shall not apply to a C/S/E's executives, managerial employees, engineering employees, supervisors (except those covered by Schedule A collective bargaining agreements), office and clerical employees, or any other employee not performing construction craftwork.

(5) Notwithstanding the foregoing, it is understood and agreed that Building/Construction Inspector and Field Soils and Material Testers (inspectors) are a covered craft under this Agreement. This inclusion applies to the scope of work defined in the State of California Wage Determination for that Craft. This shall not cover quality assurance work or material testing performed by or on behalf of the Department. Every Inspector performing under the wage classification of Building/Construction Inspector and Field Soils and Material Tester under a professional services agreement or a

construction contract shall be bound to all applicable requirements of this Agreement. Notwithstanding the provisions of this sub-section, the Department may engage consultants for limited periods of time in the event of an urgent need for specialized inspection services. The Department must provide prior notice to the Trades Council that despite good faith efforts, it is unable to obtain qualified inspector(s) under the provisions of this Agreement. Such engagement shall be only to meet immediate and limited needs until such qualified inspectors working under this Agreement are available.

(6) This Agreement shall not apply to material suppliers or delivery by any means of material, supplies, or equipment required to any point of delivery.

(7) This Agreement shall not apply to City employees.

(8) This Agreement shall not apply to the work of persons, firms and other entities that perform consulting, planning, scheduling, management or other supervisory services on the Project, provided such entities do not perform craft employee construction work on the Project with their own employees or to customer service work performed post completion by an entity other than the C/S/E that performed the original construction work.

(9) This Agreement shall not apply to Harbor Department construction contracts or Projects, if the federal funding source has established provisions or rules that forbid the inclusion of a Project Labor Agreement.

(10) FHWA Projects: All provisions of this Agreement shall apply to the project, in accord with the policies and conditions under which the FHWA funds are received from the U.S. Department of Transportation.

(11) Out-of-State Workers: Hours worked by residents of states other than California shall not be included in calculation of total hours of Project work for purposes of the percentage requirements set forth by the Agreement.

(12) Notwithstanding the foregoing, demolition and asbestos abatement shall constitute work covered by the Project Labor Agreement when such work is part of a Covered Project.

2.5 The Harbor Department and/or the C/S/Es, as appropriate, have the absolute right to award contracts on this project to any C/S/E, notwithstanding the existence or non-existence of any agreements between such C/S/E and any Union parties, provided only that such C/S/E is ready, willing and able to execute and comply with this Agreement should such C/S/E be awarded work covered by this Agreement.

ARTICLE III

EFFECT OF AGREEMENT

3.1 By executing the Agreement, the Unions and the Board agree to be bound by each and all of the provisions of the Agreement.

3.2 By accepting the award of a construction contract for a Project, whether as a C/S/E, the C/S/E agrees to be bound by each and every provision of the Agreement.

3.3 At the time that any C/S/E enters into a subcontract with any subcontractor of any tier providing for the performance on the construction contract, the C/S/E shall provide a copy of this Agreement to said subcontractor and shall require the subcontractor as a part of accepting the award of a construction subcontract to agree in writing in the form of a Letter of Assent to be bound by each and every provision of this Agreement prior to the commencement of work. See Attachment "A" for a sample

Letter of Assent.

(1) Approval of any C/S/E to perform work on the Project will be contingent upon the submittal of its Letter of Assent and its Employment Hiring Plan to the Chief Harbor Engineer and the Council.

3.4 This Agreement shall only be binding on the signatory C/S/Es hereto and shall not apply to the parents, affiliates, subsidiaries, or other ventures of any construction contract prior to the execution of this Agreement.

ARTICLE IV

WORK STOPPAGES, STRIKES, SYMPATHY STRIKES AND LOCKOUTS

4.1 The Unions, Board and C/S/Es agree:

(1) During the existence of this Agreement, there shall be no strike, sympathy strike, picketing, hand billing, slowdown, withholding of work, refusal to work, lockout, sick-out, walk-off, sit-down, stand-in, wobble, boycott, or other work stoppage, disruption, advising the public that a labor dispute exists, or other impairment of any kind for any reason by the Unions or employees employed on the Project, at the job site of the Project, or at any other facility of the City because of a dispute on this Project.

(2) As to employees employed on the Project, there shall be no lockout of any kind by any C/S/E(s) covered by the Agreement. The C/S/E(s) may lay off employees for lack of work or delay of work on the Project.

(3) The Unions agree that they shall not sanction in any way any picket line or other impairment of the work on the Project and will affirmatively take all measures necessary to effectively induce their respective members to cross any and all picket lines and report for work as scheduled and that responsible representatives of the

Unions who are employed on the Project will also do so themselves.

(4) The Unions agree that they shall not sanction, aid or abet, encourage or continue any work stoppage, strike, picketing or other disruptive activity at the Project site or C/S/E's business site that will economically and/or materially affect the completion of the Project. Any such costs that economically and/or materially harm the City shall be borne by the affected Union and made payable to the City.

(5) Notwithstanding any provision of this Agreement to the contrary, it shall not be a violation of this Agreement for any Union to withhold the services of its members (but not the right to picket) from a particular C/S/E who:

(i) fails to timely pay its weekly payroll; or

(ii) fails to make timely payments to the Union's Labor/Management Trust Funds in accordance with the provisions of the applicable Schedule A Agreements. Prior to withholding its members services for the C/S/E's failure to make timely payments to the Union's Labor/Management Trust Funds, the Union shall give at least ten (10) days (unless a lesser period of time is provided in the Union's Schedule A Agreement, but in no event less than forty-eight (48) hours) written notice of such failure to pay by registered or certified mail, return receipt requested, and by facsimile transmission to the involved contractor, the prime contractor, and the BCA. Union will meet within the ten (10) day period to attempt to resolve the dispute.

(iii) Upon the payment of the delinquent C/S/E of all monies due and then owing for wages and/or fringe benefit contributions, the Union shall direct its members to return to work and the C/S/E shall return all such members back to work.

4.2 Expiration of Local Agreements: If the Schedule A Agreement, or any local,

regional, and other applicable collective bargaining agreements expire during the term of the Project, the Union(s) agree that there shall be no work disruption of any kind as described in Section 4.1 above as a result of the expiration of any such agreement(s) having application on this Project and/or failure of the involved Parties to that agreement to reach a new contract. Terms and conditions of employment established and set for purposes of prevailing wage requirements under this Agreement at the time of bid shall remain established and set. Otherwise to the extent that such agreement does expire and the Parties to that agreement have failed to reach concurrence on a new contract, work will continue on the Project on one of the following two (2) options, both of which will be offered by the Unions involved to the Contractors affected:

(1) Each of the Unions with a contract expiring must offer to continue working on the Project under interim agreements that retain all the terms of the expiring contract, except that the Unions involved in such expiring contract may each propose wage rates and employer contribution rates to employee benefit funds under the prior contract different from what those wage rates and employer contributions rates were under the expiring contracts. The terms of the Union's interim agreement offered to Contractors will be no less favorable than the terms offered by the Union to any other employer or group of employers covering the same type of construction work in Los Angeles County.

(2) Each of the Unions with a contract expiring must offer to continue working on the Project under all the terms of the expiring contract, including the wage rates and employer contribution rates to the employee benefit funds, if the C/S/E affected by that expiring contract agrees to the following retroactive provisions: if a new Schedule A Agreement, local, regional or other applicable labor agreement for the industry having

application at the Project is ratified and signed during the term of this Agreement and if such new labor agreement provides for retroactive wage increases, then each affected C/S/E shall pay to its employees who performed work covered by this Agreement at the Project during the hiatus between the effective dates of such expired and new labor agreements, an amount equal to any such retroactive wage increase established by such new labor agreement, retroactive to whatever date is provided by the new labor agreement for such increase to go into effect, for each employee's hours worked on the Project during the retroactive period. All Parties agree that such affected C/S/Es shall be solely responsible for any retroactive payment to its employees and that neither the Project, nor the Board, nor the Board's designee, nor any other C/S/E has any obligation, responsibility or liability whatsoever for any such retroactive payments or collection of any such retroactive payments, from any such C/S/E.

(3) Some C/S/Es may elect to continue to work on the Project under the terms of the interim agreement option offered under paragraph (1) above and other C/S/Es may elect to continue to work on the Project under the retroactivity option offered under paragraph (2) above. To decide between the two options, C/S/Es will be given one week after the particular labor agreement has expired or one week after the Union has personally delivered to the Contractors in writing its specific offer of terms of the interim agreement pursuant to paragraph (1) above, whichever is the later date. If the C/S/E fails to timely select one of the above options, the C/S/E will be deemed to have selected paragraphs 4.2(2), above.

4.3 Expedited Arbitration will be utilized for all work stoppages and lockouts. In lieu of

or in addition to any other action at law or equity, any party may institute the following procedure when a breach or violation of this Article IV is alleged to have occurred:

(1) The party invoking this procedure shall notify the permanent arbitrator next in sequence from the following list:

1. Joseph Gentile
2. Michael Rappaport
3. Walter Daugherty
4. Paul Greenberg
5. Lou Zigman

The Parties agree these shall be the five permanent Arbitrators under this procedure. In the event that none of the five permanent Arbitrators are available for a hearing within 24 hours, the party invoking the procedure shall have the option of delaying until one of the five permanent Arbitrators is available or of asking the permanent Arbitrator that would normally hear the matter to designate an arbitrator to sit as a substitute Arbitrator for this dispute. If any of the permanent Arbitrators ask to be relieved from their status as a permanent Arbitrator, the Parties shall mutually select a new permanent Arbitrator from the following list of arbitrators:

1. John Kagel
2. Fred Horowitz
3. Wayne Estes

Selection shall be made by each party alternately striking from the foregoing list until one name remains who shall be the replacement permanent Arbitrator. Expenses incurred in arbitration shall be borne equally by the Union and the Contractor involved

and the decision of the Arbitrator shall be final and binding on both Parties, provided, however, that the Arbitrator shall not have the authority to alter or amend or add to or delete from the provisions of this Agreement in any way. Notice to the Arbitrator shall be by the most expeditious means available, including by telephone and by facsimile or e-mail to the party alleged to be in violation and to the Trades Council and involved local Union if a Union is alleged to be in violation.

(2) Upon receipt of said notice, the Arbitrator shall convene a hearing within twenty-four (24) hours if it is contended that the violation still exists.

(3) The Arbitrator shall notify the Parties by telephone and by facsimile or telegram of the place and time for the hearing. Notice shall be given to the individual Unions alleged to be involved; however, notice to the Trades Council shall be sufficient to constitute notice to the Unions for purposes of the arbitration being heard by the Arbitrator. Said hearing shall be completed in one session, which, with appropriate recesses at the Arbitrator's discretion, shall not exceed twenty-four (24) hours unless otherwise agreed upon by all Parties. A failure of any party to attend said hearings shall not delay the hearing of evidence or the issuance of any decision by the Arbitrator.

(4) The sole issue at the hearing shall be whether or not a violation of Section 4.1 or 4.2 of this Article IV has in fact occurred. The Arbitrator shall have no authority to consider any matter of justification, explanation or mitigation of such violation or to award damages, which issue is reserved for court proceedings, if any. The decision shall be issued in writing within three (3) hours after the close of the hearing, and may be issued without a written opinion. If any party desires a written opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with or

enforcement of the decision. The Arbitrator may order cessation of the violation of this Article and other appropriate relief and such decision shall be served on all Parties by hand or registered mail upon issuance.

(5) Such decision may be enforced by any Court of competent jurisdiction upon the filing of this Agreement and all other relevant documents referred to above in the following manner. Written notice of the filing of such enforcement proceedings shall be given to the other party. In the proceeding to obtain a temporary order enforcing the Arbitrator's decision as issued under Section 4.3 (4) of this Article, all Parties waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any party's right to participate in a hearing for a final order of enforcement. The Court's order or orders enforcing the Arbitrator's decision shall be served on all Parties by hand or delivered by registered mail.

(6) Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance therewith are hereby waived by the Parties to whom they accrue.

(7) The fees and expenses incurred in arbitration shall be divided equally by the Parties to the arbitration, including Union(s) and the C/S/E(s) involved.

4.4 The procedures contained in Section 4.3 shall be applicable to alleged violations of Article IV to the extent any conduct described in Section 4.1 or 4.2 occurs on the Project. Disputes alleging violation of any other provision of this Agreement, including any underlying disputes alleged to be in justification, explanation, or mitigation of any violation of Section 4.1 or Article IV shall be resolved under the applicable grievance adjudication procedures for these other Articles.

ARTICLE V

NO DISCRIMINATION

5.1 The C/S/Es and Unions agree not to engage in any form of discrimination, including in the hiring and dispatching of workers, on the grounds of, or because of, race, religion, national origin, ancestry, sex, sexual orientation, age, physical handicap, domestic partner status, medical condition, political affiliation, membership in a labor organization, being a party to a collective bargaining agreement, color, or disability.

ARTICLE VI

UNION SECURITY

6.1 The C/S/Es recognize the Unions as comprising the respective sole bargaining representatives for all craft employees working within the scope of this Agreement.

6.2 No employee covered by this Agreement shall be required to join any Union as a condition of being employed, or remaining employed, for the completion of Project work; provided, however, that any employee who is a member of the referring Union at the time of referral shall maintain that membership in good standing while employed under this Agreement. All employees shall, however, be required to comply with the Union security provisions for the period during which they are performing on-site Project work to the extent, as permitted by law, of rendering payment of the applicable monthly and working dues.

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ARTICLE VII

REFERRAL

7.1 The Union(s) shall be the primary source of all craft labor employed on the Project(s) and will exert their best efforts to recruit and identify individuals, particularly residents residing in the Tier 1 or 2 zip code areas, as well as those referred by the Jobs Coordinator, for entrance into joining labor/management apprenticeship programs, and to assist individuals in qualifying and becoming eligible for such programs.

In the event that the C/S/E has his or her own Core Worker(s), and wishes to employ such workers to perform covered work, the C/S/E shall employ such workers in accord with the provisions of this Article VII. The following process shall govern the employment of workers at the Project:

(1) A worker shall be considered a member of a C/S/E's core workforce for the purposes of this Article if the worker meets the required definition of 1.11 above. The C/S/E shall identify Core Workers in their Employment Hiring Plan and shall provide payroll records evidencing the worker's qualification as a Core Worker upon request by the City. Prior to each C/S/E, which utilizes any core employees, performing any work on the Project, each such C/S/E shall provide a list of its core employees to the Department and the Trades Council. Failure to do so will prohibit the C/S/E from using any core employees. The number of Core Workers on this Project shall be governed by the following procedure: one Core Worker shall be selected and one worker from the hiring hall of the affected trade or craft and this process shall repeat until such C/S/E's requirements are met or until such C/S/E has hired five (5) such Core Workers for that craft, whichever occurs first. Thereafter, all additional employees in the affected trade

or craft shall first be requisitioned from the hiring hall in accordance with other provisions in Article VII.

(2) In the event of a reduction-in-force or layoff, such will take place in a manner to assure that the number of Core Workers in the affected craft does not exceed, at any time, the number of others working in that craft who were employed pursuant to other procedures available to the C/S/E under this Agreement. This provision applies only to employees who were not working under the terms of a Schedule A Agreement at the time of their transfer to the work covered under this Agreement and is not intended to limit transfer provisions of the Schedule A Agreements of any Union.

7.2 C/S/Es shall be bound by and utilize the registration facilities and referral systems established or authorized by the signatory Unions for all job site craft employee(s) before such employee(s) begin work, when such procedures are not in violation of Federal or State law or in conflict with provisions set forth in this Agreement.

7.3 In the event that referral facilities maintained by the Unions are unable to fill the requisition of a C/S/E for Local Residents and/or Transitional Workers within a forty-eight (48) hour period after such requisition is made by the C/S/E (Saturdays, Sundays, and holidays excepted), the C/S/E shall be free to obtain Local Residents and/or Transitional Workers from any source. However, for all other requisitions by a C/S/E for non-Local Residents or non-Transitional Workers, only after a forty-eight (48) hour period (Saturdays, Sundays and holidays excepted) after such requisition is made by the C/S/E shall the C/S/E be free to obtain work persons from any source if the Unions are unable to fill the requisition. However, the C/S/E is still responsible for complying

with conditions and requirements of the Targeted Hiring Guidelines for Contractors and the Policy.

(1) The C/S/E's must document, from the applicable Tiers, all efforts made to comply with the targeted hiring process to locate and hire Local Residents and/or Transitional Workers. The C/S/E may employ Local Residents and/or Transitional Workers referred by the Jobs Coordinator. However, in the event the Jobs Coordinator is unable to fill the requisition of a C/S/E for Local Residents and/or Transitional Workers, the C/S/E may utilize any organization, such as those listed in the Targeted Hiring Guidelines for Contractors, to assist them in satisfying the requirements of the Targeted Hiring Guidelines for Contractors and the Policy.

(2) The C/S/E shall inform the Unions, Job Coordinator and the BCA of the name, address, worker craft classification and social security number of any worker hired from other sources upon their employment on the Project(s).

(3) No Local Resident and/or Transitional Worker, having been pre-screened and/or pre-qualified by the Jobs Coordinator, and employed by the C/S/E to work on the Project, shall be required to participate in any Joint Labor/Management "boot camp" or pre-apprentice program that will unnecessarily delay the Local Resident and/or Transitional Worker's start of work or cause said worker's termination due to having to participate in such "boot camps" or pre-apprentice programs.

(4) Any work person hired under this Section 7.3, as well as all other workers hired under this Article VII, shall be obligated to register with the appropriate Union hiring hall within five (5) working days prior to their first day of employment on the project and comply with the Union Security provisions of this Agreement.

