PROJECT MANUAL

FOR

ROGERS MIDDLE SCHOOL
CENTRAL KITCHEN HVAC
UPGRADES

AT

4110 W. 154th St., Lawndale, CA 90260

LAWNDALE ELEMENTARY SCHOOL DISTRICT

Prepared by:

BUDLONG

700 N. Central Avenue, Ste. 520
Glendale, CA 91203
(818) 638-8780

Budlong Project No. 24-025

DSA# 03-124869; File #19-57

December 06, 2024

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LAWNDALE ELEMENTARY SCHOOL DISTRICT
Lawndale, California

Prepared by

BUDLONG
700 N. Central Avenue
Suite 520
Glendale, CA 91203

December 06, 2024

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 03-124869 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☐
DATE: 02/07/2025

REGISTERED PROFESSIONAL ENGINEER
WILL A. LAMBERT
No. 5430
Exp. 06/30/2026
STRUCTURAL
STATE OF CALIFORNIA
12/6/2024 LAWNDALE
KITCHEN HVAC REVIEW

STRUCTURAL
Will Lambert, 5430
Orion Structural Group, Inc.

REGISTERED PROFESSIONAL ENGINEER
SUNIL G. PATEL
No. 29448
EXP. 06-30-25
MECHANICAL
STATE OF CALIFORNIA

MECHANICAL ENGINEER
Sunil Patel, 29448
Budlong

REGISTERED PROFESSIONAL ENGINEER
MANAN H. CHRISTIAN
E 22864
9/30/25
ELECTRICAL
STATE OF CALIFORNIA

ELECTRICAL ENGINEER
Manan Christian, E22864
Budlong

Budlong
Project No. 24-025

SECTION 00 00 08
PROJECT DIRECTORY

Rogers Middle School Central
Kitchen HVAC Upgrades

OWNER:

Lawndale Elementary School District
4161 W. 147th Street
Lawndale, CA 90260
(310) 973-1300
Representative: Karla Bertran
Karla_bertran@lawndalesd.net

STRUCTURAL ENGINEER:

Orion Structural Group, Inc.
223 E. Thousand Oaks Blvd., #304
Thousand Oaks, CA 91360
(805) 390-9242
Representatives: Will Lambert
will@orionstructural.com

MECHANICAL ENGINEER:

Budlong & Associates, Inc.
700 N. Central Ave., Suite 520
Glendale, CA 91203
(818) 638-8780
Representatives: Sunil Patel
sunil@budlong.com
Patrick Fitzimmons, Project Manager
patrick@budlong.com

ELECTRICAL ENGINEER:

Budlong & Associates, Inc.
700 N. Central Ave., Suite 520
Glendale, CA 91203
(818) 638-8780
Representatives: Manan Christian
manan@budlong.com

END OF SECTION

TABLE OF CONTENTS

SECTION NO. SECTION TITLE

DIVISION 01 GENERAL REQUIREMENTS

01 11 00 SUMMARY OF WORK

01 25 13 PRODUCT OPTIONS AND SUBSTITUTIONS

01 25 13.01 PRODUCT OPTIONS AND SUBSTITUTIONS

01 26 73 CONSTRUCTION CHANGE DOCUMENT PROCEDURES

01 29 00 APPLICATION FOR PAYMENT AND CONDITIONAL UNCONDITIONAL WAIVERS

01 29 00.01 APPLICATION FOR PAYMENT

01 31 13 PROJECT COORDINATION

01 31 19 PROJECT MEETINGS

01 32 13 SCHEDULING OF WORK

01 33 00 SUBMITTALS

01 35 00 QUALITY REQUIREMENTS (MOCK-UP REQUIREMENTS)

01 35 13 SITE STANDARDS

01 35 42 CALGREEN REQUIREMENTS

01 43 00 MATERIALS AND EQUIPMENT

01 45 00 QUALITY CONTROL

01 45 25 TESTING, ADJUSTING, AND BALANCING FOR HVAC

01 50 00 TEMPORARY FACILITIES AND CONTROLS

01 50 13 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

01 50 13.01 CONSTRUCTION WASTE MANAGEMENT PLAN

01 52 13 FIELD OFFICES

01 55 00 VEHICULAR ACCESS AND PARKING

01 57 23 STORM WATER POLLUTION CONTROL

01 57 23.01 STORM WATER POLLUTION CONTROL

01 57 23.02 STORM WATER POLLUTION CONTROL

01 64 00 OWNER-FURNISHED PRODUCTS

01 66 00 PRODUCT DELIVERY, STORAGE AND HANDLING

01 71 23 FIELD ENGINEERING

01 73 29 CUTTING AND PATCHING

01 76 00 ALTERATION PROJECT PROCEDURES

01 77 00 CONTRACT CLOSEOUT AND FINAL CLEANING

01 78 23 OPERATION AND MAINTENANCE DATA

01 78 36 WARRANTIES

01 78 39 RECORD DOCUMENTS

DIVISION 02 EXISTING CONDITIONS

02 41 16 DEMOLITION

DIVISION 03 CONCRETE

03 30 00 CAST IN PLACE CONCRETE

DIVISION 05 METALS – NOT USED

DIVISION 06 WOOD, PLASTICS, AND COMPOSITES – NOT USED

DIVISION 07 THERMAL MOISTURE PROTECTION

07 92 00 JOINT SEALANTS

DIVISION 08 OPENINGS – NOT USED

DIVISION 09 FINISHES

09 29 00 GYPSUM BOARD

09 90 13 PAINTING OF EXISTING FACILITIES

DIVISION 10 SPECIALTIES – NOT USED

DIVISION 22 PLUMBING – NOT USED

DIVISION 23 MECHANICAL

23 05 00 COMMON WORK RESULTS FOR HVAC

23 05 48 HVAC SOUND, VIBRATION AND SEISMIC CONTROL

23 05 53 HVAC IDENTIFICATION

23 07 00 HVAC INSULATION

23 30 00 AIR DISTRIBUTION

23 80 00 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

DIVISION 26 ELECTRICAL

26 00 00 ELECTRICAL REQUIREMENTS

26 05 00 ELECTRICAL MATERIALS AND METHODS

26 05 13 ELECTRICAL WIRE AND CABLE

26 05 19 EQUIPMENT WIRING SYSTEM

26 05 26 GROUNDING AND BONDING OF ELECTRICAL SYSTEMS

26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

26 05 33 ELECTRICAL RACEWAYS AND BOXES

26 05 53 ELECTRICAL IDENTIFICATION

26 08 00 WORK INCLUDED

26 22 10 DRY TYPE TRANSFORMERS

26 23 10 DISCONNECT SWITCHES

26 24 16 PANELBOARDS

26 27 16 ELECTRICAL CABINETS AND ENCLOSURES

26 27 26 WIRING DEVICES

26 28 13 FUSES (600 VOLT AND BELOW)

26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

DIVISION 28 ELECTRONIC SAFETY AND SECURITY – NOT USED

DIVISION 31 EARTHWORK – NOT USED

DIVISON 32 EXTERIOR IMPROVEMENTS – NOT USED

DOCUMENT 01 11 00

SUMMARY OF WORK

ROGERS MS CENTRAL KITCHEN

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Access Conditions and Requirements;

B. Special Conditions.

2. SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

The Work of this Contract consists of the following:

Per plans, specifications and other documents for this project and all addenda, amendments, changes or modifications approved by the District and including Existing building conversion into kitchen and associated exterior landscape and civil improvements.

3. WORK BY OTHERS

A. Work on the Project that will be performed and completed prior to the start of the Work of this Contract:
   1.

B. Work on the Project that will be performed by others concurrent with the Work of this Contract:
   1.

4. EXISTING CONDITIONS

A. The reports and other data or information regarding existing conditions and underground facilities at or contiguous to the Project may be obtained through the District.

4. CODES, REGULATIONS, AND STANDARDS

A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect for review and resolution.

B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

5. PROJECT RECORD DOCUMENTS:

A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders, directives and other modifications to the Contract.
5. Construction Change Directives (CCD's).
6. Reviewed shop drawings, product data, and samples.
7. Field test records.
8. Inspection certificates.
9. Manufacturer's certificates and material data sheets.
10. All changes/ modifications are to be corrected on the drawing's, including but not limited to RFI's and ASI's.
11. Updated Project Schedule and Weekly Schedule.

B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples. All Record Documents shall be available to the District, Construction Manager or Architect for review, inspection or reproduction upon advance written request.

C. Contractor shall record information concurrent with construction progress.

D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications with the description of the actual product(s) installed, including the following:

1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda, Change Orders, CCD's and written directives.

6. EXAMINATION OF EXISTING CONDITIONS

A. Contractor shall examine the Project Site and acquaint itself with the conditions of the Site and of the streets or roads approaching the Site. See Article 4 General Conditions for more information.

B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.

1. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor should immediately report it to the District and the Architect.

C. Contractor shall document such damage prior to the start of construction. Provide District with a copy of documentation.

7. CONTRACTOR'S USE OF SITE

A. Contractor shall have use of the Site for the execution of the Work. If the Site is occupied, the Contractor's use of the Site shall be coordinated with other occupants' use of the Site.

B. Coordinate use of the Site under the direction of the District.

C. If unoccupied and only with District's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.

D. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor without adjustment of the Contract Price or Contract Time.

E. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.

F. Contractor shall maintain existing building in weather-tight conditions throughout construction period. Repair damage caused by construction operations to the condition existing before damage; repairs shall be subject to District acceptance. Take all precautions necessary to protect building and its occupants during construction.

G. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.

H. Contractor shall keep driveways and entrances serving premises clear and accessible to the District, District's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

I. No one other than those directly involved in the demolition and construction, or specifically designated by the District or the Architect shall be permitted in the areas of work during demolition and construction activities.

J. The Contractor shall install the construction security fence and maintain the security fence with fabric for the entire duration of construction. The security fence must include a lockable gate and sound blankets around all perimeter fencing. Sound blankets are to be that the Contractor is responsible for locking when the Site is not in use. Keys to this fencing will be provided to the

District.

8. PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.

B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

9. UTILITY SHUTDOWNS AND INTERRUPTIONS

A. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to re-establish utility services should be performed by the Contractor without adjustment of the Contract Time or the Contract Price.

1. In the event any utility service is interrupted without a minimum of three (3) days written notice in advance, Contractor shall be financially liable for all damages suffered by District due to unauthorized interruption.

B. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

10. STRUCTURAL INTEGRITY

A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.

B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

END OF DOCUMENT 01 11 00

DOCUMENT 01 25 13

PRODUCT OPTIONS AND SUBSTITUTIONS

1. RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. Instructions to Bidders;

B. General Conditions, including, without limitation, Substitutions For Specified Items;

C. Special Conditions.

2. SUBSTITUTIONS OF MATERIALS AND EQUIPMENT:

A. Contractor to submit request for product substitution to the Construction Manager and Lori Rubenstein, Bond Program Manager, for approval ten (10) days prior to the bid opening date.

B. Catalog numbers and specific brands or trade names followed by the designation 'or equal' are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions, including limits on the time for submitting requests to substitute an alternative to a specified product.

C. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. A product substitution request may be rejected if the proposed substitution requires modifications to the design or the Work to accommodate use of such proposed alternative product. If such alternatives are proposed by Contractor and are approved by the District and/or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor; including any costs from DSA. Contractor assumes liability for any time delays caused by the substitution.

D. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and 'or approved equal,' supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions.

E. If the District and/or Architect, in reviewing proposed substitute materials and equipment, require revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall promptly do so. If any proposed substitution is judged by the District and/or Architect to be unacceptable, the specified material or equipment shall be provided.

F. Samples may be required. Tests required by the District and/or Architect for the

determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the District.

G. In reviewing the supporting data submitted for substitutions, the District and/or Architect will use for purposes of comparison all the characteristics of the specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents. If more than two {2) submissions of supporting data for a proposed product substitution are required, the cost of reviewing the additional supporting data shall be borne by Contractor, and the District will deduct the costs from the Contract Price.

END OF DOCUMENT 01 25 13

DOCUMENT 0125 13.01

SUBSTITUTION REQUEST

(During the Bidding Phase)

Project: _____ Substitution Request Number: _____

_____ From: _____

Bid No.: _____ Date: _____

To: _____ A/E Project Number: _____

Re: _____ Contract For: LawndaleElementary School District

Specification Title: _____ Description: _____

Section: _____ Page: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Contractor will be responsible for payment of charges and construction costs caused by the substitution for changes to building design, including A/E design, furnishings and detailing.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____ Email: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Substitution procedures.

☐ Substitution approved as noted - Make submittals in accordance with Substitution procedures.

☐ Substitution rejected - Use specified materials.

☐ Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: ☐Drawings ☐Product Data ☐Samples ☐Tests ☐Reports ☐_____

SECTION 01 26 73

DSA CONSTRUCTION CHANGE DOCUMENT PROCEDURES PART 1 - GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing DSA Construction Change Documents for modifications of portions of the project affecting the Structural Safety, Access Compliance, and Fire and Life Safety.

B. Related Sections:
1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling contract modifications not affecting the Structural Safety, Access Compliance, and Fire and Life Safety portions of the project.

1.02 DEFINITIONS

A. DSA: Division of the State Architect.

1.03 CONSTRUCTION CHANGE DOCUMENT

A. Construction Change Document: Architect will submit a Construction Change Document on DSA Form 140 Application for Approval of Construction Change Document to DSA. Upon DSA approval of a Construction Change Document, Architect will notify Contractor to proceed with the change in the Work, for subsequent inclusion in a Change Order.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

DOCUMENT 01 29 00

APPLICATION FOR PAYMENT, AND CONDITIONAL AND UNCONDITIONAL WAIVER, AND RELEASE FORMS

1. GENERAL INFORMATION

A. The Pay Application is to be completed in conjunction with Schedule of Values (SOV) form, unless the contractor has received prior written authorization from the District.

B. Application and Certificate for Payment, documents are designed to be used on a project where a Contractor has a direct Agreement with the District.

2. COMPLETING THE PAY APPLICATION FORM

After the Contractor has received an approved SOV, it is to be transferred to the Pay Application process.

3. MAKING PAYMENT

The District will make payment directly to the Contractor based on the amount certified by the Project Inspector, Construction Manager, and Architect/Engineer on the approved Pay Application. The completed form contains the name and address of the Contractor. Payment will not be made to any other party.

4. APPLICATION FOR PAYMENT

Contractor shall comply with all provisions in the general conditions related to applications for payment and/or payments.

5. WAVIER AND RELEASE FORMS

Contractor shall submit the appropriate forms of waiver and release (completed and executed by the Contractor and all Subcontractors receiving a portion of the payment requested) when submitting an Application for Payment.

6. INSTRUCTIONS FOR COMPLETION OF PAY APPLICATION & SCHEDULE OF VALUES

A. The Application for Payment is to be used in conjunction with Schedule of Values, Continuation Sheet. These documents are designed to be used on a project where a Contractor has a direct Agreement with the District. Procedures for their use are as follows.

B. Line 1- 'Original Contract Amount': This needs to equal the amount of the original signed contract, not including any changes. This also needs to equal Column Con the Schedule of Values (if there are no Change Orders this will equal the total at the bottom, if there are Change Orders this will equal the sub-total).

C. Line 2 - 'Net Change by Change Orders': This needs to equal all Board Approved Change Orders. The Change Order information needs to be added in the bottom section of the SOV, listing the COP's separately along with their amounts in Column C. NOTE: Change Order needs to list the COP's and the site they are tied to for any multi-site project. ADD'L

NOTE: All change orders need to be board approved prior to being listed on the Pay App.

D. Line 3 - 'Contract Amount to Date': The addition of Lines 1 and 2. This should still equal the Total of Column Con the SOV.

E. Line 4 - 'Total Completed and Stored to Date': Total work done as of the date listed on the Pay App. Needs to be agreed to by District Representative. On the first pay app, this will equal Column E and G on the SOV. NOTE: On subsequent Pay Apps, the amount from Column E gets moved and added to Column D so Column E only equals the current amount being requested. The total on Column E less 5% always equals Line 8 on Pay App 'Current Payment Due'. The 5% Retainage should automatically fill in Column I when Column Eis filled out for the current payment due.

F. Line 5 - 'Retainage': This is 5% of Line 4. This will also equal Column I on the SOV.

G. Line 6 - 'Total Earned Less Retainage': Line 4 minus Line 5. This will also equal Column G less 5% on SOV.

H. Line 7 - 'Less Previously Approved Certificates for Payment': Total of all applications previously turned in for payment.

I. Line 8- 'Current Payment Due': Line 6 less Line 7. Also equals Column E less 5% on SOV.

J. Line 9 - 'Balance to Finish, Including Retainage': Line 3 less Line 6 on Pay App This is will also equal Column H plus Column I on SOV.

K. NOTES:

1. Column C, 'Scheduled Value' on SOV amounts down to the sub-total will never change.

2. If the project calls for an allowance there needs to be an 'Allowance' line item on SOV.

3. If it is for a multi-site project, SOV needs to be reflective of each site, or there needs to be an SOV for each site so charging correct accounts is able to be figured easily.

4. Pay Applications will not be processed if As-builts are not up to date and signed off by District and/or inspector. Pay Applications will not be processed if base line schedule is not current.

5. Column Fon SOV, any stored items must be in a bonded facility; this is spelled out in the General Conditions and MUST be approved by SVUSD.

6. Please note that IF this is a multi-site project, when invoicing is created it will need to reflect a breakdown of how much was done at each site. This will assist the office staff in accounting accurately by site.

7. COMPLETING THE APPLICATION FOR PAYMENT FORM:

A. After the Contractor has completed Schedule of Values, Continuation Sheet, summary information should be transferred to the Application for Payment.

B. The Contractor should submit a draft copy to have the numbers verified by the Project Inspector and Construction Manager prior to submitting electronically.

C. The Project Inspector and Construction Manager will review and sign the Application for Payment noting the Work verified as completed and the amount due the Contractor for verified completed Work. Forward the completed and fully executed (Contractor, Project Inspector and Construction Manager) Application for Payment to the District for processing.

D. Unless otherwise stated in the Contract Documents, Retention equal to five percent (5%) of the amount approved for payment on each Application for Payment will be withheld by the District

E. Change Orders: Change Orders are listed separately at the end of the basic schedule under the heading Approved Change Orders to Date. The amount of the original contract adjusted by Change Orders is to be entered in the appropriate location on the APPLICATION FOR PAYMENT form.

8. VERIFICATION OF CERTIFIED PAYROLL RECORDS SUBMITTED

This form must be submitted with each Application for Payment, except for the final Payment Application, which is for the retainage only. See section 4.18.2 of the General Conditions for more information.

END OF DOCUMENT 0129 00

CONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

California Civil Code Section 8136

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. APERSON SHOULD NOT RELY ON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information

Name of Claimant:	
Name of Customer:	Lawndale Elementary School District
Job Location:	4110 W. 154th Street Lawndale, CA. 90260
Owner:	Lawndale Elementary School District

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has forlabor and service provided, and equipment and material delivered, to the customer on this job. Rights basedupon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective onlyon the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check:	
Amount of Check:	$
Check Payable to:	

Exceptions:

This document does not affect any of the following:

Disputed claims for extras: $

Signature

Claimant's Signature: _____ Date of Signature: _____

Claimant's Printed Name: _____ Claimant's Title: _____

CONDITIONAL WAIVER AND RELEASE ON

California Civil Code Section 8132

NOTICE: THIS DOCUMENT WAIVES THE CLAIMANT'S LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS EFFECTIVE ON RECEIPT OF PAYMENT. A PERSON SHOULD NOT RELYON THIS DOCUMENT UNLESS SATISFIED THAT THE CLAIMANT HAS RECEIVED PAYMENT.