7.4 The Unions will exert their best efforts to refer/recruit sufficient numbers of skilled craft Local Residents and Transitional Workers to fulfill the requirements of the C/S/E(s). In recognition of the fact that the communities within the boundaries of the City and the Port's impact zone will be impacted by the construction of the Project, the Parties agree to support the development and graduation of transitional construction apprentices and workers from residents within Tiers 1 or 2 zip code areas. Towards that end, the Unions agree to encourage and provide referrals and utilization of qualified workers residing preferably within the Tier 1 zip code areas identified in the following:

Tier 1 Zip Codes

90001	90222	90501	90732	90804
90002	90242	90502	90744	90805
90003	90247	90503	90745	90806
90044	90249	90505	90746	90807
90059	90255	90710	90748	90808
90061	90262	90717	90755	90810
90220	90280	90723	90802	90813
90221	90303	90731	90803	90815

7.5 When the Unions cannot provide the C/S/Es, having documented their efforts in the attainment of Local Residents and/or Transitional Workers within the Tier 1 zip code areas as listed in Article 7.4 above, the Unions will exert their best efforts to recruit and identify Local Residents and/or Transitional Workers within Tier 2 zip code areas identified in the following and Transitional Workers in the remaining zip code areas of the City:

Tier 2 Zip Codes

90004	90023	90045	91042	91364
90005	90024	90046	91302	91367
90006	90026	90007	91303	91401
90007	90027	90048	91304	91402

90008	90028	90049	91306	91403
90010	90029	90057	91324	91405
	90031	90058	91325	91406
90012	90033	90062		91411
90013	90034	90063	91331	91423
90014	90035	90065	91335	91505
90015	90036	90066	91340	91601
90016	90037	90068	91342	91602
90017	90038	90071	91343	91604
		90073	91344	91605
90019		90089	91345	91606
90020	90042		91352	91607
90021	90043	91040	91356	

The Unions will exert their best efforts to recruit and identify Local Residents and/or Transitional Workers of the City and assist individuals in qualifying and becoming eligible for such apprenticeship programs.

7.6 The Prime Contractor is responsible for ensuring compliance with the targeted hiring process for the Project(s) to achieve the following anticipated levels of participation:

(1) The following percentages shall be the targeted hiring for the Project:

(a) At least 30% of total work hours shall be performed by Local Residents residing within Tier 1 described in Article 7.4. If the 30% local hire is not attained utilizing the Tier 1, the outreach shall expand to the Tier 2 as described in Article 7.5 of this Agreement.

(b) At least 10% of total work hours shall be performed by Transitional Workers residing within Tier 1 or Tier 2 zip code areas described in Articles 7.4 and 7.5 respectively and the remaining zip code areas within the City of Los Angeles. These hours shall be applied towards the 30% Local Resident targeted hiring.

(c) At least 20% of total work hours on each project will be performed by apprentices, but the hours performed by apprentices in each individual craft shall not exceed the ratio to journeymen established by the applicable craft union's DAS approved apprenticeship standards. The Parties agree that residents in the Tier 1 or 2 zip code areas will perform 50% of all apprenticeship hours worked on the Project.

An apprentice who begins his/her period of apprenticeship as a resident in the Tier 1 or 2 zip code areas will retain that status for the entire apprenticeship, regardless of any changes in the apprentice's residence provided the Unions submit to BCA the necessary identifying information to enable the tracking of such apprentices, if requested by BCA.

(d) The C/S/Es shall document their compliance efforts through the utilization of the Craft Request Form, hiring hall procedures, the resources of organizations listed in BCA's Targeted Hiring Guidelines for Contractors, Jobs Coordinator or any other organization/agency that can assist the C/S/E in meeting this requirement. The provisions to address the non-attainment of the targeted hiring participation and/or apprenticeship hiring participation levels on a Project are addressed in the Policy.

(2) The employer retains authority in making individual hiring decisions.

(3) Hours worked by residents of states other than California shall not be included in calculation of total hours of Project work for purposes of the percentage requirements set forth above.

(4) The above referenced targeted hiring shall apply to FHWA projects in accord with the policies and conditions under which the FHWA funds are received from the U.S. Department of Transportation.

7.7 The Transitional Workers, as also defined also in Section 1.29, above, may be referred to the Unions from the Jobs Coordinator qualified to perform construction jobs coordination and related services. The Jobs Coordinator shall pre-screen and/or pre-qualify any applicant prior to referral to the Unions. Drug screening will be a prerequisite to employment. The following criteria will be used to identify the Transitional Worker:

a. Being a Veteran;

b. Having a documented history of involvement with the justice system;

c. Being homeless; or

(2) Faces at least two of the following barriers to employment:

a. Having household income below 50% of the Los Angeles County's median annual household income;

b. Emancipated from the foster care system ;

Receiving public assistance;

Lacking a GED or high school diploma;

Being an apprentice with less than 15% of the apprenticeship hours

c required to graduate to journey level in a program described in Section 1.3;

d. Being a custodial single parent

e. Suffering from long-term unemployment

To qualify under this section, the Jobs Coordinator shall verify and certify that the

individual's primary place of residence is within the City and that such individual satisfies the criteria set forth above.

7.8 The C/S/Es and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The C/S/Es and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the Parties.

7.9 The Unions and C/S/Es agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on a Project and of apprenticeship and employment opportunities for a Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

7.10 C/S/Es agree to only use the Craft Request Form (See Attachment C) and the procedures written therein to request any and all workers from Unions with a concurrent transmittal of such request to the Jobs Coordinator, including workers qualified as Local Residents, Transitional Workers, and/or general dispatch.

(1) When Local Residents and/or Transitional Workers are requested by the C/S/Es, the Unions will refer such workers regardless of their place in the Unions' hiring halls' list and normal referral procedures.

(2) In the event that a C/S/E, having not achieved its targeted hiring participation levels, requests a Local Resident and/or Transitional Worker from the

Union hiring facility, and is referred a worker who is not a Local Resident and/or Transitional Worker, the C/S/E is under no obligation to hire the referred worker for the Project work and shall notify the Union hiring facility and the Jobs Coordinator.

(3) The C/S/Es, Unions and Jobs Coordinator agree to maintain copies of all Craft Request Forms used on the Project submitted or received including transmission verification reports that are date/time imprinted. All Craft Request Forms and transmission verification reports shall be available for inspection and copies provided, upon request by the Harbor Department representative as described in Article XI of this Agreement.

7.11 Apprentices

(a) The Parties recognize the need to maintain continuing support of the programs designed to develop adequate numbers of competent workers in the construction industry, the obligation to capitalize on the availability of the Harbor Department's and the City's local work force, and the opportunities to provide continuing work for Projects covered by this Agreement. To these ends, the Parties shall facilitate, encourage, and assist Local Residents and/or Transitional Workers within Tier 1 or 2 zip code areas to commence and progress in Labor/Management apprenticeship and/or training programs in the construction industry leading to participation in such apprenticeship programs. The Harbor Department, Jobs Coordinator, Work Source Centers, other non-profit entities, organizations and the Unions, will work cooperatively to identify, or establish and maintain effective programs and procedures for persons interested in entering the construction industry and which will help prepare them for the

formal joint Labor/Management apprenticeship programs maintained by the signatory unions.

(b) Unions shall track retention of Apprentices hired through this program for so long as those Apprentices participate in a joint labor/management apprenticeship program. The signatory unions shall collect and compile information on the retention of these Apprentices and submit this information to the Department and the BCA on a quarterly basis. The City will use the information provided to generate a quarterly report on the retention of Apprentices on the Department's PLA projects.

(c) All apprentices shall work under the direct supervision of a journeyman from the trade in which the apprentice is indentured. A journeyman shall be defined as set forth in the California Code of Regulations, Title 8 [apprenticeship] section 205, which defines a journeyman as a person who has either completed an accredited apprenticeship in his or her craft, or has completed the equivalent of an apprenticeship in length and content of work experience and all other requirements in the craft which has workers classified as journeyman in the apprenticeable occupation. Should a question arise as to a journeyman's qualification under this subsection, the C/S/E shall provide adequate proof evidencing the worker's qualification as a journeyman.

ARTICLE VIII

WAGES AND BENEFITS

8.1 Wages. All employees covered by this Agreement shall be classified in accordance with work performed and paid the hourly wage rates for those classifications in compliance with the applicable prevailing wage rate determination established pursuant to the California Labor Code by the Department of Industrial

Relations or as established by the US DOL if applicable. If a prevailing rate increases during the term of this Agreement under State law or Federal law, the Contractor shall pay the rate as of its effective date under the applicable law. C/S/Es directly signatory to one or more of the Schedule A Agreements are required to pay all wages set forth in those Schedule A Agreements without reference to the foregoing. If the prevailing wage laws are repealed during the term of this Agreement, the contractor shall pay the wage rates established under the Schedule A Agreements, except as otherwise provided in this Agreement.

8.2 Benefits.

(a) C/S/Es not signatory to the established Labor/Management Trust Fund agreements, as specified in the Schedule A Agreements for the craft workers in their employ, shall sign a "Subscription Agreement" with the appropriate Labor/Management Trust Fund covering the work performed under this agreement.

(b) C/S/Es shall pay contributions to the established employee benefit funds on behalf of all employees performing Project work under this Agreement in the amounts designated in the appropriate Schedule A Agreement and make all employee-authorized deductions in the amounts designated in the appropriate Schedule A Agreement; provided, however, that such contributions shall not exceed the contribution amounts set forth in the applicable prevailing wage determination. C/S/Es directly Signatory to one or more of the Schedule A Agreements are required to make all contributions set forth in those Schedule A Agreements without reference to the forgoing. Bona fide jointly-trusteed benefit plans or authorized employee deductions programs established or negotiated under the applicable Schedule A Agreement or by

the Parties to this Agreement during the life of this Agreement may be added, provided that the contributions do not exceed the amounts set forth in the applicable prevailing wage determination.

(c) The C/S/E adopts and agrees to be bound by the written terms of the applicable, legally established, trust agreement(s) specifying the detailed basis on which payments are to be made into, and benefits paid out of, such trust funds for its employees. The C/S/E authorizes the Parties to such trust funds to appoint trustees and successors' trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the C/S/E.

ARTICLE IX

EMPLOYEE GRIEVANCE PROCEDURE

9.1 Should a grievance arise regarding the imposition of discipline of an employee, or the dismissal of an employee, working on Project work, all such grievance(s) shall be processed, exclusively, under the grievance procedure contained in the applicable Schedule A Agreement for the craft Union representing such employee(s) and not under the provisions of the Grievance Arbitration provisions of Article XIII. C/S/Es shall not discipline or dismiss its employees except for good cause.

ARTICLE X

DEPARTMENT POLICIES AND PROCEDURES

10.1 All construction contracts identified by the Harbor Department as part of the Project shall include the following provisions. Such provisions include, but are not limited to:

(1) All persons who perform labor in the execution of a construction contract shall be paid the prevailing rate of wages applicable to the classification as provided in Article III, Section 377 of the Los Angeles City Charter.

(2) All C/S/Es shall provide information concerning their experience, financial qualifications, including proof of a current State Contractor's License, Business Tax Registration Certificate, and ability to perform said contract or subcontract.

10.2 In addition to the above requirements, the C/S/Es and Unions understand and agree that all construction contracts shall be awarded in accordance with other applicable provisions of the Los Angeles City Charter ("Charter") (effective July 1, 2000), and the Los Angeles Administrative Code ("Administrative Code") (and any future amendments applicable thereto), including but not limited to:

(1) Los Angeles City Charter Article III, Section 371 (award of construction contracts to the lowest responsible bidder);

(2) Harbor Department policies providing Small Business Enterprises ("SBE"), Very Small Businesses ("VSBE"), and Minority-Owned, Women-Owned and all Other Business Enterprises ("MBE"/"WBE"/"OBE") an equal opportunity to participate in the performance of all City contracts in all areas where such contracts afford such participation opportunities.

ARTICLE XI

COMPLIANCE

11.1 It shall be the responsibility of the C/S/Es and Unions to investigate and monitor compliance with the provisions of the Agreement contained in Article VIII (Wages and Benefits). The Board shall appoint the BCA or its designee to investigate and monitor

compliance with Article VIII, the applicable provisions of the Charter and the Administrative Code, including, but not limited to, the prevailing wage requirements of the Charter, Local Residents, and Disadvantaged Worker hiring compliance and the Policy, and the affirmative action provisions of the Administrative Code, and to recommend to the Board or designee enforcement measures to ensure the C/S/E's compliance with the general conditions of a construction contract and the Policy. At the conclusion of any six-month period, the Parties to the Agreement shall report to the Board with a status update on the Agreement with regard to that Project, including a description of any obstacles or barriers faced. The provisions of this Article shall not substitute for or preclude any employee or Union from filing a grievance for any violation of Article VIII under the provisions of the Grievance Arbitration Procedure provisions of Article XIII.

11.2 Each C/S/E shall cooperate fully and promptly with any inquiry or investigation the City or its designated representatives deems necessary in order to monitor compliance with the provisions in this Agreement and the Policy.

ARTICLE XII

JOINT ADMINISTRATIVE COMMITTEE

12.1 The Parties to this Agreement may establish an eight (8) person Joint Administrative Committee (JAC). This JAC shall be comprised of three (3) representatives selected by the Department and one (1) representative of the prime contractor, and four (4) representatives of the signatory Unions to be appointed by the Trades Council to be chaired jointly by a representative of the Department and the Council.

Each representative shall designate an alternate who shall serve in his or her absence.

12.2 The JAC shall meet at the call of either of the joint chairs to discuss the implementation and administration of this Agreement, the progress of the Project, general labor management problems that may arise, and any other matters consistent with this Agreement. A unanimous decision of the JAC shall be final and binding upon all Parties. However, the JAC shall have no authority to make determinations upon or to decide grievances arising under this Agreement.

12.3 A quorum will consist of at least two (2) City and two (2) signatory union representatives. For voting purposes, only an equal number of City and signatory union representatives present may constitute a voting quorum.

ARTICLE XIII

GRIEVANCE ARBITRATION PROCEDURE

13.1 The Parties hereby agree that all grievances and disputes that may arise concerning the meaning, application or the interpretation of the terms of this Agreement, other than disputes arising from conduct described in Article IV (Work Stoppages, Strikes, Sympathy Strikes and Lockouts), Article IX (Employee Grievance Procedure) and Article XIV (Jurisdictional Disputes), shall be settled in accordance with the following procedures set out herein. Grieving parties are encouraged to meet as soon as possible and try to resolve the dispute. However, if a resolution cannot be reached, the following procedure shall be used.

13.2 Grievances and disputes shall be settled according to the following procedures:

Step 1: The business representative of the local Union involved shall first attempt to settle the matter by oral discussion with the particular C/S/E's representative no later than five (5) working days after the Union submitting the grievance first became aware of, or by the use of reasonable diligence should have been aware of, the occurrence first giving rise to the dispute or grievance. If the matter is not resolved with the C/S/E's representative within five (5) working days after the oral discussion with said C/S/E's representative, the dispute or grievance shall be reduced to writing by the grieving Union.

Step 2: In the event that the representatives (C/S/E and Union) are unable to resolve the grievance after its referral to Step 1, either involved party may submit the grievance, within five (5) business days of the Step 1 meeting of the parties to the grievance, to the Joint Administrative Committee (JAC), which shall meet within five (5) business days after such referral (or such longer time as is mutually agreed upon by all representatives of the JAC), to confer in an attempt to resolve the grievance. If the grievance is not resolved by the parties to the grievance within five (5) business days after its referral (or such longer time as is mutually agreed on by all representatives of the JAC) to the JAC, it may be referred within five (5) business days by either party to Step 3 by written notice of the submittal of the grievance to arbitration in accordance with the provisions set forth below.

Step 3: After notice by any party of intent to submit a grievance to arbitration, the Parties shall have five (5) working days to attempt, by mutual agreement, to

select as the Arbitrator to hear the dispute, one of the Arbitrators listed under the Expedited Arbitration provisions of Article 4.3 of this Agreement. If the Parties are unable to reach such agreement, the first arbitrator from the list, on a rotational basis, shall be the arbitrator to hear the dispute. The decision of the Arbitrator shall not have the authority to alter, amend, add to or delete from the provisions of this Agreement in any way. A failure of any party to attend said hearing shall not delay the hearing of evidence or the issuance of any decision by the Arbitrator. Should any party seek confirmation of the award made by the Arbitrator, the prevailing party shall be entitled to receive its reasonable attorney fees and costs.

13.3 The time limits specified in any step of the Grievance Arbitration Procedure set forth in Section 13.2 may be extended by mutual agreement of the Parties. However, failure to process a grievance, or failure to respond in writing within the time limits provided above, without a request for an extension of time, shall be deemed a waiver of such grievance without prejudice, or without precedent to the processing and/or resolution of like or similar grievances.

13.4 Grievances which are settled directly by the Parties to such grievance shall not be precedent setting.

13.5 The Harbor Department or its designated representative shall be given advance notification of all proceedings of all actions at Steps 2 and 3 and may observe such proceedings upon request.

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ARTICLE XIV

JURISDICTIONAL DISPUTES

14.1 The assignment of work will be solely the responsibility of the C/S/E performing the work involved; and such work assignments will be in accordance with the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") or any successor plan.

14.2 All jurisdictional disputes on this Project, between or among Building and Construction Trades Unions and employers shall be settled and adjusted according to the present Plan established by the Building and Construction Trades Department or any other plan or method of procedure that may be adopted in the future by the Building and Construction Trades Department. Decisions rendered shall be final, binding and conclusive on the C/S/Es and Unions. A decision shall not award back pay or any other damages for a misassignment of work, nor may any party bring an independent action for back pay or any other damages based upon a decision.

(1) If a dispute arising under this Article involves the Southwest Regional Council of Carpenters or any of its subordinate bodies, an Arbitrator shall be chosen by the procedures specified in Article V, Section 5 of the Plan from a list composed of John Kagel, Thomas Angelo, Robert Hirsch and Thomas Pagan. The Arbitrator's hearing on the dispute shall be held at the offices of the Council within fourteen (14) days of the selection of the Arbitrator. All other procedures shall be as specified in the Plan.

14.3 No Work Disruption Over Jurisdiction. All jurisdictional disputes shall be resolved without the occurrence of any strike, work stoppage, disruption, or slow down of any nature and the C/S/E's assignments shall be adhered to until the dispute is resolved.

Individuals violating this section shall be subject to immediate discharge.

14.4 Pre-Job Conference. A pre-job conference shall be held with all parties prior to the start of work by the prime contractor for the Project covered by this Agreement. The purpose of the conference will be to, among other things, determine craft manpower needs, schedule of work for the contract and Project work rules/owner rules. The subcontractors/owner operators of any tier will be advised in advance of all such conferences and shall participate. The Trades Council and the BCA's Office of Contract Compliance shall be advised in advance of all such conferences and may participate if they wish. All work assignments shall be disclosed by the C/S/E at a pre-job conference. Any formal jurisdictional dispute raised under Article XIV must be raised at the pre-job conference upon disclosure of the work assignments. If the C/S/E intends to change the work assignment after the pre-job conference or to make an assignment of work not previously known, the C/S/E must notify the appropriate affected craft union(s) prior to the commencement of work. The C/S/E performing all project work that was not previously assigned at the pre-job conference will conduct a separate pre-job conference for such newly assigned work prior to commencing such work.

ARTICLE XV

MANAGEMENT RIGHTS

15.1 The C/S/Es shall retain full and exclusive authority for the management of their operations including, but is not limited to, the right to direct their working force and to establish coordinated working hours and starting times, which shall not be in conflict with the Schedule A Agreements of the Unions.

15.2 There shall be no limit on production by workers or restrictions on the full use of tools or equipment. Craftsmen using tools shall perform any of the work of the trades and shall work under the direction of the craft foremen. There shall be no restrictions on efficient use of manpower other than as may be required by safety regulations. The C/S/Es may utilize the most efficient methods or techniques of construction, tools or other labor-saving devices to accomplish the work. Restrictive practices not a part of the terms and conditions of this Agreement will not be recognized.

15.3 The C/S/Es shall be the sole judge of the number and classifications of employees required to perform work subject to this Agreement and shall have the absolute right to hire, promote, suspend, discharge or lay off employees at their discretion and to reject any applicant for employment, subject to the provisions of the respective craft collective bargaining agreement between the particular C/S/E and Union and pursuant to this Agreement.

15.4 Nothing in this Agreement shall be construed to limit the right of any of the C/S/Es' to select the lowest bidder they deem qualified for the award of contracts or subcontracts or material, supplies, or equipment purchase orders on the Project. The right of ultimate selection remains solely with the C/S/E in accordance with the construction contract.

15.5 It is recognized that certain materials, equipment and systems of a highly technical and specialized nature will have to be installed at the Project. The nature of the materials or the nature of the equipment and systems, together with requirements of manufacturer's warranty, dictate that it will be pre-fabricated, pre-piped, pre-wired and/or installed under the supervision and direction of the Harbor Department, City

and/or manufacturer's personnel. The Unions agree that such materials, equipment and systems shall be installed without the occurrence of any conduct described in Section 4.1 or 4.2.

ARTICLE XVI

SAFETY, PROTECTION OF PERSON AND PROPERTY

16.1 It shall be the responsibility of each C/S/E to ensure safe working conditions and employee compliance with any safety rules contained herein or established by the Harbor Department, City, the state and the C/S/E. It is understood that the employees have an individual obligation to use diligent care to perform their work in safe manner and to protect themselves and the property of the C/S/E and the Harbor Department.

16.2 Employees shall be bound by the safety, security and visitor rules established by the C/S/E and the Harbor Department. These rules will be published and posted in conspicuous places throughout the work site. An employee's failure to satisfy his/her obligations under this Section will subject him/her to discipline, including discharge.

16.3 The Parties acknowledge that the Harbor Department and the C/S/E have a policy, which prohibits the use, sale, transfer, purchase and/or possession of a controlled substance, alcohol and/or firearms while on the Harbor Department's premises. Additionally, the C/S/E has a "drug free" work place policy, which prohibits those working on the Harbor Department's premises from having a level of alcohol in their system, which could indicate impairment, and/or any level of controlled substances (i.e., illegal drugs) in their system.

16.4 To that end, the Parties agree to adopt the Los Angeles/Orange Counties Building and Construction Trades Council Approved Drug and Alcohol Testing Policy, a

copy of which is attached hereto as Attachment "B" which shall be the policy and procedure utilized under this Agreement.

ARTICLE XVII

SAVINGS CLAUSE

17.1 The Parties agree that in the event any article, provision, clause, sentence or work of the Agreement is determined to be illegal or void as being in contravention of any applicable law, by a court of competent jurisdiction, the remainder of the Agreement shall remain in full force and effect. The Parties further agree that if any article, provision, clause, sentence or word of the Agreement is determined to be illegal or void, by a court of competent jurisdiction, the Parties shall substitute, by mutual agreement, in its place and stead, an article, provision, sentence or word which will meet the objections to its validity and which will be in accordance with the intent and purpose of the article, provision, clause, sentence or word in question.

17.2 The Parties also agree that in the event that a decision of a court of competent jurisdiction materially alters the terms of the Agreement such that the intent of the Parties is defeated, then the entire Agreement shall be null and void.

17.3 If a court of competent jurisdiction determines that all or part of the Agreement is invalid and/or enjoins the City or the Harbor Department from complying with all or part of its provisions and the Board accordingly determines that the Agreement will not be required as part of an award to a C/S/E, the Unions will no longer be bound by the provisions of Article IV to the extent that such C/S/E is no longer bound. The Unions and their members shall remain bound to Article IV with respect to all other C/S/Es who remain bound to this Agreement, and no action taken by the Unions or their members

shall disrupt the work of such C/S/Es.

17.4 The provisions of this Agreement shall not be applicable where prohibited by Presidential Executive Order, Federal or State law, or where the application would be inconsistent with terms and conditions of a grant or a contract with the agency of the United States, State of California, or the instruction of an authorized representative of any of these agencies with respect to any grant or contract.

ARTICLE XVIII

STEWARD

18.1 Each Union shall have the right to designate a working craft employee as steward for each C/S/E employing such craft on the Project. Such designated steward shall be a qualified workman assigned to a crew and shall perform the work of the craft. The steward shall not perform supervisory duties. Under no circumstances shall there be nonworking stewards. Stewards shall be permitted a reasonable amount of time during working hours to perform applicable Union duties related to the work being performed by the craft employees of his/her C/S/E and not to the work being performed by other C/S/Es or their employees.

18.2 Authorized representatives of the Union(s) shall have access to the Covered Project, provided that such representatives fully comply with posted visitor, security, and safety rules and the environmental compliance requirements of the Covered Project, provided that they do not unnecessarily interfere with the employees or cause them to neglect their work. The Contractor recognizes the right of access set forth in this Section and such access will not be unreasonably withheld from an authorized representative of the Union.

ARTICLE XIX

TERM

19.1 This Agreement shall commence upon execution by all Parties (the City of Los Angeles Harbor Department and the Los Angeles/Orange Counties Building and Construction Trades Council and the Craft Unions signatory to this Agreement) and shall continue in full force and effect from the date of execution by all Parties for a period of ten (10) years. During the term of this Agreement, upon request by either Party or by mutual consent, the Parties will meet to discuss the application of and their experience with this Agreement. As a result of any such meeting, the Parties may, but shall not be obligated to, mutually agree to amendments or modification of this Agreement.

19.2 The Agreement shall continue in full force and effect for each covered Project until project acceptance by the Board. Either party desiring to renew, extend or to negotiate changes to this Agreement upon expiration, shall make such intention known to the other party by written notice thereof not less than six (6) months prior to the expiration of this Agreement.

19.3 Any covered Project awarded during the term of this Agreement shall continue to be covered hereunder, until completion of the Project, notwithstanding the expiration date of this Agreement.

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IN WITNESS WHEREOF, the Parties hereto have executed this Agreement on the day and year written below.

THE UNION OFFICIALS signing this Agreement warrant and represent that they are authorized to collectively bargain on behalf of the organizations whom they represent and the members of such organizations.

THE CITY OF LOS ANGELES HARBOR DEPARTMENT

By: _____ Date: 12-11-17
Eugene D. Seroka
Executive Director

By: _____ Date: 12-11-17
Amber Klesges
Commission Secretary

LOS ANGELES/ORANGE COUNTY BUILDING AND CONSTRUCTION TRADES COUNCIL

By: _____ Date: 5-17-17
Ron Miller
Executive Secretary
Los Angeles/Orange County Building
And Construction Trades Council

APPROVED AS TO FORM:

Michael N. Feuer, City Attorney

By: _____ Date: 5/17/2017
Hugo S. Rossitter
Deputy City Attorney

Union Signatory Page

Asbestos Heat & Frost Insulators (Local 5)

Boilermakers (Local 92)

Bricklayers & Allied Craftworkers (Local 4)

Cement Masons (Local 500)

District Council of Laborers

Electricians (Local 11)

Elevator Constructors (Local 18)

Gunite Workers (Local 345)

Iron Workers (Reinforced – Local 416)

Iron Workers (Structural – Local 433)

Laborers (Local 1309)

Laborers (Local 300) (Remediation)

Operating Engineers (Local 12)

Operating Engineers (Local 12)

Operating Engineers (Local 12)

Painters & Allied Trades DC 36

Pipe Trades (Local 250)

Pipe Trades (Local 345)

Pipe Trades (Plumbers Local 78)

Pipe Trades (Sprinkler Fitters Local 709)

Plasterers (Local 200)

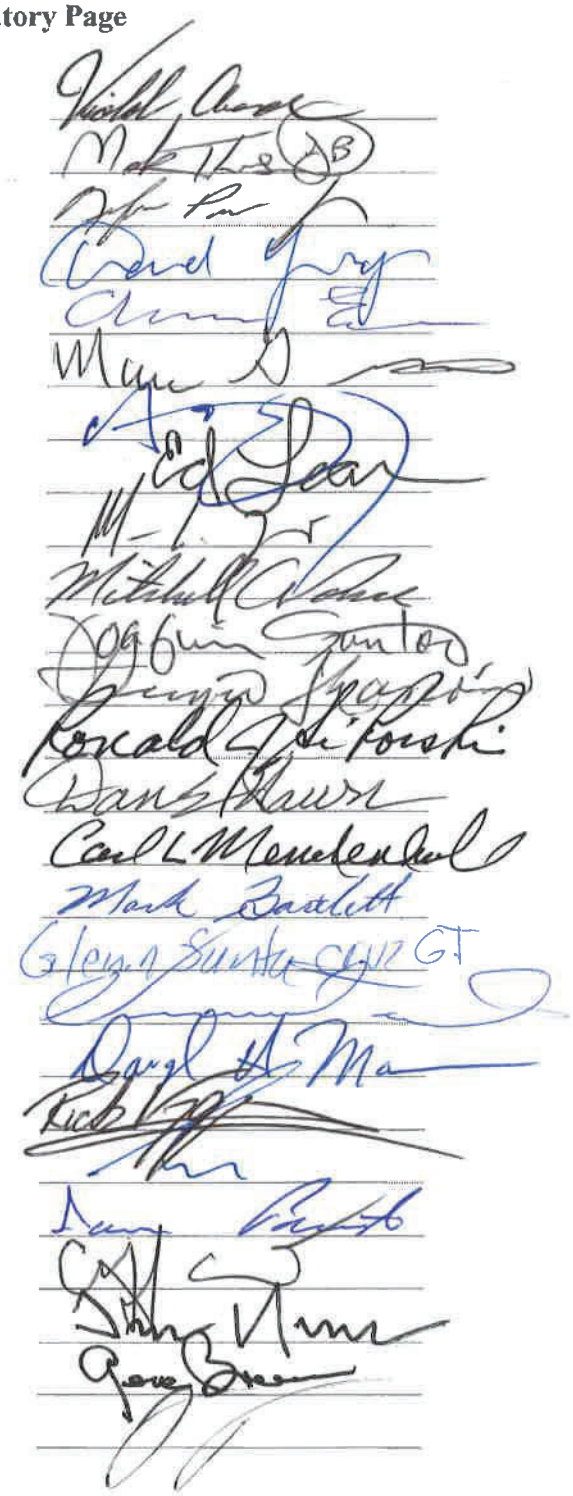
Plaster Tenders (Local 1414)

Roofers & Waterproofers (Local 36)

Sheet Metal Workers (Local 105)

Teamsters (Local 986)

Southwest Regional Council of Carpenters



ATTACHMENT "A"

COMPANY LETTERHEAD

Date: _____

Mr. Shaun Shahrestani
Chief Harbor Engineer
Construction Division
Port of Los Angeles
425 S. Palos Verdes Street
San Pedro, CA. 90731

SUBJECT: LETTER OF ASSENT

Dear Mr. Shahrestani:

This is to certify that the undersigned Contractor/Employer has examined a copy of the subject Project Labor Agreement entered into by and between the City of Los Angeles Harbor Department and Los Angeles/Orange Counties Building and Construction Trades Council and the signatory Unions dated _____. The undersigned Contractor/Employer hereby agrees to comply with all of the terms and conditions of the aforementioned Project Labor Agreement as such labor Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms.

It is understood that the signing of the letter of Assent shall be as binding on the undersigned Contractor/Employer as though the Contractor/Employer had signed the above referred Agreement and shall require all its subcontractors, of whatever tier, to become similarly bound for all work within the scope of this Agreement.

This Letter of Assent shall become effective and binding upon the undersigned Contractor/Employer the _____ day of _____, _____, and shall remain in full force and effect until the completion of the above stated project.

Sincerely,

(Name of Construction Company)

By:_____
(Name and Title of Authorized Executive)

Contractor's State License No.: _____

cc:

ATTACHMENT B

LOS ANGELES/ORANGE COUNTIES

BUILDING AND CONSTRUCTION TRADES COUNCIL

APPROVED

DRUG AND ALCOHOL TESTING POLICY

The Parties recognize the problems which drug and alcohol abuse have created in the construction industry and the need to develop drug and alcohol abuse prevention programs. Accordingly, the Parties agree that in order to enhance the safety of the work place and to maintain a drug and alcohol free work environment, individual Employers may require applicants or employees to undergo drug and alcohol testing.

1. It is understood that the use, possession, transfer or sale of illegal drugs, narcotics, or other unlawful substances, as well as being under the influence of alcohol and the possession or consuming alcohol is absolutely prohibited while employees are on the Employer's job premises or while working on any jobsite in connection with work performed under the Project Labor Agreement ("PLA").

2. No Employer may implement a drug testing program which does not conform in all respects to the provisions of this Policy.

3. No Employer may implement drug testing at any jobsite unless written notice is given to the Union setting forth the location of the jobsite, a description of the project under construction, and the name and telephone number of the Project Supervisor. Said notice shall be addressed to the office of each Union signing the PLA. Said notice shall be delivered in person or by registered mail before the implementation of drug testing. Failure to give such notice shall make any drug testing engaged in by

the Employer a violation of the PLA, and the Employer may not implement any form of drug testing at such jobsite for the following six months.

4. An employer who elects to implement drug testing pursuant to this Agreement shall require all employees on the Project to be tested. With respect to individuals who become employed on the Project subsequent to the proper implementation of this drug testing program, such test shall be administered upon the commencement of employment on the project, whether by referral from a Union Dispatch Office, transfer from another project, or another method. Individuals who were employed on the project prior to the proper implementation of this drug testing program may only be subjected to testing for the reasons set forth in Paragraph 5(f) (1) through 5(f) (3) of this Policy. Refusal to undergo such testing shall be considered sufficient grounds to deny employment on the project.

5. The following procedure shall apply to all drug testing:

a. The Employer may request urine samples only. The applicant or employee shall not be observed when the urine specimen is given. An applicant or employee, at his or her sole option, shall, upon request, receive a blood test in lieu of a urine test. No employee of the Employer shall draw blood from a bargaining unit employee, touch or handle urine specimens, or in any way become involved in the chain of custody of urine or blood specimens. A Union Business Representative, subject to the approval of the individual applicant or employee, shall be permitted to accompany the applicant or employee to the collection facility to observe the collection, bottling, and sealing of the specimen.

b. The testing shall be done by a laboratory approved by the Substance Abuse & Mental Health Services Administration (SAMHSA), which is chosen by the Employer and the Union.

c. An initial test shall be performed using the Enzyme Multiplied Immunoassay Technique (EMZT). In the event a question or positive result arises from the initial test, a confirmation test must be utilized before action can be taken against the applicant or employee. The confirmation test will be by Gas Chromatography Mass Spectrometry (GC/MS). Cutoff levels for both the initial test and confirmation test will be those established by the SAMHSA. Should these SAMHSA levels be changed during the course of this agreement or new testing procedures are approved, then these new regulations will be deemed as part of this existing agreement. Confirmed positive samples will be retained by the testing laboratory in secured long-term frozen storage for a minimum of one year. Handling and transportation of each sample must be documented through strict chain of custody procedures.

d. In the event of a confirmed positive test result the applicant or employee may request, within forty-eight (48) hours, a sample of his/her specimen from the testing laboratory for purposes of a second test to be performed at a second laboratory, designated by the Union and approved by SAMHSA. The retest must be performed within ten (10) days of the request. Chain of custody for this sample shall be maintained by the Employer between the original testing laboratory and the Union's designated laboratory. Retesting shall be performed at the applicant's or employee's expense. In the event of conflicting test results the Employer may require a third test.

e. If, as a result of the above testing procedure, it is determined that an applicant or employee has tested positive, this shall be considered sufficient grounds to deny the applicant or employee his/her employment on the Project.

f. No individual who tests negative for drugs or alcohol pursuant to the above procedure and becomes employed on the Project shall again be subjected to drug testing with the following exceptions:

1. Employees who are involved in industrial accidents resulting in damage to plant, property or equipment or injury to him/herself or others may be tested pursuant to the procedures stated hereinabove.