Identifying Information

Name of Claimant:	
Name of Customer:	Lawndale Elementary School District
Job Location:	4110 W. 154th Street Lawndale, CA. 90260
Owner:	Lawndale Elementary School District

Conditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date thatthis document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. This document is effective only on the claimant's receipt of payment from the financial institution on which the following check is drawn:

Maker of Check:	
Amount of Check:	$
Check Payable to:	

Exceptions:

This document does not affect any of the following:

(1) Retentions.

(2) Extras for which the claimant has not received payment.

(3) The following progress payments for which the claimant has previously given a conditional waiver and release but has not received payment:

Date(s) of waiver and release:

Amount(s) ofunpaid progress payment(s): $

(4) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the right to recover compensation for work not compensated by the payment.

Signature

Claimant's Signature: _____ Date of Signature: _____

Claimant's Printed Name:_____ Claimant's Title: _____

LAWNDALE ELEMENTARY SCHOOL DISTRICT

Bid No.

(Project Name)

UNCONDITIONAL WAIVER AND RELEASE ON FINAL PAYMENT

California Civil Code Section 8138

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Identifying Information

Name of Claimant:
Name of Customer: Lawndale Elementary School District
Job Location:
Owner: Lawndale Elementary School District

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for all labor and service provided, and equipment and material delivered, to the customer on this job. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has been paid in full.

Exceptions:

This document does not affect any of the following:

Disputed claims for extras in the amount of: $

Signature

Claimant's Signature: _____ Date of Signature: _____
Claimant's Printed Name: _____ Claimant's Title: _____

LAWNDALE ELEMENTARY SCHOOL DISTRICT

Bid No.:

(Project Name)

UNCONDITIONAL WAIVER AND RELEASE ON PROGRESS PAYMENT

California Civil Code Section 8134

NOTICE TO CLAIMANT: THIS DOCUMENT WAIVES AND RELEASES LIEN, STOP PAYMENT NOTICE, AND PAYMENT BOND RIGHTS UNCONDITIONALLY AND STATES THAT YOU HAVE BEEN PAID FOR GIVING UP THOSE RIGHTS. THIS DOCUMENT IS ENFORCEABLE AGAINST YOU IF YOU SIGN IT, EVEN IF YOU HAVE NOT BEEN PAID. IF YOU HAVE NOT BEEN PAID, USE A CONDITIONAL WAIVER AND RELEASE FORM.

Identifying Information

Name of Claimant:
Name of Customer: Lawndale Elementary School District
Job Location:
Owner: Lawndale Elementary School District
Through Date:

Unconditional Waiver and Release

This document waives and releases lien, stop payment notice, and payment bond rights the claimant has for labor and service provided, and equipment and material delivered, to the customer on this job through the Through Date of this document. Rights based upon labor or service provided, or equipment or material delivered, pursuant to a written change order that has been fully executed by the parties prior to the date that this document is signed by the claimant, are waived and released by this document, unless listed as an Exception below. The claimant has received the following progress payment: $

Exceptions:

This document does not affect any ofthe following:
(1) Retentions.
(2) Extras for which the claimant has not received payment.
(3) Contract rights, including (A) a right based on rescission, abandonment, or breach of contract, and (B) the

Signature

Claimant's Signature: _____ Date of Signature: _____
Claimant's Printed Name: _____ Claimant's Title: _____

Lawndale Elementary School District

APPLICATION FOR PAYMENT

Submit UNSIGNED to District as PDF. Signatures collected via DocuSign.

TO: _____ (Bond Program Manager)

FROM: _____

_____ (Remittance Address)

SCHOOL NAME: _____

PROJECT NAME: _____

PROJECT NO: _____

ARCHITECT: _____

APPLICATION NO: _____

APPLICATION DATE: _____

PERIOD TO: _____

CONTRACT START DATE: _____

BID NUMBER: _____

CONTRACTOR'S APPLICATION FOR PAYMENT

1. ORIGINAL CONTRACT AMOUNT ..... $ _____

2. Net Change by Change Orders ..... $ _____

3. CONTRACT AMOUNT TO DATE (Line 1 + Line *LJ* ..... $ _____

4. TOTAL COMPLETED & STORED TO DATE ..... $ _____
(Column G on Continuation Sheet)

5. RETAINAGE:

a. 5% of Completed Work (Line 4) i

TOTAL RETAINAGE ..... $ 0.00

6. TOTAL EARNED LESS RETAINAGE ..... $ 0.00
(Line 4 less Line 5 Total)

7. LESS PREVIOUSLY APPROVED CERTIFICATES FOR PAYMEN $ _____
(Line 6 from prior Application for Payment)

8. CURRENT PAYMENT DUE (Line 6 less Line 7) ..... $ 0.00

9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6) • $ _____

CERTIFICATION

Under penalty of perjury under the Laws of California, I certify that all items, units, quantities and prices for work shown on this payment request are correct; that all work has been performed and materials supplied in full accordance with the terms and conditions of the construction contract on this project; that all of the information set forth herein or attached hereto is a true and correct statement of the Contract Amount and the Contract Time up to and including the last day of the period covered by this invoice, and that no part of the "Current Payment Due" has been received.

Contractor: _____
(Please print name of company)

_____
(Name and title)

_____
(Contractor's Signature) (Date)

Owner Use Only:

TOTAL WITHHOLDS (from *Owner Assessment Summary):* ..... _____

TOTAL RELEASES (from *Owner Assessment Summary):* ..... $ _____

ADJUSTED PAYMENT AMOUNT: ..... $ _____

D **Allowance Being Invoiced** D **Change Order Being Invoiced**

IF SO, PROVIDE:

D COP Included
D RFI Included
D CCD Included (Construction Change Directive)
D Drawing Changes Included
D Sub-contractor Proposal Included

REVIEWED AND APPROVED AS PER TERMS OF CONTRACT

Inspector of Record	(Signature)	(Date)
Architect	(Signature)	(Date)
Construction Manager	(Signature)	(Date)
MARC CUNNIGHAM Construction Project Manager	(Signature)	(Date)
LORI RUBENSTEIN Bond Program Manager	(Signature)	(Date)
RONTODO Associate Superintendent, Business & Facilities	(Signature)	(Date)

APPLICATION FOR PAYMENT containing Contractor's signed Certification must be attached. Use Column I on Contracts where variable retainage for line items may apply.

SCHOOL NAME: Simi Valley HS **APPLICATION NO.:**
PROJECT NO.: **APPLICATION DATE:**
BID NO.: 0 **PERIOD FROM:**
PERIOD TO:

A	B	C	D	E	F	G		H	
	SUMMARY		**WORK COMPLETED**						
				This Application		Total Completed			
Item No.	Description of Work **Note: (SOV must be itemized in further detail by building and area and Phase)**	Scheduled Value	Previous Applications	Work in Place	Stored Mtls.	& Stored To Date	%	Balance To Finish	Retainage (5%)
	General Conditions					0.00	#DIV/0!	$	0.000
2	LLB Fee					0.00	#DIV/0!	$	0.000
3	Bonds & Insurance					0.00	#DIV/0!	$	0.000
4	Landscaping					0.00	#DIV/0!	$	0.000
5	Concrete					0.00	#DIV/0!	$	0.000
6	Specialties					0.00	#DIV/0!	$	0.000
7	Electrical					0.00	#DIV/0!	$	0.000
8	Pre-Cast Furnishings (Outdoor Creations)					0.00	#DIV/0!	$	0.000
9	Cal Storm Comliance (SWPP ConsultanUPrep)					0.00	#DIV/0!	$	0.000
10	Clock works Ren Proposal (Budget)					0.00	#DIV/0!	$	0.000
11	Contractory Contigency					0.00	#DIV/0!	$	0.000
	TOTALGMP:	I	Is	Is	Is	Is	#DIV/0!	**S**	**S -**
12	Financing					0.00	#DIV/0!	0.00	0.000
	District Contigency					0.00	#DIV/0!	0.00	0.000
	TOTAL Total Project Cost:	I	Is	Is	Is	Is	#DIV/0!	**S**	**S -**
	APPROVED CHANGE ORDERS TO DATE								
						0.00	#DIV/0!	0.00	0.00
						0.00	#DIV/0!	0.00	0.00
	NET CHANGE ORDER SUBTOTAL!		Is	Is	Is	Is	#DIV/0!	**S**	**S -**
LJ	**TOTALS**	1	$	I$	I$	I$	#DIV/0!	$	$ -

SECTION 01 31 13

PROJECT COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section specifies administrative and procedural requirements necessary for coordinating Work operations including, but not limited to, the following:

1. General coordination procedures.

2. Coordination drawings.

1.02. RELATED REQUIREMENTS

A. Section 01 12 16: Phasing of the Work.

B. Section 01 32 13: Construction Schedule.

C. Section 01 33 00: Submittal Procedures.

D. Section 01 45 23: Test and Inspection.

E. Section 01 77 00: Contract Closeout.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

1.01 COORDINATION

A. CONTRACTOR shall coordinate operations included in various sections of Contract Documents to assure efficient and orderly installation of each part of Work. Coordinate Work operations included under related sections of Contract Documents that depend on each other for proper installation, connection, and operation of Work, including but not limited to:

1. Schedule construction operations in sequence required where installation of one part of Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.