2. The Employer may test employees following thirty (30) days advance written notice to the employee(s) to be tested and to the applicable Union. Notice to the applicable Union shall be as set forth in Paragraph 3 above and such testing shall be pursuant to the procedures stated hereinabove.

3. The Employer may test an employee where the Employer has reasonable cause to believe that the employee is impaired from performing his/her job. Reasonable cause shall be defined as exhibiting aberrant or unusual behavior, the type of which is a recognized and accepted symptom of impairment (i.e., slurred speech, unusua1 lack of muscular coordination, etc.). Such behavior must be actually observed by at least two persons, one of whom shall be a Supervisor who has been trained to recognize the symptoms of drug abuse or impairment and the other of whom shall be the job steward. If the job steward is unavailable or there is no job steward on the project the other person shall be a member of the applicable Union's bargaining unit. Testing shall be pursuant to the procedures stated hereinabove. Employees who

are tested pursuant to the exceptions set forth in this paragraph and who test positive will be removed from the Employer's payroll.

g. Applicants or employees who do not test positive shall be paid for all time lost while undergoing drug testing. Payment shall be at the applicable wage and benefit rates set forth in the applicable Union's Master Labor Agreement. Applicants who have been dispatched from the Union and who are not put to work pending the results of a test will be paid waiting time until such time as they are put to work. It is understood that an applicant must pass the test as a condition of employment. Applicants who are put to work pending the results of a test will be considered probationary employees.

6. The employers will be allowed to conduct periodic job site drug testing on the Project under the following conditions:

a. The entire jobsite must be tested, including any employee or subcontractor's employee who worked on that project three (3) working days before or after the date of the test;

b. Jobsite testing cannot commence sooner than thirty (30) days after start of the work on the Project;

c. Prior to start of periodic testing, a business representative will be allowed to conduct an educational period on company time to explain periodic jobsite testing program to affected employees;

d. Testing shall be conducted by a SAMHSA certified laboratory, pursuant to the provisions set forth in Paragraph 5 hereinabove.

e. Only two periodic tests may be performed in a twelve month period.

7. It is understood that the unsafe use of prescribed medication, or where the use of prescribed medication impairs the employee's ability to perform work, is a basis for the Employer to remove the employee from the jobsite.

8. Any grievance or dispute which may arise out of the application of this Agreement shall be subject to the grievance and arbitration procedures set forth in the PLA.

9. The establishment or operation of this Policy shall not curtail any right of any employee found in any law, rule or regulation. Should any part of this Agreement be found unlawful by a court of competent jurisdiction or a public agency having jurisdiction over the parties, the remaining portions of the Agreement shall be unaffected and the parties shall enter negotiations to replace the affected provision.

10. Present employees, if tested positive, shall have the prerogative for rehabilitation program at the employee's expense. When such program has been successfully completed the Employer shall not discriminate in any way against the employee. If work for which the employee is qualified exists he/she shall be reinstated.

11. The Employer agrees that results of urine and blood tests performed hereunder will be considered medical records held confidential to the extent permitted or required by law. Such records shall not be released to any persons or entities other than designated Employer representatives and the applicable Union. Such release to the applicable Union shall only be allowed upon the signing of a written release and the information contained therein shall not be used to discourage the employment of the individual applicant or employee on any subsequent occasion.

12. The Employer shall indemnify and hold the Union harmless against any and all claims, demands, suits, or liabilities that may arise out of the application of this Agreement and/or any program permitted hereunder.

13. Employees who seek voluntary assistance for substance abuse may not be disciplined for seeking such assistance. Requests from employees for such assistance shall remain confidential and shall not be revealed to other employees or management personnel without the employee's consent. Employees enrolled in substance abuse programs shall be subject to all Employer rules, regulations and job performance standards with the understanding that an employee enrolled in such a program is receiving treatment for an illness.

14. This Memorandum, of Understanding shall constitute the only Agreement in effect between the parties concerning drug and alcohol abuse, prevention and testing. Any modifications thereto must be accomplished pursuant to collective bargaining negotiations between the parties.

DRUG ABUSE PREVENTION AND DETECTION

APPENDIX A

CUTOFF LEVELS

DRUG	SCREENING METHOD	SCREENING LEVEL **	CONFIRMATION METHOD	CONFIRMATION LEVEL
Alcohol	EMIT	0.02%	CG/MS	0.02%
Amphetamines	EMIT	1000 ng/m*	CG/MS	500 ng/ml*
Barbiturates	EMIT	300 ng/ml	CG/MS	200 ng/ml
Benzodiazepines	EMIT	300 ng/ml	CG/MS	300 ng/ml
Cocaine	EMIT	300 ng/ml*	CG/MS	150 ng/ml*
Methadone	EMIT	300 ng/ml	CG/MS	100 ng/ml
Methaqualone	EMIT	300 ng/ml	CG/MS	300 ng/ml
Opiates	EMIT	2000 ng/ml*	CG/MS	2000 ng/ml*
PCP (Phencyclidine)	EMIT	25 ng/ml*	CG/MS	25 ng/ml*
THC (Marijuana)	EMIT	50 ng/ml*	CG/MS	15 ng/ml*
Propoxyphene	EMIT	300 ng/ml	CG/MS	100 ng/ml

* SAMHSA specified threshold

** A sample reported positive contains the Indicated drug at or above the cutoff level for that drug. A negative sample either contains no drug or contains a drug below the cutoff level.

EMIT - Enzyme Immunoassay

CC/MS - Gas Chromatography/Mass Spectrometry

SIDE LETTER OF AGREEMENT

TESTING POLICY FOR DRUG ABUSE

It is hereby agreed between the parties hereto that an Employer who has otherwise properly implemented drug testing, as set forth in the Testing Policy for Drug Abuse, shall have the right to offer an applicant or employee a "quick" drug screening test. This “quick” screen test shall consist either of the “ICUP” urine screen or similar test or an oral screen test. The applicant or employee shall have the absolute right to select either of the two “quick” screen tests, or to reject both and request a full drug test.

An applicant or employee who selects one of the quick screen tests, and who passes the test, shall be put to work immediately. An applicant or employee who fails the “quick” screen test, or who rejects the quick screen tests, shall be tested pursuant to the procedures set forth in the Testing Policy for Drug Abuse. The sample used for the "quick" screen test shall be discarded immediately upon conclusion of the test. An applicant or employee shall not be deprived of any rights granted to them by the Testing Policy for Drug Abuse as a result of any occurrence related to the “quick” screen test.

Attachment C

CITY OF LOS ANGELES HARBOR DEPARTMENT
REQUEST/VERIFICATION FOR CRAFT EMPLOYEES
(*INSERT NAME OF PROJECT*)

INSTRUCTIONS

To the Contractor:

Please complete and fax this form to the applicable union to request craft workers that fulfill all hiring requirements for the City of Los Angeles project. After faxing your request, call the Local to verify receipt and substantiate their capacity to furnish local, at-risk or general dispatch as requested. Contact information for Locals is listed on back of form. Please print your Fax Transmission Verification Report and keep a copy of this request for your records.

To the Union:

Please complete the "Union Use Only" section and fax form back to the requesting contractor. Retain form for your records.

To:	Local	Fax# ( )	Date:
From – Company Name			
Person Sending:		Contact Phone: ( )	

Please provide me with union craft workers per the City of Los Angeles PLA that fulfills the requirements for this project as defined below:

30% Local Requirement (Union craft employees, including apprentices, who reside in the local metropolitan area zip codes listed below. If unavailable, can be dispatched from any one of the Citywide zip codes listed in Attachment).

SEE ATTACHED TIER 1 AND TIER 2 ZIP CODES

10% "Transitional Worker" Requirement (Union craft employees, including apprentices, who live in one of the Citywide zip codes listed in Attachment, and are certified to fulfill the "Transitional worker" hiring requirement).

General Dispatch (Union craft employees dispatched per normal dispatch procedures, not including the 30% Local or 10% Transitional Worker requirements)

Employee Name	Address	Zip Code

Craft Employees Requested						
Job/Craft Description	Journeyman / Apprenticeship Level	Number(s) Requested			Report Date	Report Time
		30% Local	10% Transitional	General Dispatch		

Total Workers Requested_____

Please have worker(s) report to the following address indicated below:

Site Address: _____ Report to (On-Site Contact): _____

On-Site Tel.#: ( ) _____ Fax: ( ) _____

Comments or special requirements:

Union Use Only

(Fax the Completed Form Back to Contractor)

Reception Date: Dispatch Date: Received By:

Requested Dispatch	Available for Dispatch	Unavailable for Dispatch
30% Local	☐	☐
10% Transitional	☐	☐
General Dispatch	☐	☐

Comments:

ATTACHMENT D

Harbor Department PLA Construction Trade Unions Contact Numbers

Asbestos Heat & Frost Insulators (Local 5)
670 E. Foothill Blvd.
Azusa, CA 91702
Tel: (626) 815-9794
Fax: (626) 815-0165

Boilermakers (Local 92)
2260 S. Riverside Avenue
Bloomington, CA 92316
Tel: (909) 877-9382
Fax: (909) 877-8318

Bricklayers & Allied Craftworkers (Loc. 4)
11818 Clark St., Suite A
Arcadia, CA 91706
Tel: (626) 739-5600
Fax: (626) 739-5610

Drywall Finishers Local 1136
Corporate Center Drive
Monterey Park, CA 91754
Tel: (626) 296-8003
Fax: (626) 296-8076

Electricians (Local 11)
297 N. Marengo Avenue
Pasadena, CA 91101
Tel: (626) 243-9700
Fax: (626) 793-9743

Elevator Constructors (Local 18)
100 S. Mentor Avenue
Pasadena, CA 91106
Tel: (626) 449-1869
Fax: (626) 577-1055

Operating Engineers (Local 12)
150 E. Corson
Pasadena, CA 91103
Tel: (626) 792-8900
Fax: (626) 792-9039

Glaziers (Local 636)
1155 Corporate Center Dr.
Monterey Park, CA 91754
Tel: (626) 448-1565
Fax: (626) 797-8395

Gunite Workers (Local 345)
P.O. Box 3345
Burbank, CA 91508
Tel: (818) 846-1303
Fax: (818) 846-1226

Iron Workers (Reinforced – Local 416)
13830 San Antonio Dr.
Norwalk, CA 90650
Tel: (562) 868-1251
Fax: (562) 868-1429

Iron Workers (Structural – Local 433)
17495 Hurley St. East
City of Industry, CA 91744
Tel: (626) 964-2500
Fax: (626) 964-1754

Laborers Local 1309
3971 Pixie Ave.
Lakewood, CA 90712
Tel: (562) 421-9346
Fax: (562) 421-5964

Laborers Local 300
2005 W. Pico Blvd.
Los Angeles, CA 90006
Tel: (213) 385-3550
Fax: (213) 385-6985

Painters & Allied Trades DC 36
1155 Corporate Center Drive
Monterey Park, CA 91754
Tel: (626) 584-9925
Fax: (626) 584-1949

Plaster Tenders
1055 W. Second Street
Pomona, CA
Tel.: (909) 622-8500
Fax: (909) 623-5244

Plumbers (Local 78)
1111 West James Wood Boulevard
Los Angeles, CA 90015
(213) 688-9000
(213) 627-4624

Pipe Trades (Local 250)
Steamfitters/Air Conditioning/ Refrigeration / Industrial Pipefitters
18355 S. Figueroa St.
Gardena, CA 90248
Steamfitters: Tel: (310) 660-0035
Fax: (310) 329-2465
AC/Refrig. Tel: (310) 660-0045
FAX: (310) 329-2465

Pipe Trades (Local 345)
Landscape, Irrigation, Underground & Specialty Piping
1430 Huntington Dr.
Duarte, CA 91010
Tel: (626) 357-9345
Fax: (626) 359-0359

Pipe Trades (Sprinkler Fitters – Local 709)
12140 Rivera Road
Whittier, CA 90606
Tel: (562) 698-9909
Fax: (562) 698-7255

Plasterers (Local 200)
1610 W. Holt Ave.
Pomona, CA 91768
Tel: (909) 865-2240
Fax: (909) 865-9392

Cement Masons #500
1605 N. Susan St.
Santa Ana, CA 92703
Tel.: (714) 554-0730
Fax: (714) 265-0780

Resilient Floor & Dec. Cov. (Local 1247)
8051 Pioneer Blvd.
Whittier, CA 90606
Tel: (562) 695-7402
Fax: (562) 695-6337

Roofers & Waterproofers (Local 36)
5380 Poplar Blvd.
Los Angeles, CA 90032
Tel: (323) 222-0251
Fax: (323) 222-3585

Sheet Metal Workers (Local 105)
2120 Auto Centre Dr., Suite 105
Glendora, CA 91740
Tel: (909) 305-2800
Fax: (909) 305-2822

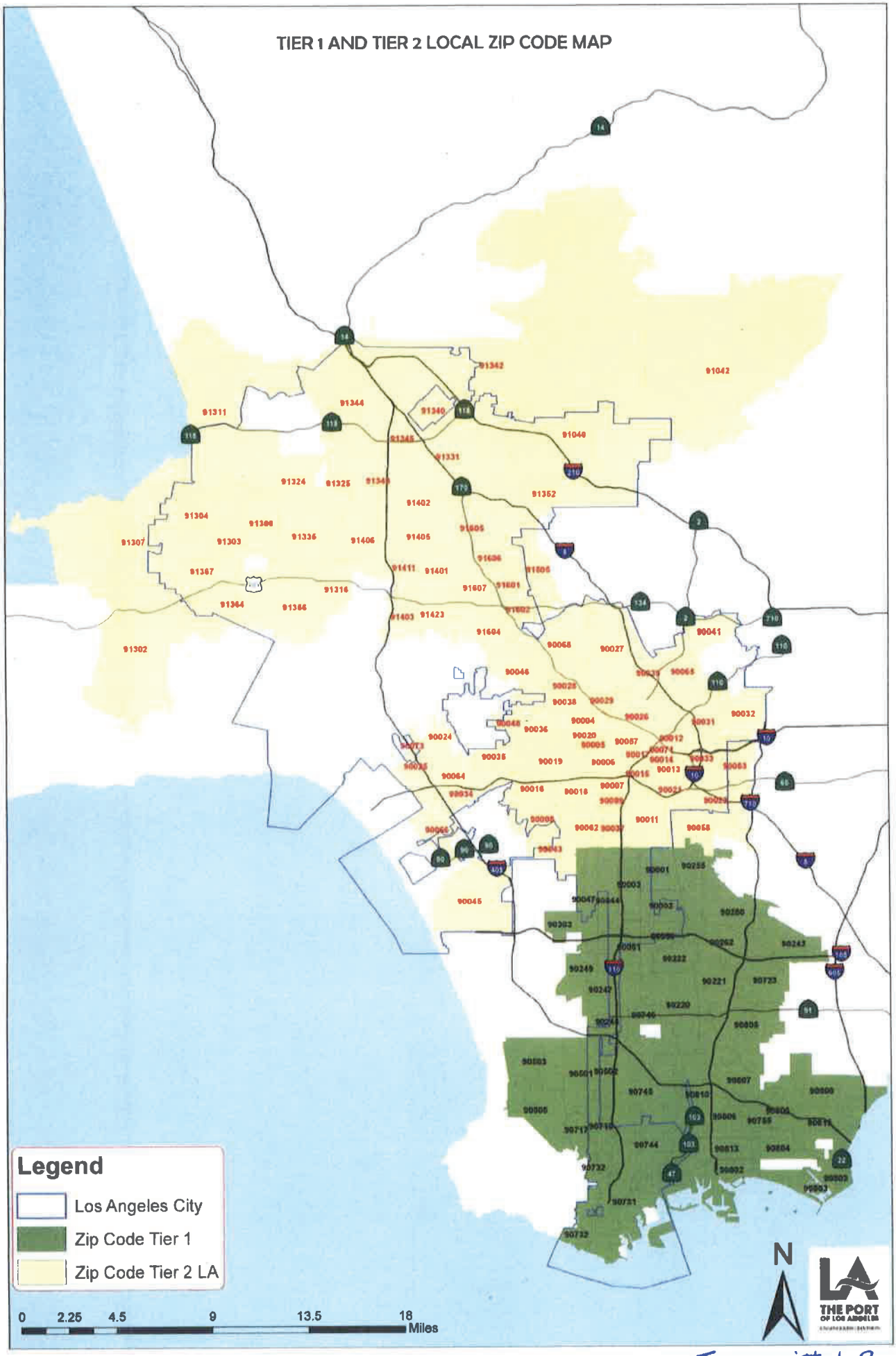
Teamsters (Local 986)
1198 Durfee Avenue
So. El Monte, CA 91733
Tel: (626) 350-9860
Fax: (626) 448-0986

Tradeshow and Sign Crafts
1155 Corporate Center Drive
Monterey Park, CA 91754
Tel: (626) 296-8086
Fax: (626) 584-1949

ATTACHMENT E
Harbor Department Calendar Years 2017 Thru 2027
Capital Improvement Program (CIP) Project List