3. Provide provisions to accommodate items scheduled for later installation.

4. Prepare and administer provisions for coordination drawings.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required in notices, reports, attendance at meetings, and:

1. Prepare similar memoranda for OAR and Separate Work Contract where coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of Work. Such administrative activities include, but are not limited to, following:

1. Preparation of schedules.
2. Installation, relocation, and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate Work operations to assure operations are carried out with consideration given to conservation of energy, water, materials, and:

1. Salvage materials and equipment involved in performance of, but not actually incorporated into Work.

1.02 SUBMITTALS

A. Coordination Drawings: CONTRACTOR shall prepare coordination drawings to coordinate the installation of products and materials fabricated, furnished and installed by separate entities, under different parts of the Contract. CONTRACTOR shall notify OAR and ARCHITECT of all major conflicts in writing in a timely manner so that the design team can respond without construction delays. Coordination drawings shall address the following at a minimum:

1. Limitations in available space for installation or service. CONTRACTOR shall overlay plans of each trade and verify space requirements and conflicts between trades. Minor changes and adjustments that do not affect design intent shall be made by CONTRACTOR and shall be highlighted for ARCHITECT'S review.
2. Incompatibility between items provided under different trades (such as difference in voltage between equipment specified under Divisions 22 and 23 and electrical power provided under Division 26.)
3. Inconsistencies between drawings, specifications and codes (between trades and within each trade).
4. Additional items required for existing facilities construction projects shall be designed and prepared from available as-built drawings that are verified through non-invasive and non-destructive, visual observation only. CONTRACTOR shall field verify actual existing conditions during and upon completion of demolition work and incorporate findings into preparation of co-ordination drawings. Minor changes and adjustments that do not affect design intent shall be made by Sub-Contractor and shall be highlighted for OAR and ARCHITECT'S reviews.

B. Prepare coordination drawings in CAD with each trade on a separate layer, in specified color and scale. CONTRACTOR and each Subcontractor shall provide and forward reproducible copies and CAD drawing files in the order described here:

1. Structural shop drawings shall indicate location and sizes of columns, beams and other structural members, as well as wall, roof and slab penetrations, and will be provided to mechanical, electrical, low voltage and plumbing Sub-contractors for co-ordination. Structural items shall be indicated using black lines.
2. HVAC Subcontractor will indicate all ductwork, piping and equipment complete with installation and dimensioned service clearances, duct and pipe sizes, fitting

types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger and support locations. Minor changes and adjustments that do not affect design intent shall be made by Subcontractor and shall be highlighted for OAR and ARCHITECT'S reviews. Forward drawings to plumbing Subcontractor for further co-ordination. HVAC items shall be indicated using orange lines.

3. Plumbing Subcontractor will indicate all plumbing lines, and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger/support locations Co-ordinate with HVAC Subcontractor. Minor changes and adjustments that do not affect design intent shall be made by Sub-contractor and shall be highlighted for OAR and ARCHITECT'S reviews Upon completion drawings shall be forwarded to Fire Sprinkler Subcontractor for further co-ordination. All Plumbing items shall be indicated using blue lines.

4. Fire sprinkler Subcontractor will indicate fire sprinkler piping and equipment complete with installation and dimensioned service clearances, pipe sizes, fitting types and sizes, top or bottom of pipe elevations, distances of pipes and equipment from building reference points and hanger or support locations. Co-ordinate with Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for OAR and ARCHITECT'S reviews. Upon completion drawings shall be forwarded to Electrical CONTRACTOR for further co-ordination. Fire sprinkler equipment shall be indicated using red lines.

5. Electrical and Low Voltage Subcontractors will indicate service and feeder conduit runs and other electrical equipment complete, including low voltage with installation and dimensioned service clearances, sizes, top or bottom of conduit and rack elevations, distances of conduits and equipment from building reference points and hanger and support locations. Co-ordinate with Fire Sprinkler, Plumbing and HVAC Subcontractors. Minor changes and adjustments that do not affect design intent shall be made by sub-contractors and shall be highlighted for OAR and ARCHITECT'S reviews. Upon completion drawings shall be forwarded to CONTRACTOR for further co-ordination. Electrical work shall be indicated in dark green lines. Low voltage work shall be indicated in light green lines.

6. CONTRACTOR will be responsible for the overall coordination review. As each coordination drawing is completed, CONTRACTOR will meet with OAR to review and resolve all conflicts on coordination drawings.

7. Coordination meetings will be held in Project field office of CONTRACTOR. CONTRACTOR is required to distribute Shop Drawings, cut sheets and submittals to Subcontractors where appropriate. Reviewed coordination drawings will be maintained in Project field office of CONTRACTOR. Meeting minutes shall be developed by CONTRACTOR and submitted to OAR within 5 days.

END OF SECTION 01 31 13

DOCUMENT 01 31 19
PROJECT MEETINGS

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation, the General Conditions; and the Special Conditions.

2. PROGRESS MEETINGS:

A. The Contractor shall be responsible to schedule and hold regular weekly progress meetings. The meeting date and time shall be sent to all Invitees as indicated below.

B. Location: Contractor's field office, or mutually agreed on other location

C. The District and/or Contractor shall notify and invite the following entities ('Invitees'), at District's discretion:

1. District.
2. Contractor.
3. Contractor's Project Manager.
4. Contractor's Superintendent.
5. Subcontractors, as appropriate to the agenda of the meeting.
6. Suppliers, as appropriate to the agenda of the meeting.
7. Architect
8. Engineer(s), if any and as appropriate to the agenda of the meeting.
9. Inspector of Record
10. Others, as appropriate to the agenda of the meeting.

D. The Contractor, Contractor Project Manager, Contractor Superintendent, Subcontractors, Suppliers shall attend all scheduled meetings, at the District's discretion.

E. The District, the Architect, the engineers and/or consultants will attend at the District's discretion, in response to the agenda.

F. The Contractor and/or the Architect or another District Agent shall take and distribute meeting minutes in accordance with the General Conditions, at the District's discretion.

G. At the District's discretion, the Contractor may be requested to take and distribute meeting notes to attendees and other concerned parties.

H. Contractor required to attend weekly construction meetings; day and time to be coordinated with the District.

3. PRE-INSTALLATION/PERFORMANCE MEETING:

A. Contractor shall schedule a meeting prior to the start of each of the following portions of the Work, including but not limited to: cutting and patching of plaster, roofing, other weather-exposed and moisture-resistant products, painting, door hardware, and per the specific specification section. Contractor shall invite all Invitees to this meeting, and others whose work may affect or be affected by the quality of the cutting and patching work.

B. Contractor shall review in detail prior to this meeting, the manufacturer's requirements and specifications, applicable portions of the Contract Documents, Shop Drawings, and other submittals, and other related work. At this meeting, invitees shall review and resolve conflicts, incompatibilities, or inadequacies discovered or anticipated. Contractor shall review in detail Project conditions, scheduling/coordination transportation, delivery and availability of materials, equipment and other resources, requirements for performance, application, installation, quality of completed Work, and protection of adjacent Work and property.

C. Contractor shall review in detail means of protecting the completed Work during the remainder of the construction period.

D. Contractor shall protect existing in place.

END OF DOCUMENT 01 31 19

DOCUMENT 01 32 13
SCHEDULING OF WORK

1. **RELATED DOCUMENTS AND PROVISIONS:** All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

    A. General Conditions;

    B. Special Conditions;

    C. Summary of Work; and

    D. Submittals.

2. **SECTION INCLUDES:**

    A. Scheduling of Work under this Contract shall be performed by Contractor in accordance with requirements of this Section and the General Conditions. The terms "CPM Schedule" "Construction Schedule, Progress Schedule and other similar terms are used interchangeability in the Contract Documents.

        1. Construction Phasing

        2. Development of schedule, cost and resource loading of the schedule, monthly payment requests, and project status reporting requirements of the Contract shall employ computerized Critical Path Method ('CPM') scheduling ('CPM Schedule').

        3. CPM Schedule shall be resource cost loaded based on the Schedule of Values as approved by District and/or labor resource loaded as required by the Contract Documents. If the Contract Documents do not require the CPM Schedule to cost or labor loaded, the District may require updates/revisions of the CMP Schedule to be cost or labor loaded without adjustment of the Contract Price or the Contract Time.

        4. Submit CPM Schedules and related CPM Schedule reports as specified in the General Conditions.

    B. Upon Award of Contract, Contractor shall immediately commence development of Initial and Original CPM Schedules to ensure compliance with CPM Schedule submittal requirements.

3. **CONSTRUCTION PHASING:**

    A. Phase 1:

    B. Phase 2:

    C. Phase 3:

4. CONSTRUCTION SCHEDULE:

A. Within five (5) calendar days of Notice to Proceed and before request for first progress payment, the Contractor shall prepare and submit to the Project Manager a construction progress schedule conforming to the Milestone Schedule below.

B. Construction schedule shall be based on weekday hours.

C. The Construction Schedule shall be continuously updated, and an updated schedule shall be submitted with each application for progress payment. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.

D. Milestone Events: See Special Conditions, Section 00 73 00, for specific Milestone Events that must be incorporated into the CPM Schedule.

E. Site Conditions and Constraints: The CPM Schedule shall take into account Site conditions and constraints. If the Work is in occupied areas or during School sessions, the Contractor shall perform the Work after school hours, during evenings, weekends, and school holidays. The typical working hours for this project, when school is in session, are from 3:30 PM to 11:45 PM. The District will occupy and make full use of each school, including its existing technology systems during the same time the Work of this Project is taking place. When school is on summer, spring, and winter breaks, other working hours may become available for the limited durations of the respective school breaks. Contractor shall work while not affecting or disrupting the school site. All work shall be coordinated with the District's representatives for each site so as not to disrupt each site's daily operations. The District's operational calendars are available on the District's website.

5. QUALIFICATIONS

A. Contractor shall employ experienced scheduling personnel qualified to use the latest version of software mutually agreed upon. Experience level required is set forth below. Contractor may employ such personnel directly or may employ a consultant for this purpose.

1. Concurrently with submittal of the Initial CPM Schedule, the Contractor shall submit a written statement identifying the individual who will perform CPM scheduling. The CPM Scheduler Information shall include:

    a. Knowledge of critical path method (CPM) scheduling utilizing Microsoft Project or District's web-based software as directed by the District.

    b. Capability and experience shall be verified by description of construction projects on which individual has successfully applied computerized CPM.

    c. Contractor's personnel of specialist Consultant specializing in CPM scheduling with one year's minimum experience.

2. Required level of experience shall include at least two (2) projects of similar nature and scope with value not less than three fourths (¾) of the Total Bid Price of this Project. The written statement shall provide contact persons for referenced projects with current telephone and address information.

3. Scheduler:

   a. Dedicated to this project and available on-site as needed to meet the strict requirement of this spec. section.

   b. Scheduler will attend all project meetings, as required.

B. District reserves the right to approve or reject Contractor's scheduler or consultant at any time. District reserves the right to refuse replacing of Contractor's scheduler or consultant, if District believes replacement will negatively affect the scheduling of Work under this Contract.

6. GENERAL

A. Progress Schedule shall be based on and incorporate milestone events and completion dates specified in Contract Documents.

B. Overall time of completion and time of completion for each milestone event shown on Progress Schedule shall adhere to times in the Contract, unless an earlier (advanced) time of completion is requested by Contractor and agreed to by District. A Change Order shall formalize any such agreement.

1. District is not required to accept an early completion schedule, i.e., one that shows an earlier completion date than the Contract Time.

2. Contractor shall not be entitled to extra compensation in event agreement is reached on an earlier completion schedule and Contractor completes its Work, for whatever reason, beyond completion date shown in its early completion schedule but within the Contract Time.

3. A schedule showing the work completed in less than the Contract Time, and that has been accepted by District, shall be considered to have Project Float. The Project Float is the time between the scheduled completion of the work and the Completion Date. Project Float is a resource available to both District and the Contractor.

C. Ownership of Project Float: Neither the District nor Contractor owns Project Float. The Project owns the Project Float. As such, liability for delay of the Completion Date rests with the party whose actions, last in time, actually cause delay to the Completion Date.

1. For example, if Party A uses some, but not all of the Project Float and Party B later uses remainder of the Project Float as well as additional time beyond the Project Float, Party B shall be liable for the time that represents a delay to the Completion Date.

2. Party A would not be responsible for the time since it did not consume the entire

Project Float and additional Project Float remained; therefore, the Completion Date was unaffected by Party A.

D. Progress Schedule shall be the basis for evaluating job progress, payment requests, and time extension requests. Responsibility for developing Contract CPM Schedule and monitoring actual progress as compared to Progress Schedule rests with Contractor.

E. Failure of Progress Schedule to include any element of the Work, or any inaccuracy in Progress Schedule, will not relieve Contractor from responsibility for accomplishing the Work in accordance with the Contract. District's acceptance of schedule shall be for its use in monitoring and evaluating job progress, payment requests, and time extension requests and shall not, in any manner, impose a duty of care upon District, or act to relieve Contractor of its responsibility for means and methods of construction.

F. Software: Use the latest version of Microsoft Projects or the web-based software, or mutually agreed upon program. Such software shall be compatible with Windows operating system. Contractor shall transmit contract file to District by email and/ or USB at times requested by District. See *Article 7 of the General Conditions* and *Section 5 of the Special Conditions.*

G. Transmit each item under the form approved by District.

1. Identify Project with District Contract number and name of Contractor.

2. Provide space for Contractor's approval stamp and District's review stamps.

3. Submittals received from sources other than Contractor will be returned to the Contractor without District's review.

7. SCHEDULE FORMAT

A. Format: Prepare schedules in format at the District's option, either bar chart, Microsoft Project, PERT or GANTT format, providing clear indication of sequencing and scheduling of Work, for determination of 'critical path' of construction progress.

1. Prepare schedules with Microsoft Project or District's web-based scheduling software for this Project.

2. Provide clear indication of sequencing and scheduling of work for determination of 'critical path' of construction progress.

3. Present schedule in both electronic and reproducible paper formats with sheet size large enough to clearly read the characters.

B. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

C. Diagram Sheet Size: Maximum 22 x 17 inches.

D. Sheet Size: Multiples of 8-1/2 x 11 inches.

E. Scale and Spacing: To allow for notations and revisions.

8. INITIAL CPM SCHEDULE- Pre-Construction

A. Initial CPM Schedule submitted for review at the pre-construction conference shall serve as Contractor's schedule

B. Indicate detailed plan for the Work to be completed in first **ninety (90)** days of the Contract; details of planned mobilization of plant and equipment; sequence of early operations; procurement of materials and equipment. Show Work beyond **ninety (90)** calendar days in summary form.

C. Initial CPM Schedule shall be time scaled.

D. Initial CPM Schedule shall be cost and resource loaded. Accepted cost and resource loaded schedule will be used as basis for monthly progress payments until acceptance of the Original CPM Schedule. Use of Initial CPM Schedule for progress payments shall not exceed **ninety (90)** calendar days.

E. District and Contractor shall meet to review and discuss the Initial CPM Schedule within **five (5)** calendar days after it has been submitted to District.

1. District's review and comment on the schedule shall be limited to Contract conformance (with sequencing, coordination, and milestone requirements).

2. Contractor shall make corrections to schedule necessary to comply with Contract requirements and shall adjust schedule to incorporate any missing information requested by District. Contractor shall resubmit Initial CPM Schedule if requested by District.

F. If, during the first **ninety (90)** days after Notice to Proceed, the Contractor is of the opinion that any of the Work included on its Initial CPM Schedule has been impacted, the Contractor shall submit to District a written Time Impact Evaluation ('TIE'). The TIE shall be based on the most current update of the Initial CPM Schedule.

9. ORIGINAL CPM SCHEDULE - Complete Construction Schedule

A. Submit a detailed proposed Original complete project CPM Schedule presenting an orderly and realistic plan for completion of the Work in conformance with requirements as specified herein. The terms proposed Original complete Project CPM Schedule and Preliminary Construction Schedule are used interchangeably.

B. Progress Schedule shall include or comply with following requirements:

1. Time scaled, cost and resource (labor and major equipment) loaded CPM schedule.

2. No activity on schedule shall have duration longer than fifteen (15) work days, with exception of submittal, approval, fabrication and procurement activities, unless otherwise approved by District.

3. Activity durations shall be total number of actual work days required to perform that

activity.

4. The start and completion dates of all items of Work, their major components, and milestone completion dates, if any.

5. District furnished materials and equipment, if any, identified as separate activities.

6. Activities for maintaining Project Record Documents.

7. Dependencies (or relationships) between activities.

8. Processing/approval of submittals and shop drawings for all material and equipment required per the Contract. Activities that are dependent on submittal acceptance or material delivery shall not be scheduled to start earlier than expected acceptance or delivery dates.

    a. Include time for submittals, re-submittals and reviews by District. Coordinate with accepted schedule for submission of Shop Drawings, samples, and other submittals.

    b. Contractor shall be responsible for all impacts resulting from re-submittal of Shop Drawings and submittals.

9. Procurement of major equipment, through receipt and inspection at jobsite, identified as separate activity.

    a. Include time for fabrication and delivery of manufactured products for the Work.

    b. Show dependencies between procurement and construction.

    c. Activity description; what Work is to be accomplished and where.

10. If required by the Contract Documents., the total cost of performing each activity, which shall be the total of labor, material, and equipment, excluding overhead and profit of Contractor and labor resources for completing each activity. Overhead and profit of the General Contractor shall be shown as a separate activity in the schedule. Sum of cost for all activities shall equal total Contract value. Resources required (labor and major equipment) to perform each activity.

11. Responsibility code for each activity corresponding to Contractor or Subcontractor responsible for performing the Work.

12. Identify the activities that constitute the controlling operations or critical path. No more than twenty-five (25%) of the activities shall be critical or near critical. Near critical is defined as float in the range of one (1) to (5) days.

13. Five (5) workdays for developing punch list(s), completion of punch-list items, and final clean-up for the Work or any designated portion thereof. No other activities shall be scheduled during this period.

14. Interface with the work of other contractors, District, and agencies such as, but not limited to, utility companies.

15. Show detailed Subcontractor Work activities. In addition, furnish copies of Subcontractor schedules upon which CPM was built.

    a. Also, furnish for each Subcontractor, as determined by District, submitted on Subcontractor letterhead, a statement certifying that Subcontractor concurs with Contractor's Original CPM Schedule and that Subcontractor's related schedules have been incorporated, including activity duration, cost and resource loading.

    b. Subcontractor schedules shall be independently derived and not a copy of Contractor's schedule.

    c. In addition to Contractor's schedule and resource loading, obtain from electrical, mechanical, and plumbing Subcontractors, and other Subcontractors as required by District, productivity calculations common to their trades, such as units per person day, feet of pipe per day per person, feet of wiring per day per person, and similar information.

    d. Furnish schedule for Contractor/Subcontractor CPM schedule meetings, which shall be held prior to submission of Original CPM schedule to District. District shall be permitted to attend scheduled meetings as an observer.

16. Activity durations shall be in Workdays.

17. Submit with the schedule a list of anticipated non-Work days, such as weekends and holidays. The Progress Schedule shall exclude in its Work Day calendar all non-Work days on which Contractor anticipates critical Work will not be performed.

C. Original CPM Schedule Review Meeting: Contractor shall, within **ten (10)** days from the Notice to Proceed date, meet with District to review the Original CPM Schedule submittal.

1. Contractor shall have its Project Manager, Project Superintendent, Project Scheduler, and key Subcontractor representatives, as required by District, in attendance. The meeting will take place over a continuous one (1) day period.

2. District's review will be limited to submittal's conformance to Contract requirements including, but not limited to, coordination requirements. However, review may also include:

    a. Clarifications of Contract Requirements.

    b. Directions to include activities and information missing from submittal.

    c. Requests to Contractor to clarify its schedule.

3. Within **three (3)** days of the Pre-Construction Meeting, Contractor shall respond in writing to all questions and comments expressed by District at the Meeting.

10. ADJUSTMENTS TO CPM SCHEDULE

A. Adjustments to Original CPM Schedule: Contractor shall have adjusted the Original CPM Schedule submittal to address all review comments from original CPM Schedule review

meeting and resubmit network diagrams and reports for District's review.