Project Title	Anticipated Start
2017 - 2019 Site Improvements	2017/2018
B. 196-199 & 200A - Wharf Rehabilitation (2516600)	2017/2018
B. 212-224 - Intermodal Container Transfer Facility (ICTF) Expansion (2533300)	2017/2018
B. 93 - Cruise Terminal - Customs and Border Protection Improvements (2525300)	2017/2018
B.187-190 - MOTEMS Repairs (2524600)	2017/2018
Front Street Beautification (2504700)	2017/2018
North Gaffey Street Beautification -Phase II (7934500)	2017/2018
B. 240 A, B, & C - Seawall Improvements - ExxonMobil (2537600)	2017/2018
San Pedro Waterfront - Ports O' Call Promenade and Town Square (2532100)	2017/2018
B. 200 - Rail Yard and Track Connections Enhancements (2540800)	2017/2018
B. 214 - 220 - Concrete Wharf Improvements (2537800)	2018/2019
B. 167-169 - MOTEMS- Shell (2493600)	2018/2019
B. 226-236 Terminal Improvements - Wharf and Backlands (2531200)	2018/2019
B. 228-230 - Alternative Maritime Power (AMP) Upgrade and Retrofit (2529400)	2018/2019
Wilmington Waterfront Pedestrian Bridge (2537700)	2018/2019
Wilmington Waterfront Promenade (2533000)	2018/2019
San Pedro Waterfront - Sampson Way (7th St. to 22nd St.) Roadway Improvements (2488200)	2018/2019
2018 - 2020 Marine Improvements	2018/2019
B. 148-151 - MOTEMS- Phillips 66 (2493800)	2018/2019
B. 238 - MOTEMS- ExxonMobil (2489900)	2018/2019
West Basin Lead Track Gap Closure (2536600)	2018/2019
B. 226-236- Terminal Infrastructure Reconstruction (2539400)	2018/2019
San Pedro Waterfront - Harbor Boulevard From Miner Street to SP Slip (2543000)	2018/2019
San Pedro Waterfront - B. 57 - Wharf Retrofit and Signal Street Improvements (2500600)	2019/2020
San Pedro Waterfront - B. 80-83 - Waterside Improvements (2539000)	2019/2020
2019 - 2021 Site Improvements	2019/2020
B. 164 - MOTEMS - Valero (2493900)	2019/2020
B. 100-102 Marine Operations Building (2454300)	TBD
B. 100-102 Crane Maintenance Building (2502600)	TBD
B. 121-131 Wharf Upgrades (2449000)	TBD
B. 121-131 West Basin Intemodal Container Transfer Facility (WBICTF)(24810000)	TBD
RB 301-305 Buildings, Gates and Backland Development(2489000)	TBD
B. 306 Wharf and Backland Development (2489100)	TBD
B. 306 Alternative Maritime Power (AMP) (2506800)	TBD
B. 163 MOTEMS-NuStar (2493700)	TBD
B. 187-191 MOTEMS-Vopak (2494000)	TBD
B. 161 Marine Ways Modifications (2486100)	TBD
Harbor Administration Building-HVAC Replacement (2509600)	TBD

All Projects on this list are subject to change. The anticipated starts are the best estimate at the time this document was prepared.



Transmittal 2



CONSTRUCTION CAREERS POLICY

(Revision 1)

TABLE OF CONTENTS

		Page
Port of Los Angeles Construction Careers Policy		
Section		
I.	Definitions	1-4
II.	Coverage of Projects	4
III.	Implementation	5
IV.	Exclusions and/or Modifications	5
V.	Targeted Hiring	5-6
VI.	Responsibilities of Harbor Department, C/S/Es, Unions and Jobs Coordinator	6-10
VII.	Compliance	10-11
VIII.	Enforcement	12-13
IX.	Applicable Laws and Severability	13

SECTION I. DEFINITIONS

1. “Apprentice” means any worker who is indentured in a bona fide Labor/Management construction apprenticeship program, registered and approved by the State of California Department of Industrial Relations, Division of Apprenticeship Standards (DAS) or in the case of Projects with federal funding, indentured in a bona fide Labor/Management apprenticeship program approved by the US Department of Labor (DOL) and California DAS.

2. “Apprenticeship Program” means any Labor/Management construction apprenticeship program certified and approved by the California DAS or in the case of Projects with federal funding, approved by the US DOL and California DAS.

3. “Awarding Authority” means the City of Los Angeles, acting by and through the Board of Harbor Commissioners, or any employee or officer of the Board that is authorized to award or enter into any contract on behalf of the Board.

4 “Board” means the Los Angeles Board of Harbor Commissioners.

5. “Bureau of Contract Administration” (BCA) means the designated bureau within the City’s Department of Public Works which may provide support services to the Harbor Department in administering the Policy and the PLA.

6. “City” means the City of Los Angeles, a municipal corporation, and all City awarding authorities.

7. “Construction Contract” means a City contract which has been awarded by the Board, and is necessary to complete the Project.

8. “Contractor/Subcontractor/Employer (C/S/E)” means any individual firm, partnership, owner operator, or corporation, or combination thereof, including joint ventures, which is an independent business enterprise and has entered into a contract with the Harbor Department or any of its contractors or subcontractors/owner operators of any tier, with respect to the construction of any part of the Project(s) under contract terms and conditions approved by the Board.

9. “Core Worker” means a verifiable member of a C/S/E’s core workforce for the purpose of the PLA and this Policy if the worker’s name appears on the C/S/E’s active payroll for 60 of 100 working days immediately prior to award of the construction contract and meets all standards required by applicable local, state or federal law or regulation.

10. “Covered Project(s)” or “Project” means a project or projects that have been included in the Ten-Year “Capital Improvement Program (CIP) Project List” included as Attachment “E” to the PLA, or so designated by the Board. The Board may identify additional projects that are appropriate for coverage by the Agreement for

inclusion under the CIP and include such projects by Board Resolution. The Board shall request an annual review of the Harbor Department Capital Improvement Program to identify any new projects appropriate for coverage by the Agreement.

11. "Craft Request Form" means the document through which a C/S/E shall request workers from the Union and/or Jobs Coordinator, in the form set forth in the PLA and/or Policy.

12. "Employment Hiring Plan" (EHP) means a C/S/E's detailed hiring plan as described in BCA's Targeted Hiring Guidelines for Contractors and the Policy or other applicable Department policy.

13. "Engineer" means the Chief Harbor Engineer of the City of Los Angeles Harbor Department, Construction Division, or its authorized representative.

14. "Executive Director" shall mean the Executive Director of the City of Los Angeles Harbor Department, or his or her designee.

15. "FHWA Project" means a Harbor Department Project that is funded in whole or in part by the Federal Highway Administration (FHWA).

16. "Harbor Department" means the city of Los Angeles Harbor Department.

17. "Jobs Coordinator" means the Prime Contractor's designated person, agent or agency that will facilitate the local hire referral process with the C/S/E, Unions and other referral organizations, such as those listed in the BCA's Targeted Hiring Guidelines for Contractors. The Jobs Coordinator must be able to demonstrate or document to the BCA that it has the requisite qualification and/or experience to fulfill the duties and responsibilities as outlined in the Policy.

18. "LA/OCBTC" (Trades Council) means the Los Angeles /Orange Counties Building and Construction Trades Council.

19. "Letter of Assent" means the document that each C/S/E (of any tier) must sign and submit to the Engineer or designated administrator, which formally binds them to adherence to all the forms, requirements and conditions of the PLA and this Policy.

20. "Liquidated Damages" means disputed funds withheld from the Prime Contractor until they are found to be in compliance, the contract is terminated, or the Covered Project is completed.

21. "Local Resident" means an individual whose primary residence is within the Tier 1 or Tier 2 zip code areas.

22. "Long-Term Unemployment" as defined by the Bureau of Labor Statistics means being jobless for 21 weeks or more, as defined.

24. “PLA” means the Project Labor Agreement entered into between the Harbor Department of the City of Los Angeles and Unions, applicable to Covered Projects.

25. “Policy” means this Harbor Department Construction Careers Policy.

26. “Port” means the Port of Los Angeles.

27. “Project Work” means construction work performed as part of a Covered Project.

28. “Prime Contractor” means any individual firm, partnership, owner-operator, or corporation, or combination thereof, including joint-ventures, that is an independent business enterprise and that has entered into a Construction Contract with the Harbor Department.

29. “Reporting Period” means the Harbor Department’s indicated reporting period for measuring the targeted hiring efforts of the C/S/Es. These reporting periods shall be at the Harbor Department’s determination of 10%, 30%, 50%, 70% and 90% construction completion phases.

30. “Targeted Hiring Guidelines for Contractors” means the document provided by the Department to assist C/S/E’s in implementing the targeted hiring procedures.

31. “Tier 1” means the zip codes identified in Article 7.4 of the PLA, which fall within an approximate ten mile radius of the Port and in which the rate of unemployment is in excess of 105% of the County of Los Angeles’ unemployment rate at the time of application and/or are within the area of Port-related operations and activity.

32. “Tier 2” means the zip codes within the City, identified in Article 7.5 of the PLA, that includes at least 2 census tracts (or a portion thereof) in which the median annual household income is less than $62,627 per and/or where the rate of unemployment is in excess of 100% of the County of Los Angeles’ unemployment rate at the time of application.

33. “Transitional Worker” means any individual whose primary place of residence is within a Tier 1 or Tier 2 zip code of the City of Los Angeles, and who prior to commencing work on a project has been certified as satisfying at least one of the following criteria:

    (1) having a Veteran status; having a documented history of involvement with the criminal justice system; being homeless; or

    (2) is an individual facing two or more of the following barriers to employment: having a household income less than 50% of the Los Angeles County median annual household income, receiving public assistance, lacking a GED or high school diploma, being a custodial single parent, suffering from long term unemployment, being emancipated from the foster care system, or being an

apprentice, in a program described in Section I Number 1 above , with less than 15% of the apprenticeship hours required to graduate to journey level.

34. “Underemployment” means a situation in which a worker (i) is employed only part-time when one needs and desires full-time employment, and/or (ii) is inadequately employed at a low-paying job that requires less skill or training than one possesses.

35. “Unemployment” means, in accordance with the Bureau of Labor Statistics definition, a situation in which a person does not have a job, has actively looked for work in the prior4 weeks, and is currently available for work and chronic Unemployment means unemployment lasting 27 weeks or longer.

36. “Union(s)” or “Signatory Unions” means the Los Angeles/Orange Counties Building and Construction Trades Council affiliated with the Building & Construction Trades Department (AFL/CIO) Craft International Unions or any other craft labor organization signatory to the PLA, acting in their own behalf and on behalf of their respective affiliates and member organizations whose names are subscribed hereto and who have through their officers executed the PLA.

SECTION II. COVERAGE OF PROJECTS

1. Covered Projects:

   (a) Except as provided otherwise herein, this Policy applies to all Covered Projects contained in the 10-Year CIP list, and awarded by the Board.

   (b) The Board may identify additional projects that are appropriate for coverage by the Policy and the PLA and include such projects by Board Resolution based on specific findings that such coverage will advance the Harbor Department’s legitimate proprietary and policy interests and promote the public interest in assuring completion of the project in question in a safe and cost-effective manner while minimizing or negating any adverse impact to the public welfare.

2. FHWA Projects: In the event that the Harbor Department determines that a project to which this Policy applies is an FHWA Project or other grant-funded project, the Department shall modify or not enforce any aspect of the Policy or PLA in accordance with a valid and binding instruction from the U.S. Department of Transportation or applicable funding authority.

SECTION III. IMPLEMENTATION

Prior to bid, Harbor Department staff shall review each Covered Project's bid specifications to ensure the following provisions are incorporated:

1. That the Request for Bid Package Authorization from the Executive Director specifies that the Covered Project contains the PLA and this Policy;

2. That the Bid specifications require all contractors submitting bids or proposals agree to the terms of the PLA and this Policy;

3. That a provision exists in the prime contract obligating the Prime Contractor and all its C/S/Es (of any tier) to comply with the terms of the PLA and this Policy and require compliance with PLA and Policy terms through a Letter of Assent or any other form or legally enforceable obligation to the City.

4. That the Construction Contract shall include provisions establishing liquidated damages amounts as described in Section VIII of this Policy.

SECTION IV. EXCLUSIONS AND/OR MODIFICATIONS

1. Funding Source: this Policy shall not apply to construction contracts or projects where the funding source has established provisions or rules that forbid the inclusion of a PLA and/or Local Hire provision. If the project is listed as part of the CIP, Harbor Department staff must present the reason(s) to the Board prior to final determination to exclude the Covered Project.

2. This Policy shall not apply to work performed by a C/S/E's executives, managerial employees, engineering employees, supervisors (except those covered by Schedule A collective bargaining agreements), office and clerical employees, or any other employee not performing construction craftwork.

3. Out-of-State Workers: hours worked by residents of states other than California shall not be included in calculation of total hours of project work for purposes of determining compliance with the Section 5 below.

SECTION V. TARGETED HIRING

1. Requirements for Covered Projects:

   The Prime Contractor shall ensure that the following targeted hiring requirements are met for each Covered Project:

(a) At least 30% of total work hours on each project shall be performed by Local Residents residing within Tier 1 as described in Article 7.4 of the PLA. If the 30% local hire is not attained utilizing Tier 1, the outreach shall expand to the Tier 2 as described in Article 7.5 of the PLA.

(b) At least 20% of total work hours on each project will be performed by apprentices, but the hours performed by apprentices in each individual craft shall not exceed the ratio to journeymen established by the applicable craft union's DAS approved apprenticeship standards. The parties agree that residents in the Tier 1 or 2 zip code areas will perform 50% of all apprenticeship hours worked on the Project.

(c) At least 10% of total hours worked on each project shall be performed by Transitional Workers residing within Tier 1 or Tier 2 zip code areas described in Articles 7.4 and 7.5 of the PLA respectively and the remaining zip code areas within the City of Los Angeles. These hours shall be applied towards the 30% Local Resident targeted hiring.

SECTION VI. RESPONSIBILITIES OF HARBOR DEPARTMENT, C/S/Es, UNIONS, and JOBS COORDINATOR

1. Harbor Department Responsibilities:

(a) Work with BCA or the Harbor Department's designated PLA administrator to monitor and enforce the targeted hiring measures of the PLA and Policy and issue Notices of Non-Compliance where appropriate.

(b) Review, approve or disapprove submitted Employment Hiring Plans prior to a C/S/E's estimated start of work. Approval of a C/S/E to work on a Covered Project is contingent on the C/S/E's submittal of an approved EHP.

(c) Ensure, prior to a C/S/E's approval to work on a Covered Project, its submittal of a duly signed Letter of Assent.

(d) Work with BCA or the Harbor Department's designated PLA administrator to post local hire status reports on the BCA website (http://bca.lacity.org) for Covered Projects.

(e) Inform the Board on a quarterly basis regarding the status of all Covered Projects.

(f) Determine any withholding from payments as disputed funds and make recommendations for assessment of Liquidated Damages.

2. Prime Contractor and C/S/Es:

   (a) Employment Hiring Plan (EHP): Prime Contractor shall ensure that its C/S/Es (of any tier), at least 20 business days prior to starting their work on the Covered Project, shall submit their plan(s) to the Harbor Department for approval by the Executive Director or his/her designee. Each C/S/E shall include in its EHP a description of how it will meet the targeted hiring requirements set forth in the PLA and Policy. No C/S/E (of any tier) shall be approved to work on a Covered Project without an approved EHP.

   (b) PLA and Policy: Prime Contractor shall ensure that its C/S/Es (of any tier), prior to start of work, (i) read and understand the requirements of the PLA and Policy; (ii) submit their Employment Hiring Plans at least 20 business days prior to their subcontractors' start of work and (iii) sign and submit their Letters of Assent prior to start of work. No C/S/E (of any tier) shall be approved to work on a Covered Project without having submitted a signed Letter of Assent.

   (c) Prior to start of work on the project, the Prime Contractor shall:

      (i) Recommend a Jobs Coordinator for approval by the Harbor Department.

      (ii) Upon Department's approval of its Jobs Coordinator, notify its subcontractor (of any tier) who the Jobs Coordinator is.

      (iii) Provide within 10-calendar days upon request by the Department or its designated representative, documentation of their Jobs Coordinator's qualifications.

   (d) The Prime Contractor and its C/S/Es (of any tier) shall coordinate with the Jobs Coordinator for services to support their efforts in meeting the targeted hiring percentages as described in Article 7 of the PLA and Section 5 of the Policy.

   (e) Pre-Job Conference: The Prime Contractor and its C/S/Es (of any tier), prior to start of work, shall hold a pre-job conference. The purpose of the pre-job conference is to determine craft personnel needs, schedule of work for the contract and all other matters as described in the PLA and the Policy. All work assignments shall be disclosed by the Prime Contractor and/or C/S/Es (of any tier) at the pre-job conference. Any formal jurisdictional dispute(s) raised under Article 14 of the PLA must be raised at the pre-job conference upon disclosure of the work assignments. If the Prime Contractor and/or C/S/Es intend to change the work assignment after the pre-job conference or to make an assignment of work not previously known, the Prime Contractor and/or C/S/Es must notify the appropriate affected craft union(s) prior to the commencement of work.

(f) Craft Request Form: The Prime Contractor and its C/S/Es (of any tier) shall only use the Craft Request Form (Attachment “C” of the PLA) and the procedures written therein to request workers from the affected Union(s). All C/S/Es must transmit a concurrent Craft Request transmittal of such request to the Jobs Coordinator.

(g) The Prime Contractor and its C/S/Es (of any tier) must satisfactorily document their contact with the Jobs Coordinator when the Unions have not been able to refer a Local Resident and/or Transitional Worker within the 48-hour window of referral.

(h) The Prime Contractor and its C/S/Es (of any tier) shall maintain proof of transmittal of the Craft Request forms to the Union hiring halls and Jobs Coordinator. Upon request by the Harbor Department or its designated representative, copies shall be provided within 10-calendar days of request.

(i) The Prime Contractor and its C/S/Es (of any tier) shall make available to the Harbor Department, BCA, or designated representatives, records and information that are deemed relevant to monitoring and enforcement of the provisions of the PLA and the Policy.

(j) The Prime Contractor and its C/S/Es (of any tier) shall cooperate fully and promptly with any inquiry or investigation the Harbor Department, BCA or designated representatives deem necessary in order to monitor compliance with the provisions of the PLA and the Policy.

(k) The Prime Contractor and its C/S/Es (of any tier), within 60 calendar days after concluding work on the Covered Project, shall submit to the Harbor Department a verified statement of the number of journeypersons and apprentices who worked on the project, their classifications and the hours worked (per California Labor Code 1777.5(e)).

Upon request of the BCA, or the Harbor Department, the Prime Contractor and its C/S/Es (of any tier) must provide documentation of their Local Resident, Apprentice and Transitional Workers targeted hiring participation level efforts within 10-calendar days of the request for documentation.

3. Union Responsibilities:

(a) Ensure that its dispatchers properly adhere to the use of the Craft Request Form and the procedures written therein.

(b) Refer Local Residents and/or Transitional Workers requested through the Craft Request Form regardless of their place on the hiring hall list and normal referral procedures.

(c) Exert their best efforts to recruit and identify Local Residents residing in Tier 1, and then Tier 2 zip code areas, as well as those referred by the Jobs Coordinator for entrance, indentureship into a union apprenticeship program, and assisting such individuals in graduating into eligible journeypersons.

(d) Upon receiving a request from a C/S/E for a Local Resident, exhaust the available list of individuals residing the Tier 1 zip codes before referring an individual residing in the Tier 2 zip codes.

(e) Track retention of Local Residents and/or Transitional Worker apprentices participating in joint Labor/Management apprenticeship programs and provide the Harbor Department with the necessary information as requested.

4. Jobs Coordinator:

(a) Criteria for Selecting a Jobs Coordinator: The Jobs Coordinator plays an integral part in the success of its partners in obtaining the targeted hiring percentages. It is the responsibility of the Prime Contractor to designate a Jobs Coordinator possessing, but not limited to, the following demonstrable experience and qualifications:

(i) Developing, creating, designing and marketing specific programs targeting Local Residents and/or Transitional Workers for construction opportunities at the Covered Project (e.g. handouts and fliers for “walk-ins” demonstrating program entrance procedures).

(ii) Coordinating services for contractors to assist in their local worker, transitional worker and apprentice utilization.

(iii) Educating and assisting contractors on incentives provided by State or federal programs for On-the-Job Training and employer tax credits.

(iv) Conducting orientations, job fairs and community outreach meetings to the local community.

(v) Providing supportive services such as skills training, child care, transportation, education remediation, assistance with union fees and tools.

(vi) Screening and certifying the Transitional Worker status of workers.

(vii) Establishing a referral and retention tracking mechanism for placed local and/or transitional workers and apprentices.

(viii) Networking with the various Work Source Centers, community and faith based organizations and other non-profit entities that provide qualified local workers and/or transitional workers.

(ix) Liaising with the various building trades crafts for referral and placement of local hire and/or transitional workers.

(b) Jobs Coordinator Responsibilities. The Jobs Coordinator shall:

(i) Coordinate the local hire referral process with the C/S/Es, Unions, City Work Source Centers, Faith and Community Based Organizations, and other organizations that can provide qualified local hire referrals.

(ii) Certify the Transitional Worker status.

(iii) Maintain a database of pre-qualified Local Residents for referral to work on a Covered Project and/or indentureship into a bona fide Labor/Management apprenticeship program.

(iv) Facilitate relationships among approved apprenticeship programs and the C/S/Es to enable prompt referral.

(v) Be the point of contact to provide information about available job opportunities on Covered Projects.

(vi) Educate and provide financial incentives information to the C/S/Es whom hire eligible workers under Work Opportunity Tax Credit (WOTC) and On-the-Job Training (OJT) and other benefits for which a C/S/E may be eligible based on their implementation of the Local Hire requirements.

(vii) Assist the C/S/Es with their local hire effort documentations and other reports as it relates to their Local Resident and/or Transitional Worker targeted hiring requirements.

(viii) Work closely with Harbor Department staff, the building trades and C/S/Es in achieving the targeted hiring.

Parties with responsibilities under the PLA and/or Policy, shall maintain those responsibilities regardless of the performance of the Jobs Coordinator at the tasks described in the PLA and the Policy.

SECTION VII. COMPLIANCE

The Harbor Department or its authorized representatives shall determine whether a Prime Contractor and its C/S/Es have complied with the requirements of the PLA and the Policy. The Prime Contractor is ultimately responsible for its and its C/S/Es (of any tier) compliance with the PLA and Policy requirements.

In determining compliance with the Apprentice Targeted Hiring, project hours performed by trades who do not have approved training under Chief of the Division of apprenticeship standards, and/or do not have written apprentice agreements under Chapter 4(commencing with Section 3070) will be excluded in calculations determining compliance with the Targeted Hiring requirements as applicable.

1. If, after the Harbor Department or its authorized representatives takes into account all applicable hours of Project Work performed up to that point in time of the Reporting Period, the targeted hiring requirements of the PLA and Policy have been satisfied for a Project, then the Prime Contractor and its subcontractors (of any tier) working on that Project shall be deemed to be in compliance.

2. If the targeted hiring requirements of the PLA and the Policy have not been satisfied for a Project, the Prime Contractor nonetheless may be deemed to be in compliance if it demonstrates both (a) that it and each of its C/S/Es (of any tier) have complied with all other requirements of the PLA and the Policy, and (b) that it and each C/S/E (of any tier) have either (i) satisfied the targeted hiring requirements of the PLA and this Policy with regard to the Project Work that it has performed or (ii) satisfactorily demonstrated the following:

    (a) Adherence to procedures contained in its Employment Hiring Plan as approved by the Harbor Department.

    (b) Requests to Unions, through Craft Request Forms, of sufficient numbers of Local Residents and Transitional Workers to meet the targeted hiring percentages set forth in Section 5 of the Policy for that C/S/E's Project Work.

    (c) Documented contact with the Jobs Coordinator in each instance when the relevant Union did not refer qualified Local Residents or Transitional Workers within the 48 hours following the C/S/E's request and the C/S/E's fair consideration of any Local Resident or Transitional Worker subsequently referred by the Jobs Coordinator.

    (d) Accurate records documenting the C/S/E's compliance efforts that include (but are not limited to):

        (i) A listing by name and address of all local recruitment sources contacted by the C/S/E;

        (ii) The date of the local recruitment contact and the identity of the person contacted, the trade and classification and number of hire referrals requested;

        (iii) The number of Local Residents and/or Transitional Workers hires made as a result of the contact;

(iv) The identity and address of the worker(s) hired pursuant to the contact;

(v) (v) Documentation when a referral was not hired (reason for non-hire) and/or premature termination.

SECTION VIII. ENFORCEMENT

The Prime Contractor for every Project agrees:

1. To be liable to the Harbor Department for Liquidated Damages as provided in this section;

2. That the Prime Contractor and its C/S/Es (of any tier) commitment to comply with the targeted hiring requirements of PLA and Policy is a material element of the Covered Project;

3. That the failure of the Prime Contractor and its C/S/Es (of any tier) to comply with the targeted hiring requirements in accordance with Section VII of this Policy will cause harm to the Harbor Department and the public which is significant and substantial but extremely difficult to quantify. The harm to the City includes the difficult-to-quantify harm that the community and its families suffer as a result of high unemployment and concentrated poverty;

4. Liquidated Damages: Due to the difficulty of estimation of damages for violation(s) of requirements of this Policy, Construction Contracts shall have provisions establishing liquidated damage to be assessed as follows:

   (a) The Prime Contractor shall pay liquidated damages equal to the average journeyperson project wage for each applicable work hour the Project fell short of the targeted hiring, or $200 per day, whichever is greater. When more than one targeted hiring requirement is not in compliance, the liquidated damages will not be assessed cumulatively; however, the highest violation will govern.

   (b) If the Covered Project's targeted hiring requirements are out of compliance during any Reporting Period, the Prime Contractor shall meet with the Harbor Department or their designated representative to develop a recovery plan for compliance. The Prime Contractor has until the next Reporting Period to effectuate the recovery compliance plan or Liquidated Damages shall be withheld.

   (c) Before Liquidated Damages are sought, the Prime Contractor shall be notified of the proposed Liquidated Damages and served with a summary of the information upon which the Liquidated Damages are based.

   (d) Liquidated Damages shall be withheld from all subsequent monthly progress payment request(s) as disputed funds until such time as Prime Contractor is

found to be in compliance, the Covered Project contract is terminated, or the Covered Project is completed.

(e) Should the Covered Project be terminated or completed before the Prime Contractor is found to be in compliance, the Engineer will evaluate the data and determine if Liquidated Damages are recommended. If the Engineer recommends assessment of Liquidated Damages, then the amount of the Liquidated Damages shall be returned to the fund from whence they came.

5. Liquidated Damages Appeal:

(a) A Prime Contractor that has received a Liquidated Damages assessment letter, which includes the targeted hiring data and Liquidated Damages calculations, may send a written appeal to the Engineer, within fourteen(14) calendar days. The Prime Contractor shall provide documentation supporting the appeal of the assessment.

(b) A meeting with the Engineer, Harbor Department staff, and the Prime Contractor will be held to present any relevant information. The Prime Contractor will be allowed to provide evidence that it has made all of the showings required under Section 7 of the Policy during the meeting. The decision of the Engineer on the Liquidated Damages assessment shall be final when rendered. The Contractor shall be notified of the final decision in writing by the Engineer.

(c) Failure to submit a written request for an appeal within the time frame stipulated in this Section will be deemed a waiver of the right to appeal and the recommendation for assessment of Liquidated Damages will be implemented.

6. Termination of Contract(s): Consistent, substantial violations of the PLA and/or this Policy by any Prime Contractor and/or C/S/E may result in a recommendation to the Board that the contract of the offending Prime Contractor and/or C/S/E be terminated per Section 00405 of the Master General Conditions.

SECTION IX. APPLICABLE LAW AND SEVERABILITY

The provisions of this Policy shall not be applicable where prohibited by federal or state law, or where the application would violate or be inconsistent with the terms and conditions of a grant or a contract with an agency of the United States or the State of California, or the valid instructions of an authorized representative of any of these agencies with respect to any grant or contract. If enforcement of any provision of this Policy is enjoined by an court of competent jurisdiction, the remaining provisions shall remain in full force and effect.

APPENDIX "B"

WASTE MANAGEMENT PLAN (WMP) AND SOLID WASTE DIVERSION AND DISPOSAL (SWDD) REPORT FORMS

ATTACHMENT A - INSTRUCTION SHEET FOR WASTE MANAGEMENT PLAN

1. For assistance, contact the Solid Resources Citywide Recycling Division of LA Sanitation & Environment at (213) 485-3460 or sansrcrd_cdrecycling@lacity.org.
2. Please print very clearly or type.
3. Waste Management Plan (WMP) is to be completed and approved prior to start of construction. Along with the WMP, the Contractor is to include a copy of the waste hauler's waste hauler permit.
4. Attachment A includes**:** **Part 1-**Inert Debris and **Part 2**-Metal, Wood, C&D waste, and all other materials.
5. Must meet ≥80% recycling rate in **Part 1** – Inert Debris such as concrete, asphalt, dirt, rock, and brick.
6. Must meet ≥65% recycling rate in **Part 2** – Metal, wood, green waste, C&D waste, and all other materials.
7. The information required includes but is not limited to, the following:
    a. Contractor and project work order number.
    b. Permitted solid waste hauler(s) and permit number(s).
    c. Facility names and addresses that are to process the C&D materials.
    d. Estimated quantities of **all** C&D materials listed in **tons**.
    e. Verify whether the Waste Management Plan meets the minimum recycling requirement of 80% for inert debris in Part 1. Verify whether the Waste Management Plan meets the minimum recycling requirement of and 65% for other C&D waste.
8. **Calculating recycling and disposal for mixed C&D waste taken to a certified processing facility: the total tons taken to certified processing facility times the recycling rate = amount to be recycled. Total tons taken to facility minus amount to be recycled = amount for disposal. E.g. 100 tons x 0.80 (80% recycling rate) = 80 tons diverted and 20 tons disposed.

ATTACHMENT A

WASTE MANAGEMENT PLAN (PART 1-INERT DEBRIS)

Project Title:	W. O. Number:	Date Submitted:
Name & Title of Responsible Person:	Signature:	
Permitted Waste Hauler Name(s) and Permit No(s):		

Material	Facility Name and Address	Tons Diverted	Tons Disposed
RECYCLING/REUSE			
Asphalt			
Concrete			
Brick			
Dirt			
Mixed Inerts			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Other (Describe)			
Other (Describe)			
Other (Describe)			
DIVERSION AND DISPOSAL TOTALS =			

Percent Recycling = $\frac{\text{Total diversion}}{\text{Total diversion + Total disposed}}$ X 100 =

Percent Recycling = $\frac{\quad}{+}$ X 100 = %

Does Part 1 (Inert Debris) of this Waste Management Plan meet the minimum recycling requirement of 80% for Inert Debris?

YES ☐ NO ☐

ATTACHMENT A

WASTE MANAGEMENT PLAN (PART 2-ALL OTHER C&D WASTE)

W. O. No.:	Date Submitted:

Contractors Name:

Street address:

City, State, Zip:

Phone: Fax: Email:

Permitted Waste Hauler Name(s) and Permit No(s):

Material	Facility Name and Address	Tons Diverted	Tons Disposed
RECYCLING/REUSE			
Glass			
Wood/Greenwaste			
Metal			
Cardboard			
Other (Describe)			
DISPOSAL			
Other (Describe)			
Other (Describe)			
CERTIFIED PROCESSING**			
Mixed C&D Waste			
Mixed C&D Waste			
DIVERSION AND DISPOSAL TOTALS =			

$$\text{Percent Recycling} = \frac{\text{Total Diversion}}{\text{Total Diversion} + \text{Total Disposed}} \times 100 =$$

$$\text{Percent Recycling} = \frac{\qquad}{+} \times 100 = \quad \%$$

Does Part 2 (All Other C&D Waste) of this Waste Management Plan meet the minimum recycling requirement of 65% for all other C&D Waste? YES ☐ NO ☐

****Recycling tonnages for mixed C&D waste taken to a certified processing facility = total tonnage x recycling rate. Remaining tonnage counts as disposal. Example: 200 tons x 0.80 = 160 tons diverted and 40 tons disposed.**

EXAMPLE WASTE MANAGEMENT PLAN
ATTACHMENT A
WASTE MANAGEMENT PLAN (PART 1-INERT DEBRIS)

Project Title: *Big Street Overcrossing*	W. O. Number: *XYZ12345*	Date Submitted: *01/01/2020*
Name & Title of Responsible Person: *Bobby Lee, Project Manager*	Signature: *Bobby Lee*	
Permitted Waste Hauler Name(s) and Permit No(s): *Grava Gravel Haulers, PER-22-333*		

Material	Facility Name and Address	Tons Diverted	Tons Disposed
RECYCLING/REUSE			
Asphalt	*Inert Recycling Facility A,888 Valle Valley, CA 12345*	*600*	
Concrete	*Inert Recycling Facility A,888 Valle Valley, CA 12345*	*55*	
Brick	*Inert Recycling Facility B, 777 Valle Valley,CA 12345*	*6*	
Dirt	*The Landscaping Co., 222 Valle Valley, CA 12345*	*200*	
Mixed Inerts			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Other (Describe)			
Other (Describe)			
Other (Describe)			
	DIVERSION AND DISPOSAL TOTALS =	*861*	

$$\text{Percent Recycling} = \frac{\text{Total diversion}}{\text{Total diversion} + \text{Total disposed}} \times 100 =$$

$$\text{Percent Recycling} = \frac{861}{861 + 0} \times 100 = 100.00\ \%$$

Does Part 1 (Inert Debris) of this Waste Management Plan meet the minimum recycling requirement of 80% for Inert Debris?