1. District and/or Architect, within **ten (10}** days from date that Contractor submitted the revised schedule, will either:

    a. Accept schedule and cost and resource loaded activities as submitted, or

    b. Advise Contractor in writing to review any part or parts of schedule that either do not meet Contract requirements or are unsatisfactory for District to monitor Project's progress, resources, and status or evaluate monthly payment request by Contractor.

2. District and/or Architect may accept schedule with conditions that the first monthly CPM Schedule update be revised to correct deficiencies identified.

3. When schedule is accepted, it shall be considered the 'Original CPM Schedule', which will then be immediately updated to reflect the current status of the work.

4. District reserves right to require Contractor to adjust, add to, or clarify any portion of schedule, which may later be discovered to be insufficient for monitoring of Work or approval of partial payment requests. No additional compensation will be provided for such adjustments, additions, or clarifications.

B. Acceptance of Contractor's schedule by District will be based solely upon schedule's compliance with Contract requirements.

1. By way of Contractor assigning activity durations and proposing sequence of Work, Contractor agrees to utilize sufficient and necessary management and other resources to perform work in accordance with the schedule.

2. Upon submittal of schedule update, updated schedule shall be considered 'current' CPM Schedule.

3. Submission of Contractor's schedule to District shall not relieve Contractor of total responsibility for scheduling, sequencing, and pursuing Work to comply with requirements of Contract Documents, including adverse effects such as delays resulting from ill-timed Work.

C. Submittal of Original CPM Schedule, and subsequent schedule updates, shall be understood to be Contractor's representation that the Schedule meets requirements of Contract Documents and that Work shall be executed in sequence indicated on the schedule.

D. Contractor shall distribute Original CPM Schedule to Subcontractors for review and written acceptance, which shall be noted on Subcontractors' letterheads to Contractor and transmitted to District for the record.

11. MONTHLY CPM SCHEDULE UPDATE SUBMITTALS

A. Following acceptance of Contractor's Original CPM Schedule, Contractor shall monitor progress of Work and adjust schedule each month to reflect actual progress and any

anticipated changes to planned activities.

1. Each schedule update submitted shall be complete, including all information requested for the Original CPM Schedule submittal.

2. Each update shall continue to show all Work activities including those already completed. These completed activities shall accurately reflect 'as built' information by indicating when activities were actually started and completed.

B. A meeting will be held on approximately the twenty fifth (25th) of each month to review the schedule update submittal and progress payment application.

1. At this meeting, at a minimum, the following items will be reviewed: Percent(%) complete of each activity; Time Impact Evaluations for Change Orders and Time Extension Request; actual and anticipated activity sequence changes; actual and anticipated duration changes; and actual and anticipated Contractor delays.

2. These meetings are considered a critical component of overall monthly schedule update submittal and Contractor shall have appropriate personnel attend. At a minimum, these meetings shall be attended by Contractor's Project Manager, Contractor's Project Superintendent and Scheduler.

3. Contractor shall plan on the meeting taking no less than **four (4)** hours.

C. Within five (5) working days after monthly schedule update meeting, Contractor shall submit the updated CPM Schedule update. Pay Application will not be processed if schedule is not updated.

D. Within five (5) work days of receipt of above noted revised submittals, District will either accept or reject monthly schedule update submittal.

1. If accepted, percent(%) complete shown in monthly update will be basis for The Application for Payment by the Contractor. The schedule update shall be submitted as part of the Contractor's Application for Payment.

2. If rejected, update shall be corrected and resubmitted by Contractor before the Application for Payment is submitted.

E. Neither updating, changing or revising of any report, curve, schedule, or narrative submitted to District by Contractor under this Contract, nor District's review or acceptance of any such report, curve, schedule or narrative shall have the effect of amending or modifying in any way the Completion Date or milestone dates or of modifying or limiting in any way Contractor's obligations under this Contract.

12. SCHEDULE REVISIONS

A. Updating the Schedule to reflect actual progress shall not be considered revisions to the Schedule. Since scheduling is a dynamic process, revisions to activity durations and sequences are expected on a monthly basis.

B. To reflect revisions to the schedule, the Contractor shall provide District with a written narrative with a full description and reasons for each Work activity revised. For revisions affecting the sequence of work, the Contractor shall provide a schedule diagram, which compares the original sequence to the revised sequence. The Contractor shall provide the written narrative and schedule diagram for revisions two (2) working days in advance of the monthly schedule update meeting.

C. Schedule revisions shall not be incorporated into any schedule update until the revisions have been reviewed by District. District may request further information and justification for schedule revisions and Contractor shall, within three (3) days, provide District with a complete written narrative response to District's request.

D. If the Contractor's revision is still not accepted by District, and the Contractor disagrees with District's position, the Contractor has seven (7) calendar days from receipt of District's letter rejecting the revision to provide a written narrative providing full justification and explanation for the revision. The Contractor's failure to respond in writing within seven (7) calendar days of District's written rejection of a schedule revision shall be contractually interpreted as acceptance of District's position, and the Contractor waives its rights to subsequently dispute or file a claim regarding District's position.

E. At District's discretion, the Contractor can be required to provide Subcontractor certifications of performance regarding proposed schedule revisions affecting said Subcontractors.

13. RECOVERY SCHEDULE

A. If the Schedule Update shows a completion date seven (7) calendar days beyond the Contract Time as adjusted, or individual Milestone Event completion dates, the Contractor shall submit to District the proposed revisions to recover the lost time within three (3) calendar days. As part of this submittal, the Contractor shall provide a written narrative for each revision made to recapture the lost time. If the revisions include sequence changes, the Contractor shall provide a schedule diagram comparing the original sequence to the revised sequence of work.

B. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed and accepted by the District.

C. At District's discretion, the Contractor can be required to provide Subcontractor certifications for revisions affecting said Subcontractors.

14. TIME IMPACTS EVALUATION ('TIE') FOR CHANGE ORDERS, AND OTHER DELAYS

A. When Contractor is directed to proceed with changed Work, the Contractor shall prepare and submit within five (5) calendar days from the Notice to Proceed with Changed Work a TIE that includes both a written narrative and a schedule diagram depicting how the changed Work affects other schedule activities. The schedule diagram shall show how the Contractor proposes to incorporate the changed Work in the schedule and how it affects the current schedule-update critical path. The Contractor is also responsible for requesting time extensions based on the TIE's impact on the critical path. The diagram must be tied to the main sequence of schedule activities to enable District to evaluate the impact of changed Work to the scheduled critical path.

B. Contractor shall be responsible for all costs associated with the preparation of TIEs, and the process of incorporating them into the current schedule update. The Contractor shall provide District with one (1) hard copy, one (1) electronic and upload into Web-based software, of each TIE.

C. TIEs are subject to District review and acceptance. The District may accept, accept in part/reject in part or reject a TIE based on the District's evaluation of the TIE including without limitation, accuracy of factual basis of the TIE, consistency of time impact analysis with generally accepted construction schedule analysis principles and reasonableness of conclusions reached. If upon District review of a TIE, the District reasonably concludes that the Contract Time is subject to adjustment based on the TIE, the Contract Time shall be adjusted by such time as determined by the District based on the TIE and the District's evaluation of the TIE. Requests for adjustment of the Contract Time will be reviewed and considered by the District only if the request is accompanied by a TIE supporting the request for Contract Time adjustment.

15. TIME EXTENSIONS

A. The Contractor is responsible for requesting time extensions for time impacts that, in the opinion of the Contractor, affect the critical path of the current schedule update. Notice of time impacts shall be given in accord with the General Conditions.

B. Where an event for which the Contractor believes the District is responsible impacts the projected Completion Date, the Contractor shall provide a written mitigation plan, including a schedule diagram, which explains how (e.g., increase crew size, overtime, etc.) the impact can be mitigated. The Contractor shall also include a detailed cost breakdown of the labor, equipment, and material the Contractor would expend to mitigate time impacts the Contractor believes is caused by the District. The Contractor shall submit its mitigation plan to District within five (5) calendar days from the date of discovery of the impact. The Contractor is responsible for the cost to prepare the mitigation plan.

C. Failure to request time, provide TIE, or provide the required mitigation plan will result in Contractor waiving its right to a time extension and cost to mitigate the delay.

D. No time will be granted under this Contract for cumulative effect of changes.

E. District will not be obligated to consider any time extension request unless the Contractor strictly complies with the requirements of Contract Documents relating to timely notice of an event affecting the Contract Time, timely submittal of request for adjustment of the Contract Time and Time Impact Evaluation supporting the request for Contract Time adjustment.

F. Failure of the Contractor to perform in accordance with the current schedule update shall not be excused by submittal of time extension requests.

G. If the Contractor does not submit a TIE within the required five (5) calendar days for any event that may result in adjustment of the Contract Time, the Contractor shall be deemed to have waived its right to request adjustment of the Contract Time relating to such event,.

16. SCHEDULE REPORTS

A. Submit one (1) hard copy, one (1) electronic and upload into District's Web-based Software the following reports with the Initial CPM Schedule, the Original CPM Schedule, and each monthly update.

B. Required Reports:

1. Two activity listing reports: one sorted by activity number and one by total Project Float. These reports shall also include each activity's early/late and actual start and finish dates, original and remaining duration, Project Float, responsibility code, and the logic relationship of activities.

2. Cost report sorted by activity number including each activity's associated cost, percentage of Work accomplished, earned value- to date, previous payments, and amount earned for current update period.

3. Schedule plots presenting time-scaled network diagram showing activities and their relationships with the controlling operations or critical path clearly highlighted.

4. Cash flow report calculated by early start, late start, and indicating actual progress. Provide an exhibit depicting this information in graphic form.

5. Planned versus actual resource (i.e., labor) histogram calculated by early start and late start.

C. Other Reports:

In addition to above reports, District may request, from month to month, any two of the following reports. Submit one (1) hard copy, one (1) electronic and upload into Web-based software of all reports.