YES ☒ NO ☐

ATTACHMENT A

WASTE MANAGEMENT PLAN (PART 2-ALL OTHER C&D WASTE)

W. O. No.: XYZ12345	Date Submitted: 01/01/2020

Contractors Name: Awesome Engineering Contractors

Street address: Circular Drive

City, State, Zip: *Ciudad City, CA 12345*

Phone: (123) 456-7891 Fax: (321) 123-4567 Email: AEC@zmail.com

Permitted Waste Hauler Name(s) and Permit No(s):

Material	Facility Name and Address	Tons Diverted	Tons Disposed
RECYCLING/REUSE			
Glass			
Wood/Greenwaste	*The Landscaping Co., 222 Valle Valley, CA 12345*	*50*	
Metal	*Kim Loai Metal Recycling, 333 Camino St, CA 12345*	*6*	
Cardboard			
Other (Describe)			
DISPOSAL			
Other (Describe)	*Municipal Landfill, 456 Montana Mountains, CA 12345*		*15*
Other (Describe)			
CERTIFIED PROCESSING**			
Mixed C&D Waste	*Certified Processor A (Recycling Rate = 75% = 0.75)*	*18.75*	*6.25*
Mixed C&D Waste	*25 tons x 0.75 = 18.75 tons recycled and 6.25 tons disposed*		
	DIVERSION AND DISPOSAL TOTALS =	*74.75*	*21.25*

$$\text{Percent Recycling} = \frac{\text{Total Diversion}}{\text{Total Diversion} + \text{Total Disposed}} \times 100 =$$

$$\text{Percent Recycling} = \frac{74.75}{74.75 + 21.25} \times 100 = 77.86\ \%$$

Does Part 2 (All Other C&D Waste) of this Waste Management Plan meet the minimum recycling requirement of 65% for all other C&D Waste? YES ☒ NO ☐

****Recycling tonnages for mixed C&D waste taken to a certified processing facility = total tonnage x recycling rate. Remaining tonnage counts as disposal. Example: 200 tons x 0.80 = 160 tons diverted and 40 tons disposed.**

ATTACHMENT B - INSTRUCTION SHEET FOR SOLID WASTE DIVERSION & DISPOSAL REPORT

1. For assistance, contact the Solid Resources Citywide Recycling Division of LA Sanitation & Environment at (213) 485-3460 or sansrcrd_cdrecycling@lacity.org.
2. Please print very clearly or type.
3. All **three (3) pages** of Attachment B and **all** manifests, weight tickets, receipts, reports, invoices, and other supporting documents specifically identifying the projects, the recyclables and solid waste generated by the project, and where the material was sent must be submitted to the inspector with each application for progress payment.
4. Attachment B includes**: Part 1** - Inert Debris, **Part 2** - All Other C&D Waste, **Part 3** - Project Cumulative Total.
5. Must meet ≥80% recycling rate for Inert Debris by end of construction.
6. Must meet ≥65% recycling rate in Metal, wood, green waste, C&D waste, and all other materials by end of construction.
7. In **Part 1 and Part 2,** record:
    a. Material type generated.
    b. Permitted solid waste hauler(s) and permit number(s).
    c. Facility names and addresses where materials were delivered.
    d. Tons diverted/disposed for a particular pay period.
    e. Verify whether Part 1 meets the minimum recycling requirement of 80% for Inert Debris. Verify whether Part 2 meets the minimum recycling requirement of 65% for other C&D Waste. Contractor is to meet the minimum recycling requirements by the end of construction.
8. In **Part 3**, record:
    a. Pay period beginning and period ending
    b. Diversion and disposal for the pay period and cumulative diversion and disposal for the project
    c. Cumulative waste generated (diversion + disposal) for the project
    d. Cumulative recycling rate for the project (diverted/generated)*100
9. The information required includes but is not limited to, the following:
    a. Contractor and project identification information
    b. Actual quantities of **all** materials listed in tons
10. Source-separated material taken to a recycling facility or certified processing facility is 100% recycled.
11. **Calculating recycling and disposal for mixed material taken to a certified processing facility: the total tons taken to certified processing facility times the recycling rate = amount to be recycled. Total taken to facility minus amount to be recycled = amount for disposal. E.g. 100 tons x 0.80 (80% recycling rate) = 80 tons diverted and 20 tons disposed.

ATTACHMENT B

SOLID WASTE DIVERSION AND DISPOSAL REPORT
PART 1 OF 3 - INERT DEBRIS

Project Title:	W. O. Number:	Date Submitted:	Progress Payment #
Company Name:	Daytime Phone Number:		
Period Covered In This Report: From:	To:		
Permitted Waste Hauler Name(s) and Permit No(s):			

Material	Facility Name and Address	Tons diverted	Tons Disposed
RECYCLING/REUSE			
Asphalt			
Concrete			
Brick			
Dirt			
Mixed Inerts			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Other (Describe)			
Other (Describe)			
Other (Describe)			
DIVERSION AND DISPOSAL TOTALS *	**=**		

***Copy the Tons Diverted and Tons Disposed totals to Part 3 Project Cumulative Total. Each Report needs to have the totals from every previous Diversion and Disposal Report documented on it, as well as the totals from this Report.**

ATTACHMENT B

SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 2 OF 3 - ALL OTHER C&D WASTE

W. O. Number:	Date Submitted:

Permitted Waste Hauler Name(s) and Permit No(s):

Material	Facility Name and Address	Tons Recycled	Tons Disposed
RECYCLING/REUSE			
Metal			
Wood / Lumber			
Greenwaste / Landscaping			
Glass			
Cardboard			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Mixed Solid Waste			
Other (Describe)			
Other (Describe)			
CERTIFIED PROCESSING**			
Mixed C&D Waste			
Mixed C&D Waste			
Mixed C&D Waste			
DIVERSION AND DISPOSAL TOTALS* **=**			

***Copy the Tons Diverted and Tons Disposed totals to Part 3 Project Cumulative Total. Each Report needs to have the totals from every previous Diversion and Disposal Report documented on it, as well as the totals from this Report.**

****Recycling tonnages for mixed C&D waste taken to a certified facility = total tonnage x recycling rate. Remaining tonnage counts as disposal. Example: 200 tons x 0.80 = 160 tons diverted and 40 tons disposed.**

ATTACHMENT B

SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 3 OF 3 - PROJECT CUMULATIVE TOTAL

W. O. Number:				Date Submitted:			
Period Beginning	Period Ending	*Period Diversion	Cumulative Project Diversion, **R**	*Period Disposal	Cumulative Project Disposal, **D**	Cumulative Waste **G**enerated **R + D**	Cumulative Recycling % (**R**/**G**)100
INERT DEBRIS CUMULATIVE PROJECT HISTORY, REFER TO ATTACHMENT B PART 1 OF 3							
ALL OTHER C&D WASTE CUMULATIVE PROJECT HISTORY, REFER TO ATTACHMENT B PART 2 OF 3							

Does this Report meet the minimum recycling requirement of 80% for Inert Debris and 65% for All Other C&D Waste? Contractor is to meet the minimum recycling requirements of 80% for Inert Debris and 65% for All Other C&D Waste by the end of construction.

YES ☐ NO ☐

Name & title of person responsible for the information in this form:	Signature:

***From appropriate Part 1 or 2 during each period.**

Each Attachment B Part III Report needs to have the Tons Diverted and Tons Disposed from every previous Diversion and Disposal Report documented in it, as well as the totals from this Report. Attach another Part III form and continue information if more rows are needed.

EXAMPLE SOLID WASTE DIVERSION AND DISPOSAL REPORT FOR PROGRESS PAYMENT #1

ATTACHMENT B

SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 1 OF 3 - INERT DEBRIS

Project Title: *Big Street Overcrossing*	W. O. Number: *XYZ12345*	Date Submitted: *03/15/2020*	Progress Payment # *1*
Company Name: *Awesome Engineering Contractors*		Daytime Phone Number: *(123)456-7891*	
Period Covered In This Report: From: *2/1/2020*		To: *2/28/2020*	
Permitted Waste Hauler Name(s) and Permit No(s): *Grava Gravel Haulers, PER-22-333*			

Material	Facility Name and Address	Tons diverted	Tons Disposed
RECYCLING/REUSE			
Asphalt	*Inert Recycling Facility A,888 Valle Valley, CA 12345*	*45*	
Concrete	*Inert Recycling Facility A,888 Valle Valley, CA 12345*	*10*	
Brick	*Inert Recycling Facility B, 777 Valle Valley, CA 12345*	*6*	
Dirt	*The Landscaping Co., 222 Valle Valley, CA 12345*	*150*	
Mixed Inerts			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Other (Describe)			
Other (Describe)			
Other (Describe)			
DIVERSION AND DISPOSAL TOTALS * =		*211*	

***Copy the Tons Diverted and Tons Disposed totals to Part 3 Project Cumulative Total. Each Report needs to have the totals from every previous Diversion and Disposal Report documented on it, as well as the totals from this Report.**

ATTACHMENT B

SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 2 OF 3 - ALL OTHER C&D WASTE

W. O. Number: *XYZ12345*	Date Submitted: *03/15/2020*

Permitted Waste Hauler Name(s) and Permit No(s): *Grava Gravel Haulers, PER-22-333*

Material	Facility Name and Address	Tons Recycled	Tons Disposed
RECYCLING/REUSE			
Metal	*Kim Loai Metal Recycling, 333 Camino St, CA 12345*	*2*	
Wood / Lumber	*The Landscaping Co., 222 Valle Valley, CA 12345*	*15*	
Greenwaste / Landscaping			
Glass			
Cardboard			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Mixed Solid Waste	*Municipal Landfill, 456 Montana Mountains, CA 12345*		*1*
Other (Describe)			
Other (Describe)			
CERTIFIED PROCESSING**			
Mixed C&D Waste	*Certified Facility A (Recycling Rate = 75% = 0.75)*	*9*	*3*
Mixed C&D Waste	*12 tons x 0.75 = 9.00 tons recycled and 3.00 tons disposed*		
Mixed C&D Waste			
Mixed C&D Waste			
DIVERSION AND DISPOSAL TOTALS* =		*26*	*4*

***Copy the Tons Diverted and Tons Disposed totals to Part 3 Project Cumulative Total. Each Report needs to have the totals from every previous Diversion and Disposal Report documented on it, as well as the totals from this Report.**

****Recycling tonnages for mixed C&D waste taken to a certified facility = total tonnage x recycling rate. Remaining tonnage counts as disposal. Example: 200 tons x 0.80 = 160 tons diverted and 40 tons disposed.**

ATTACHMENT B

INERT SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 3 OF 3 - PROJECT CUMULATIVE TOTAL

W. O. Number: *XYZ12345*	Date Submitted: *03/15/2020*

Period Beginning	Period Ending	*Period Diversion	Cumulative Project Diversion, **R**	*Period Disposal	Cumulative Project Disposal, **D**	Cumulative Waste **G**enerated **R + D**	Cumulative Recycling % (**R**/**G**)100
INERT DEBRIS CUMULATIVE PROJECT HISTORY, REFER TO ATTACHMENT B PART 1 OF 3							
2/1/2020	*2/28/2020*	*211*	*211*	*0*	*0*	*211*	*100(211/211)= 100.00*
ALL C&D OTHER WASTE CUMULATIVE PROJECT HISTORY, REFER TO ATTACHMENT B PART 2 OF 3							
2/1/2020	*2/28/2020*	*26*	*26*	*4*	*4*	*26+4=30*	*100(26/30)= 86.67*

Does this Report meet the minimum recycling requirement of 80% for Inert Debris and 65% for All Other C&D Waste? Contractor is to meet the minimum recycling requirements of 80% for Inert Debris and 65% for All Other C&D Waste by the end of construction.

YES ☒ NO ☐

Name & title of person responsible for the information in this form: *Bobby Lee, Project Manager*	Signature: *Bobby Lee*

***From appropriate Part 1 or 2 during each period.**
Each Attachment B Part III Report needs to have the Tons Diverted and Tons Disposed from every previous Diversion and Disposal Report documented in it, as well as the totals from this Report.
Attach another Part III form and continue information if more rows are needed.

EXAMPLE SOLID WASTE DIVERSION AND DISPOSAL REPORT FOR PROGRESS PAYMENT #2

ATTACHMENT B

SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 1 OF 3 - INERT DEBRIS

Project Title: *Big Street Overcrossing*	W. O. Number: *XYZ12345*	Date Submitted: *04/15/2020*	Progress Payment # *2*

Company Name: *Awesome Engineering Contractors* Daytime Phone Number*: (123)456-7891*

Period Covered In This Report:

From: *3/1/2020* To: *3/31/2020*

Permitted Waste Hauler Name(s) and Permit No(s): *Grava Gravel Haulers, PER-22-333*

Material	Facility and Location	Tons diverted	Tons Disposed
RECYCLING/REUSE			
Asphalt	*Inert Recycling Facility A,888 Valle Valley, CA 12345*		
Concrete	*Inert Recycling Facility A,888 Valle Valley, CA 12345*	*300*	
Brick	*Inert Recycling Facility B, 777 Valle Valley, CA 12345*		
Dirt	*The Landscaping Co., 222 Valle Valley, CA 12345*	*100*	
Other (Describe)			
Other (Describe)			
DISPOSAL			
Other (Describe)			
Other (Describe)			
Other (Describe)			
DIVERSION AND DISPOSAL TOTALS * =		*400*	

***Copy the Tons Diverted and Tons Disposed totals to Part 3 Project Cumulative Total. Each Report needs to have the totals from every previous Diversion and Disposal Report documented on it, as well as the totals from this Report.**

ATTACHMENT B

SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 2 OF 3 - ALL OTHER C&D WASTE

W. O. Number: *XYZ12345*	Date Submitted: *04/15/2020*

Permitted Waste Hauler Name(s) and Permit No(s): *Grava Gravel Haulers, PER-22-333*

Material	Facility and Location	Tons Recycled	Tons Disposed
RECYCLING/REUSE			
Metal	*Kim Loai Metal Recycling, 333 Camino St, CA 12345*	*1*	
Wood / Lumber	*The Landscaping Co., 222 Valle Valley, CA 12345*	*16*	
Greenwaste / Landscaping			
Glass			
Cardboard			
Other (Describe)			
Other (Describe)			
DISPOSAL			
Mixed Solid Waste	*Municipal Landfill, 456 Montana Mountains, CA 12345*		*1*
Other (Describe)			
Other (Describe)			
Other (Describe)			
CERTIFIED PROCESSING**			
Mixed C&D Waste	*Certified Processor A (Recycling Rate = 75% = 0.75)*	*7.5*	*3.5*
Mixed C&D Waste	*10 tons x 0.75 = 7.5 tons recycled and 2.5 tons disposed*		
Mixed C&D Waste			
Mixed C&D Waste			
DIVERSION AND DISPOSAL TOTALS* =		*24.5*	*4.5*

***Copy the Tons Diverted and Tons Disposed totals to Part 3 Project Cumulative Total. Each Report needs to have the totals from every previous Diversion and Disposal Report documented on it, as well as the totals from this Report.**

****Recycling tonnages for mixed C&D waste taken to a certified facility = total tonnage x recycling rate. Remaining tonnage counts as disposal. Example: 200 tons x 0.80 = 160 tons diverted and 40 tons disposed.**

ATTACHMENT B

INERT SOLID WASTE DIVERSION AND DISPOSAL REPORT

PART 3 OF 3 - PROJECT CUMULATIVE TOTAL

W. O. Number: *XYZ12345*	Date Submitted: *04/15/2020*

Period Beginning	Period Ending	*Period Diversion	Cumulative Project Diversion, **R**	*Period Disposal	Cumulative Project Disposal, **D**	Cumulative Waste **G**enerated **R + D**	Cumulative Recycling % (**R**/**G**)100
INERT DEBRIS CUMULATIVE PROJECT HISTORY, REFER TO ATTACHMENT B PART 1 OF 3							
2/1/2020	*2/28/2020*	*211*	*211*	*0*	*0*	*211*	*100(211/211)= 100.00*
3/1/2020	*3/31/2020*	*400*	*211+400=611*	*0*	*0*	*211+400=611*	*100(611/611)= 100.00*
ALL OTHER C&D WASTE CUMULATIVE PROJECT HISTORY, REFER TO ATTACHMENT B PART 2 OF 3							
2/1/2020	*2/28/2020*	*26*	*26*	*4*	*4*	*26+4=30*	*100(26/30)= 86.67*
3/1/2020	*3/31/2020*	*24.5*	*26+24.5=50.5*	*4.5*	*4+4.5=8.5*	*50.5+8.5=59*	*100(50.5/59)= 85.59*

Does this Report meet the minimum recycling requirement of 80% for Inert Debris and 65% for All Other C&D Waste? Contractor is to meet the minimum recycling requirements of 80% for Inert Debris and 65% for All Other C&D Waste by the end of construction.

YES ☒ NO ☐

Name & title of person responsible for the information in this form: *Bobby Lee, Project Manager*	Signature: *Bobby Lee*

***From appropriate Part I or II during each period.**
Each Attachment B Part III Report needs to have the Tons Diverted and Tons Disposed from every previous Diversion and Disposal Report documented in it, as well as the totals from this Report.
Attach another Part III form and continue information if more rows are needed.

APPENDIX "C"

ENVIRONMENTAL COMPLIANCE TRACKING (ECT) FORM

THE PORT OF LOS ANGELES

Environmental Compliance Tracking (ECT) Form

PORT OF LOS ANGELES CONSTRUCTION DIVISION

HARBOR ADMININSTRATION BUILDING HVAC REPLACEMENT

SPECIFICATION No. 2837 **CONTRACT No. ####**

Contractor			ECT No.:	

Section I: Equipment Information

Equipment Description	Equipment Make and Model No.	Est. Hours on Project

On-Road Equipment ☐	Engine Model Year	License Plate No.	

Non-Road Construction Equipment ☐	Tier Level	CARB EIN	Engine Family Name	Executive Order No. (Attach Form)	
Harbor Craft Equipment ☐	Tier Level	CARB UVI	Engine Family Name	Fleet Operator	

Section II: Compliance Status

Does the above piece of equipment comply with the environmental measures, including but not limited to regulatory compliance certifications, mitigation measures and project conditions, set forth in the contract? ***If no, please state circumstance in Section III.***

Yes ☐ No ☐

Section III: Non-Compliance Circumstance

☐	A piece of specialized equipment is unavailable, in a controlled form, or within the required Tier level, within the state of California, including through a leasing agreement.
☐	Contractor has applied for necessary incentive funds to put controls on a piece of uncontrolled equipment planned for use on the project, but the application process is not yet approved, or the application has been approved, but funds are not yet available.
☐	Contractor has ordered a control device for a piece of equipment planned for use on the Project, or Contractor has ordered a new piece of controlled equipment to replace the uncontrolled equipment, but that order has not been completed by the manufacturer or dealer. In addition, for this exemption to apply, the Contractor must attempt to lease controlled equipment to avoid using uncontrolled equipment, but no dealer within 200 miles of the Project has the controlled equipment available for lease.

Section IV: Steps Taken (Explain Below)

I certify to the best of my knowledge that the above information is true and in accordance with the contract requirements.

Signature _____ Date _____

SUBMIT FORM ONLINE

APPENDIX "D"

HVAC CONTROL POINTS LIST

HVAC CONTROLS POINTS LIST

	System/Location	Point	Description	Type	Units	Value Range	Setpoint Range
	Built-up Air Handler Unit:						
1	OSA	T	OSA Temperature	AI	Deg F	30-110	
2	OSA	H	OSA Relative Humidity	AI	% RH	0-100	
3	AHU	SS	Supply Fan 1 VFD Start/Stop	DO			
4	AHU	SC	Supply Fan 1 VFD Speed	AO	%	0-100	
5	AHU	Comm	Supply Fan 1 VFD Speed Feedback	C	%	0-100	
6	AHU	Comm	Supply Fan 1 VFD Alarm	C			
7	AHU	Comm	Supply Fan 1 VFD kW	C	kW		
8	AHU	Comm	Supply Fan 1 VFD kWh	C	kWh		
9	AHU	SS	Supply Fan 2 VFD Start/Stop	DO			
10	AHU	SC	Supply Fan 2 VFD Speed	AO	%	0-100	
11	AHU	Comm	Supply Fan 2 VFD Speed Feedback	C	%	0-100	
12	AHU	Comm	Supply Fan 2 VFD Alarm	C			
13	AHU	Comm	Supply Fan 2 VFD kW	C	kW		
14	AHU	Comm	Supply Fan 2 VFD kWh	C	kWh		
15	AHU	SS	Return Fan 1 VFD Start/Stop	DO			
16	AHU	SC	Return Fan 1 VFD Speed	AO	%	0-100	
17	AHU	Comm	Return Fan 1 VFD Speed Feedback	C	%	0-100	
18	AHU	Comm	Return Fan 1 VFD Alarm	C			
19	AHU	Comm	Return Fan 1 VFD kW	C	kW		
20	AHU	Comm	Return Fan 1 VFD kWh	C	kWh		
21	AHU	SS	Return Fan 2 VFD Start/Stop	DO			
22	AHU	SC	Return Fan 2 VFD Speed	AO	%	0-100	
23	AHU	Comm	Return Fan 2 VFD Speed Feedback	C	%	0-100	
24	AHU	Comm	Return Fan 2 VFD Alarm	C			
25	AHU	Comm	Return Fan 2 VFD kW	C	kW		
26	AHU	Comm	Return Fan 2 VFD kWh	C	kWh		
27	AHU	T	Return Air Temperature	AI	Deg F	40-90	
28	AHU	T	Mixed Air Temperature	AI	Deg F	40-90	
29	AHU	T	Supply Air 1 Temperature	AI	Deg F	40-90	
30	AHU	T	Supply Air 2 Temperature	AI	Deg F	40-90	
31	AHU	F	Minimum Outside Airflow	AI	CFM	0-30000	
32	AHU	F	Outside Air Economizer Airflow	AI	CFM	0-70000	
33	AHU	VA	Relief Air Damper	AO	VDC	0-10	
34	AHU	VA	Return Air Damper	AO	VDC	0-10	
35	AHU	VA	Minimum Outside Air Damper	AO	VDC	0-10	
36	AHU	VA	Economizer Damper	AO	VDC	0-10	
37	AHU	DP	Filter Differential Pressure	AI	Inches WC	0-1.2	0.8
38	AHU	DP	Building Pressure Loc TBD	AI	Inches WC	-0.10 to 0.10	0.05
39	AHU	DP	Building Pressure Loc TBD	AI	Inches WC	-0.10 to 0.10	0.05
40	AHU	DP	Supply Air 1 Duct Static Pressure	AI	Inches WC	0-1.5	0.2-1.2
41	AHU	DP	Supply Air 2 Duct Static Pressure	AI	Inches WC	0-1.5	0.2-1.2
42	Refrigerant Plant (All points from plant controller via Modbus):						

HVAC CONTROLS POINTS LIST

	System/Location	Point	Description	Type	Units	Value Range	Setpoint Range
43	RC-1	Comm	Compressor 1 VFD Start/Stop	C			
44	RC-1	Comm	Compressor 1 VFD Status	C			
45	RC-1	Comm	Compressor 1 VFD Alarm	C			
46	RC-1	Comm	Compressor 1 VFD kW	C	kW		
47	RC-1	Comm	Compressor 1 VFD kWh	C	kWh		
48	RC-1	Comm	Compressor 1 Suction Temperature	C	Deg F	0-50	
49	RC-1	Comm	Compressor 1 Suction Pressure	C	PSIG		
50	RC-1	Comm	Compressor 1 Discharge Temp	C	Deg F	100-200	
51	RC-1	Comm	Compressor 1 Discharge Pressure	C	PSIG		
52	RC-2	Comm	Compressor 2 VFD Start/Stop	C			
53	RC-2	Comm	Compressor 2 VFD Status	C			
54	RC-2	Comm	Compressor 2 VFD Alarm	C			
55	RC-2	Comm	Compressor 2 VFD kW	C	kW		
56	RC-2	Comm	Compressor 2 VFD kWh	C	kWh		
57	RC-2	Comm	Compressor 2 Suction Temperature	C	Deg F	0-50	
58	RC-2	Comm	Compressor 2 Suction Pressure	C	PSIG		
59	RC-2	Comm	Compressor 2 Discharge Temp	C	Deg F	100-200	
60	RC-2	Comm	Compressor 2 Discharge Pressure	C	PSIG		
61	RC-3	Comm	Compressor 3 VFD Start/Stop	C			
62	RC-3	Comm	Compressor 3 VFD Status	C			
63	RC-3	Comm	Compressor 3 VFD Alarm	C			
64	RC-3	Comm	Compressor 3 VFD kW	C	kW		
65	RC-3	Comm	Compressor 3 VFD kWh	C	kWh		
66	RC-3	Comm	Compressor 3 Suction Temperature	C	Deg F	0-50	
67	RC-3	Comm	Compressor 3 Suction Pressure	C	PSIG		
68	RC-3	Comm	Compressor 3 Discharge Temp	C	Deg F	300-200	
69	RC-3	Comm	Compressor 3 Discharge Pressure	C	PSIG		
70	EC-1	Comm	Fan VFD Start/Stop	C			
71	EC-1	Comm	Fan VFD Status	C			
72	EC-1	Comm	Fan VFD Alarm	C			
73	EC-1	Comm	Fan VFD kW	C	kW		
74	EC-1	Comm	Fan VFD kWh	C	kWh		
75	EC-1	Comm	Spray Pump Start/Stop	C			
76	EC-1	Comm	Spray Pump Status	C			
77	CC-1	Comm	Coil 1 Superheat Temperature	C	Deg F	0-50	
78	CC-1	Comm	Coil 2 Superheat Temperature	C	Deg F	0-50	
79	CC-1	Comm	Coil 3 Superheat Temperature	C	Deg F	0-50	
80	CC-2	Comm	Coil 1 Superheat Temperature	C	Deg F	0-50	
81	CC-2	Comm	Coil 2 Superheat Temperature	C	Deg F	0-50	
82	CC-2	Comm	Coil 3 Superheat Temperature	C	Deg F	0-50	
83	Building Exhaust Fans:						
84	EF-1	SS	Exhaust Fan Start/Stop	DO			
85	EF-1	S	Exhaust Fan Status	DI			
86	Parking Exhaust Fans:						
87	EF-2	SS	Exhaust Fan Start/Stop	DO			
88	EF-2	S	Exhaust Fan Status	DI			
89	EF-3	SS	Exhaust Fan Start/Stop	DO			
90	EF-3	S	Exhaust Fan Status	DI			

HVAC CONTROLS POINTS LIST

	System/Location	Point	Description	Type	Units	Value Range	Setpoint Range
91	EF-4	SS	Fan Start/Stop	DO			
92	EF-4	S	Fan Status	DI			
93	Transformer Room Supply Fan:						
94	SF-3	SS	Fan Start/Stop	DO			
95	SF-3	S	Fan Status	DI			
96	SF-3	T	Room Temperature	AI	Deg F	40-90	
97	VAV Boxes (cooling only, no CO2):						
98	VAV-xxx	VA	VAV Damper	AO	VDC		
99	VAV-xxx	F	Air Flow Rate	AI	CFM		
100	VAV-xxx	T	Room Temperature	AI	Deg F	50-90	68-78
101	VAV-xxx	T	Supply Air Temperature	C	Deg F	40-100	55-90
102	VAV Boxes (reheat, no CO2):						
103	VAV-xxx	VA	VAV Damper	AO	VDC		
104	VAV-xxx	F	Air Flow Rate	AI	CFM		
105	VAV-xxx	T	Room Temperature	AI	Deg F	50-90	68-78
106	VAV-xxx	VA	Reheat Valve	AO	VDC		
107	VAV-xxx	T	Supply Air Temperature	AI	Deg F	40-100	55-90
108	VAV Boxes (cooling only, CO2):						
109	VAV-xxx	VA	VAV Damper	AO	VDC		
110	VAV-xxx	F	Air Flow Rate	AI	CFM		
111	VAV-xxx	T	Room Temperature	AI	Deg F	50-90	68-78
112	VAV-xxx	T	Supply Air Temperature	AI	Deg F	40-100	55-90
113	VAV-xxx	SA	Room Temperature Setpoint Adjust	AI			
114	VAV-xxx	CO2	Room CO_2 Level	AI	ppm	400-1400	1000
115	VAV Boxes (reheat, CO2):						
116	VAV-xxx	VA	VAV Damper	AO	VDC		
117	VAV-xxx	F	Air Flow Rate	AI	CFM		
118	VAV-xxx	T	Room Temperature	AI	Deg F	50-90	68-78
119	VAV-xxx	T	Supply Air Temperature	AI	Deg F	40-100	55-90
120	VAV-xxx	SA	Room Temperature Setpoint Adjust	AI			
121	VAV-xxx	CO2	Room CO_2 Level	AI	ppm	400-1400	1000
122	Chiller Plant:						
123	CH-1	SS	Chiller 1 Start/Stop	DO			
124	CH-1	VA	Chiller 1 Isolation Valve Command	DO			
125	CH-1	ES	Chiller 1 Isolation Valve Position	DI			
126	CH-1	DPT	Chiller 1 CHW Differential Pressure	AI	PSID		
127	CH-1	T	Chiller 1 CHW Supply Temperature	AI	Deg F	35-70	45-60
128	CH-1	COMM	Points from panel TBD				
129	CH-2	SS	Chiller 2 Start/Stop	DO			
130	CH-2	VA	Chiller 2 Isolation Valve Command	DO			
131	CH-2	ES	Chiller 2 Isolation Valve Position	DI			
132	CH-2	DPT	Chiller 2 CHW Differential Pressure	AI	PSID		
133	CH-2	T	Chiller 2 CHW Supply Temperature	AI	Deg F	35-70	45-60
134	CH-2	COMM	Points from panel TBD				
135	P-3	SS	CHW Pump 3 VFD Start/Stop	DO			
136	P-3	SC	CHW Pump 3 VFD Speed	AO	%	0-100	
137	P-3	Comm	CHW Pump 3 VFD Speed Feedback	C	%	0-100	

HVAC CONTROLS POINTS LIST

	System/Location	Point	Description	Type	Units	Value Range	Setpoint Range
138	P-3	Comm	CHW Pump 3 VFDA Alarm	C			
139	P-3	Comm	CHW Pump 3 VFD kW	C	kW		
140	P-3	Comm	CHW Pump 3 VFD kWh	C	kWh		
141	P-4	SS	CHW Pump 4 VFD Start/Stop	DO			
142	P-4	SC	CHW Pump 4 VFD Speed	AO	%	0-100	
143	P-4	Comm	CHW Pump 4 VFD Speed Feedback	C	%	0-100	
144	P-4	Comm	CHW Pump 4 VFD Alarm	C			
145	P-4	Comm	CHW Pump 4 VFD kW	C	kW		
146	P-4	Comm	CHW Pump 4 VFD kWh	C	kWh		
147	CHWR	F	CHW System Flow Meter	AI	GPM	tbd	
148	CHWR	T	CHW Building Return Temperature	AI	Deg F	35-70	45-60
149	CHWR	T	Chiller Return Temperature	AI	Deg F	35-70	45-60
150	CHWS	T	CHW System Supply Temperature	AI	Deg F	35-70	45-60
151	CHW	DP	CHW System Differential Pressure	AI	PSID	tbd	tbd
152	CHW	VA	CHW System Bypass Valve	AO			
153	Boiler Plant:						
154	B-1	T	Boiler 1 Supply Temperature	AI	Deg F	30-180	140-160
155	B-1	Comm	Points from panel TBD				
156	B-2	T	Boiler 2 Supply Temperature	AI	Deg F	30-180	140-160
157	B-2	Comm	Points from panel TBD				
157	P-1	SS	HHW Pump 1 VFD Start/Stop	DO			
159	P-1	SC	HHW Pump 1 VFD Speed	AO	%	0-100	
160	P-1	Comm	HHW Pump 1 VFD Speed Feedback	C	%	0-100	
161	P-1	Comm	HHW Pump 1 VFDA Alarm	C			
162	P-1	Comm	HHW Pump 1 VFD kW	C	kW		
163	P-1	Comm	HHW Pump 1 VFD kWh	C	kWh		
164	P-2	SS	HHW Pump 2 VFD Start/Stop	DO			
165	P-2	SC	HHW Pump 2 VFD Speed	AO	%	0-100	
166	P-2	Comm	HHW Pump 2 VFD Speed Feedback	C	%	0-100	
167	P-2	Comm	HHW Pump 2 VFD Alarm	C			
168	P-2	Comm	HHW Pump 2 VFD kW	C	kW		
169	P-2	Comm	HHW Pump 2 VFD kWh	C	kWh		
170	HHWR	F	HHW System Flow Meter	AI	GPM	tbd	
171	HHWR	T	HHW Building Return Temperature	AI	Deg F	90-130	
172	HHWS	T	HHW System Supply Temperature	AI	Deg F	30-180	140-160
173	HHW	DP	HHW System Differential Pressure	AI	PSID	tbd	tbd
174	HHW	VA	HHW System Bypass Valve	AO			
175							
176							
177	Fan Coils (four pipe, ducted):						
178	FC-xx	SS	Supply Fan Start/Stop	DO			
179	FC-xx	SC	Supply Fan ECM Speed	AO	%	0-100	
180	FC-xx	Comm	Supply Fan Alarm	C			
181	FC-xx	T	Supply Air Temperature	AI	Deg F	40-90	
182	FC-xx	T	Room Temperature	AI	Deg F	50-90	68-78
183	FC-xx	VA	CHW Valve	AO	VDC		
184	FC-xx	VA	HHW Valve	AO	VDC		
185	FC-xx	DP	Filter Differential Pressure	AI	Inches WC	0-1.2	0.8

HVAC CONTROLS POINTS LIST

	System/Location	Point	Description	Type	Units	Value Range	Setpoint Range
186	FC-xx	S	Supply Fan Status	DI			
187	Fan Coils (two pipe, ducted):						
188	FC-xx	SS	Supply Fan Start/Stop	DO			
189	FC-xx	SC	Supply Fan ECM Speed	AO	%	0-100	
190	FC-xx	Comm	Supply Fan Alarm	C			
191	FC-xx	T	Supply Air Temperature	AI	Deg F	40-90	
192	FC-xx	T	Room Temperature	AI	Deg F	50-90	68-78
193	FC-xx	VA	CHW Valve	AO	VDC		
194	FC-xx	DP	Filter Differential Pressure	AI	Inches WC	0-1.2	0.8
195	FC-xx	S	Supply Fan Status	DI			
196	FC-xx	A	High Space Temperature Alarm (data rooms only)	DI	Deg F		85
197	Fan Coils (two pipe, ductless, STH Room):						
198	FC-xx	T	Room Temperature	AI	Deg F	60-110	70-80
199	FC-xx	A	High Space Temperature Alarm	DI	Deg F		85

APPENDIX "E"

ELECTRICAL SAFETY POLICY – IMPLEMENTATION PLAN

LOS ANGELES HARBOR DEPARTMENT

CONSTRUCTION DIVISION

ELECTRICAL SAFETY POLICY – IMPLEMENTATION PLAN

PROJECT: HARBOR ADMINISTRATION BUILDING HVAC REPLACEMENT

SPECIFICATION NO: 2837

INSPECTOR: _____ DATE: _____

THE CONTRACTOR SHALL:

IMPLEMENT THE ELECTRICAL SAFETY POLICY IN ACCORDANCE WITH THE BOARD OF HARBOR COMMISSIONERS' RESOLUTION NO. 6315, ADOPTED OCTOBER 27, 2004.

APPRENTICES AND JOURNEYMEN:

	All apprentices will be registered in a State of California Approved Apprenticeship Program.
	The use of "Journeymen" will comply with all State of California labor laws.

THE WORKFORCE OF PROJECTS DESIGNATED AS REQUIRING "ELECTRICAL SAFETY CRITERIA" SHALL COMPLY WITH THE FOLLOWING:

	70% of all "Journeymen Wiremen" will be graduates of a State of California Approved Electrical Apprenticeship Program.
	20% of the jobsite electrical workers will be OSHA 10-hour General Industry Safety and Health Certified.
	At least one jobsite electrical worker will be OSHA 30-hour General Industry Safety and Health Certified.

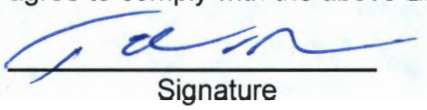
	The required workforce ratios will be determined by verifying the workforce composition on a daily basis.

FAILURE TO FULLY IMPLEMENT AND MONITOR THE ELECTRICAL SAFETY POLICY MAY RESULT IN AN ASSESSMENT OF PENALTIES AND/OR POSSIBLE SANCTIONS AGAINST THE CONTRACTOR.

Distribution:

Contractor
Job File
Inspector

As the contractor's representative, I understand and agree to comply with the above Electrical Safety Policy.



Signature

7-11-2025

Date