1. Activities by early start.

2. Activities by late start.

3. Activities grouped by Subcontractors or selected trades.

4. Activities with scheduled early start dates in a given time frame, such as fifteen (15) or thirty (30) day outlook.

D. Furnish District with one (1) hard copy, one (1) electronic and upload into the District's Web-based Software all report files containing all schedule files for each report generated.

17. PROJECT STATUS REPORTING

A. In addition to submittal requirements for CPM scheduling identified in this Section, Contractor shall provide a monthly project status report (i.e., written narrative report) to be submitted in conjunction with each CPM Schedule as specified herein. Status reporting shall be in form specified below.

B. Contractor shall prepare monthly written narrative reports of status of Project for submission to District. Written status reports shall include:

1. Status of major Project components (percent (%) complete, amount of time ahead or behind schedule) and an explanation of how Project will be brought back on schedule if delays have occurred.

2. Progress made on critical activities indicated on CPM Schedule.

3. Explanations for any lack of work on critical path activities planned to be performed during last month.

4. Explanations for any schedule changes, including changes to logic or to activity durations.

5. List of critical activities scheduled to be performed next month.

6. Status of major material and equipment procurement.

7. Any delays encountered during reporting period.

8. Contractor shall provide printed report indicating actual versus planned resource loading for each trade and each activity. This report shall be provided on weekly and monthly basis.

    a. Actual resource shall be accumulated in field by Contractor and shall be as noted on Contractor's daily reports. These reports will be basis for information provided in computer-generated monthly and weekly printed reports.

    b. Contractor shall explain all variances and mitigation measures.

9. Contractor may include any other information pertinent to status of Project. Contractor shall include additional status information requested by District at no additional cost.

10. Status reports, and the information contained therein, shall not be construed as claims, notice of claims, notice of delay, or requests for changes or compensation.

18. WEEKLY SCHEDULE REPORT

A. At the Weekly Progress Meeting, the Contractor shall provide and present a time-scaled four (4) week look-ahead schedule that is based and correlated by activity number to the current schedule (i.e., Initial, Original CPM, or Schedule Update) showing the activities completed during the previous week and the schedule of activities for the following 4 weeks ("Weekly Schedule"). The Contractor shall submit the Weekly Schedule to the Construction Manager and/or District Representative at least twenty-four (24) hours prior to each weekly progress meeting.

1. Using the same computer software as the progress schedule, use the Activity ID's, Descriptions, and logic of the current progress schedule when producing a Weekly Schedule in CPM schedule or a bar chart format. In the event that the Weekly Schedule no longer conforms to the current schedule, Contractor may be required to revise either or both schedule(s).

B. The activity designations used in the Weekly Schedule must be consistent with those used in the Baseline Schedule and the monthly Schedule Updates.

1. Contractor and Construction Manager and / or District Representative must agree on the format of the Weekly Schedule.

2. Weekly Schedule should indicate locations of work, critical activities, early start and early finish dates, actual start and actual finish dates, progress, and remaining durations for each activity in the three-week schedule.

19. DAILY CONSTRUCTION REPORTS

On a daily basis, Contractor shall submit a daily activity report to District for each workday, including weekends and holidays when worked. Contractor shall develop the daily construction reports on a computer-generated database capable of sorting daily Work, labor, and manhours by Contractor, Subcontractor, area, sub-area, and Change Order Work. Upon request of District, furnish computer disk of this database. Obtain District's written approval of daily construction report data base format prior to implementation. Include in report:

A. Project name and Project number.

B. Contractor's name and address.

C. Weather, temperature, and any unusual site conditions.

D. Brief description and location of the day's scheduled activities and any special problems and accidents, including Work of Subcontractors. Descriptions shall be referenced to CPM scheduled activities.

E. Worker quantities for its own Work force and for Subcontractors of any tier.

F. Equipment, other than hand tools, utilized by Contractor and Subcontractors.

20. PERIODIC VERIFIED REPORTS

A. Contractor shall complete and verify construction reports on forms prescribed by the Division of the State Architect and periodically file reports during construction as required by DSA or the Laws; at the completion of the Contract; at the completion of the Work; at the suspension of Work for a period of more than one (1) month; whenever the Contract is terminated for any reason; and at any time a special verified report is required by the Division of the State Architect. Refer to section 4-336 and section 4-343 of Part 1, Title 24 of the California Code of Regulations.

B. Contractor to upload reports into the DSA Box, or as required by DSA. Provide the District with one (1) hard copy, one (1) electronic copy, and upload into District's Web-based Software.

END OF DOCUMENT 01 32 13

DOCUMENT 01 33 00
SUBMITTALS

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Contractor's Submittals and Schedules, Drawings and Specifications.

B. Section 01 29 73: Schedule of Values Procedures.

C. Section 01 29 00: Progress Payment Procedures.

D. Section 01 31 19: Project Meetings.

E. Section 01 33 00: Submittals.

F. Section 01 43 00: Materials and Equipment.

G. Section 01 45 00: Quality Control.

H. Division 2 through Division 32.

2. SECTION INCLUDES:

A. Definitions:

1. Shop Drawings and Product Data are as indicated in the General Conditions and include, but are not limited to, fabrication, erection, layout and setting drawings, formwork and falsework drawings, manufacturers' standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams. In addition, there are other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment or systems and all positions conform to the requirement of the Contract Documents, including, without limitation, the Drawings.

2. 'Manufactured' applies to standard units usually mass-produced; 'fabricated' means specifically assembled or made out of selected materials to meet design requirements. Shop Drawings shall establish the actual detail of manufactured or fabricated items, indicated proper relation to adjoining work and amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure.

3. Manufacturer's Instructions: Where any item of Work is required by the Contract Documents to be furnished, installed, or performed, at a minimum, in accordance with specified product manufacturer's instructions, the Contractor shall procure and distribute copies of these to the District, the Architect, and all other concerned parties and shall

furnish, install, or perform the work, at a minimum, in accordance with those instructions.

4. Contractor shall package each Submittal appropriately for transmittal and handling and will then send Architect, Commissioning Agent (if applicable), and District Representative each Submittal for review per the Project plans and specifications. Submittals will not be accepted from sources other than the Contractor.

B. Samples, Shop Drawings, Product Data, and other items as specified, in accordance with the following requirements:

1. The submittal process shall be through District's Web-based Software, unless otherwise directed by the District.

2. Contractor shall submit all Shop Drawings, Product Data, and Samples to the District, the Architect, the Project Inspector, and the Construction Manager.

3. Contractor shall comply with all time frames herein and in the General Conditions and, in any case, shall submit required information in sufficient time to permit proper consideration and action before ordering any materials or items represented by such Shop Drawings, Product Data, and/or Samples.

4. Time for completion of Work shall not be extended on account of Contractor's failure to promptly submit Shop Drawings, Product Data, and/or Samples.

5. Reference numbers on Shop Drawings shall have Architectural and/or Engineering Contract Drawings reference numbers for details, sections, and 'cuts' shown on Shop Drawings. These reference numbers shall be in addition to any numbering system that Contractor chooses to use or has adopted as standard.

6. When the magnitude or complexity of submittal material prevents a complete review within the stated time frame, Contractor shall make this submittal in increments to avoid extended delays.

7. Contractor shall certify on Submittals for review that Submittals conform to Contract requirements. In event of any variance, Contractor shall specifically state in transmittal and on Shop Drawings, portions vary and require approval of a substitute. Also, certify that Contractor-furnished equipment can be installed in allocated space.

8. Unless specified otherwise, sampling, preparation of samples, and tests shall be in accordance with the latest standard of the American Society for Testing and Materials.

9. Upon demand by Architect or District, Contractor shall submit samples of materials and/or articles for tests or examinations and consideration before Contractor incorporates same in Work. Contractor shall be solely responsible for delays due to sample(s) not being submitted in time to allow for tests. Acceptance or rejection will be expressed in writing. Work shall be equal to approved samples in every respect. Samples that are of value after testing will remain the property of Contractor.

C. Submittal Schedule:

1. Contractor shall prepare its proposed submittal schedule that is coordinated with the proposed construction schedule and submit both to the District within five (5) days after the date of the Notice to Proceed. Contractor's proposed schedules shall become the Project Construction Schedule and the Project Submittal Schedule after each is approved by the District.

2. Contractor is responsible for all costs/losses resulting from delay, disruption or other hindrance to completing Work in accordance with the Construction Schedule if the initial Submittal is rejected, marked 'revised and resubmit', or other similar notation requiring the Contractor to revise, augment or otherwise amend. The Contract Time is not subject to adjustment for the Contractor's re-submission of Submittals.

3. All Submittals shall be forwarded to the District by the date indicated on the approved Submittal Schedule, unless an earlier date is necessary to maintain the Construction Schedule, in which case those Submittals shall be forwarded to the District so as not to delay the Construction Schedule. All costs to complete "early" submission of Submittals shall be borne by the Contractor.

3. SHOP DRAWINGS:

A. Contractor shall provide the District, Construction Manager and Architect each with one (1) hard copy, one (1) electronic copy, and upload Shop Drawings into District's Web-based Software. The District and / or Architect will review and return via District's Web-based Software, unless otherwise directed by the District.

B. Before commencing installation of any Work, the Contractor shall submit and receive approval of all drawings, descriptive data, and material list(s) as required to accomplish Work.

C. Review of Shop Drawings is regarded as a service to assist Contractor and in all cases, original Contract Documents shall take precedence as outlined under General Conditions. No claim for extra time or payment shall be based on work shown on Shop Drawings unless the claim is (1) noted on Contractor's transmittal letter accompanying Shop Drawings and (2) Contractor has complied with all applicable provisions of the General Conditions, including, without limitation, provisions regarding changes and payment, and all required written approvals. (3) District approves claim in writing.

D. District and / or Architect shall not review Shop Drawings for quantities of materials or number of items supplied.

E. District and/or Architect review of Shop Drawing will be general. District and/or Architect review does not relieve Contractor of responsibility for accuracy, proper fitting, construction of Work, furnishing of materials, or Work required by Contract Documents and not indicated on Shop Drawings. Shop Drawing reviewed by District and/or Architect is not to be construed as approving departures from Contract Documents.

F. Review of Shop Drawings and Schedules does not relieve Contractor from responsibility for any aspect of those Drawings or Schedules that is a violation of local, County, State, or Federal laws, rules, ordinances, or rules and regulations of commissions, boards, or other authorities or utilities having jurisdiction.

G. Before submitting Shop Drawings for review, Contractor shall check Shop Drawings of its subcontractors for accuracy and confirm that all Work contiguous with and having bearing on other work shown on Shop Drawings is accurately drawn and in conformance with Contract Documents.

1. Submitted drawings and details must bear stamp of approval of Contractor.

2. Stamp and signature shall clearly certify that Contractor has checked Shop Drawings for compliance with Drawings.

3. If Contractor submits a Shop Drawing prepared by a Subcontractor or Material Supplier without an executed stamp of approval, or whenever it is evident (despite stamp) that Drawings have not been checked the District and/or Architect will not consider them and will return them to the Contractor for revision and resubmission. In that event, it will be deemed that Contractor has not complied with this provision and Contractor shall bear risk of all delays to same extent as if it had not submitted any Shop Drawings or details.

H. Submission of Shop Drawings (in either original submission or when resubmitted with correction) shall be deemed the Contractor's verification that all information therein is complete and accurate and that to the Contractor shall furnish, install perform Work as shown in the Shop Drawing subject to the Architect's review comments/requirements.

I. Contractor shall pay for cost of any changes in construction due to improper checking and coordination of Submittals. Contractor shall be responsible for all additional costs, including coordination. Contractor shall be responsible for costs incurred by itself, the District, the Architect, the Project Inspector, the Construction Manager, any other Subcontractor or contractor, etc., due to improperly checked and/or coordination of submittals.

1. Review shop drawings, product data, and samples for compliance with Contract Documents and for coordination with related work. Transmit copies of reviewed documents to Architect.

2. Check field dimensions, clearances, and relationship to available space and anchors.

3. Check compatibility with equipment and work of other sections, electrical characteristics, and operational control requirements.

4. Check motor voltages and control characteristics.

5. Coordinate controls, interlocks, wiring of switches, and relays.

6. Coordinate wiring and control diagrams.

7. When changes in the work are made, review their effect on other work.

8. Verify information and coordinate maintenance of record documents.

J. Shop Drawings must clearly delineate the following information:

1. Project name, site, and address.

2. Specification number and description.

3. Architect's name and project number.

4. Shop Drawing title, number, date, and scale.

5. Names of Contractor, Subcontractor(s) and fabricator.

6. Working and erection dimensions.

7. Arrangements and sectional views.

8. Necessary details, including complete information for making connections with other Work.

9. Kinds of materials and finishes.

10. Descriptive names of materials and equipment, classified item numbers, and locations at which materials or equipment are to be installed in the Work. Contractor shall use same reference identification(s) as shown on Contract Drawings.

K. Contractor shall prepare composite drawings and installation layouts when required to solve tight field conditions.

1. Shop Drawings shall consist of dimensioned plans and elevations and must give complete information, particularly as to size and location of sleeves, inserts, attachments, openings, conduits, ducts, boxes, structural interferences, etc.

2. Contractor shall coordinate these composite Shop Drawings and installation layouts in the field between itself and its Subcontractor(s) for proper relationship to the Work, the work of other trades, and the field conditions.

4. PRODUCT DATA OR NON-REPRODUCIBLE SUBMITTALS:

A. Contractor shall submit manufacturer's printed literature in original form. Any fading type of reproduction will not be accepted. Contract must submit a minimum of two {2) hard copies each, to the District and/or Architect and/or Commissioning Agent (if applicable). District and/or Architect and/or Commissioning Agent (if applicable) shall return one (1) to the Contractor, who shall reproduce whatever additional copies it requires for distribution.

B. Contractor shall submit one (1) PDF electronic file, via District's Web-based Software, unless directed otherwise by the District and one (1) hard copy of a complete list of all major items of mechanical, plumbing, and electrical equipment and materials in accordance with the approved Submittal Schedule, except as required earlier to comply with the approved Construction Schedule. Other items specified are to be submitted prior to commencing Work. Contractor shall submit items of like kind at one time in a neat and orderly manner. Partial lists will not be acceptable. All documents will be transmitted through District's Web-based

Software, unless directed otherwise by the District.

C. Submittals shall include manufacturer's specifications, physical dimensions, and ratings of all equipment. Contractor shall furnish performance curves for all pumps and fans. Where printed literature describes items in addition to that item being submitted, submitted item shall be clearly marked on sheet and superfluous information shall be crossed out. If highlighting is used, Contractor shall mark all copies.

D. Equipment submittals shall be complete and include space requirements, weight, electrical and mechanical requirements, performance data, and supplemental information that may be requested.

5. SAMPLES:

A. Contractor shall submit for approval Samples as required and within the time frame in the Contract Documents. Materials such as concrete, mortar, etc., which require on-site testing will be obtained from Project Site.

B. Contractor shall submit three (3) samples except where greater or lesser number is specifically required by Contract Documents including, without limitation, the Specifications.

1. Samples must be of sufficient size and quality to clearly illustrate functional characteristics, with integrally related parts and attachment devices.

2. Samples must show full range of texture, color, and pattern.

3. Samples must be clearly identified with site, project name, area intended, Finish, etc. as applicable.

C. Contractor shall make all Submittals, unless it has authorized Subcontractor(s) to submit and Contractor has notified the District in writing to this effect.

D. Samples to be shipped prepaid or hand-delivered to the District.

E. Contractor shall mark samples to show name of Project, name of Contractor submitting, Contract number and segment of Work where representative Sample will be used, all applicable Specifications Sections and documents, Contract Drawing Number and detail, and ASTM or FS reference, if applicable.

F. Contractor shall not deliver any material to Site prior to receipt of District's and/or Architect's completed written review and approval. Contractor shall furnish materials equal in every respect to approved Samples and execute Work in conformance therewith.

G. District's and/or Architect's review, acceptance, and/or approval of Sample(s) will not preclude rejections of any material upon discovery of defects in same prior to final acceptance of completed Work.

H. After a material has been approved, no change in brand or make will be permitted.

I. Contractor shall prepare its Submittal Schedule and submit Samples of materials requiring laboratory tests to specified laboratory for testing not less than ten (10) days before such materials are required to be used in Work.

J. Samples, which are rejected, must be resubmitted promptly after notification of rejection and be marked 'Resubmitted Sample' in addition to other information required.

K. Field Samples and Mock-Ups are to be removed by Contractor, without adjustment of the Contract Time or Contract Price, at District's direction:

1. Size: As Specified.

2. Furnish catalog numbers and similar data, as requested.

6. REVIEW AND RESUBMISSION REQUIREMENTS:

A. Sample(s), Shop Drawing(s), Product Data, and other submittal(s) will be reviewed and returned to Contractor as provided in the Submittal Schedule. One (1) copy of product or materials data will be returned to Contractor with the review status. Material will be transmitted through District's Web-based Software, if possible, unless directed otherwise by the District.

B. Samples to be incorporated into the Work will be returned to Contractor, together with a written notice designating the Sample with the appropriate review status and indicating errors discovered on review, if any. Other Samples will not be returned, but the same notice will be given with respect thereto, and that notice shall be considered a return of the Sample.

C. Contractor shall revise and resubmit any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) as required by the reviewer. Such resubmittals will be reviewed and returned in the same manner as original Sample(s), Shop Drawing(s), Product Data, and other submittal(s), within the time established by the District and if no time is established by the District, within five (5) days after receipt.

D. Contractor may proceed with any of the Work covered by Sample(s), Shop Drawing(s), Product Data, and other submittal(s) upon its return if designated as no exception taken, or revise as noted, provided the Contractor proceeds in accordance with the District and/or the Architect's notes and comments.

E. Contractor shall not begin any of the work covered by a Sample(s), Shop Drawing(s), Product Data, and other submittal(s), designated as revise and resubmit or rejected, until a revision or correction thereof has been reviewed and returned to Contractor.

F. Neither the review nor the lack of review of any Sample(s), Shop Drawing(s), Product Data, and other submittal(s) shall waive any of the requirements of the Contract Documents or relieve Contractor of any obligation thereunder.

G. District's and/or Architect's review of Shop Drawings does not relieve the Contractor of responsibility for any errors that may exist. Contractor is responsible for the dimensions and design of adequate connections and details and for satisfactory construction of all the Work.

END OF DOCUMENT 01 33 00

DOCUMENT 01 35 00

QUALITY REQUIREMENTS (Mock-up Requirements)

PART 1GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in Sections that specify those activities. Requirements of this Section relate to customized fabrication and installation procedures specified in those Sections. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections and related actions described herein or elsewhere in the Contract Documents do not constitute a limitation on Contractor's responsibility to establish and maintain quality-control procedures that comply with requirements of the Contract Document or Applicable Laws.

1.02 RELATED DOCUMENTS

A. Construction Documents as defined in the Construction Services Agreement.

B. Construction Services Agreement.

C. Other General Requirements.

D. Divisions 2 through16 Sections for specific test and inspection requirements.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E 548 Guide for General Criteria Used for Evaluating Laboratory Competence.

1.04 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions (other than construction administration activities performed by Architect) that occur during and after execution of Work to evaluate that completed Work complies with requirements of Contract Documents and Applicable Laws.

C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample Submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation. Mockups are not Samples. Mockups establish standard by which Work will be judged.

D. Testing Agency: Entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean same as testing agency.

1.05 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by design professional are specifically required of Contractor by Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit written request for additional information to Architect.

2. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required Submittals, submit statement, signed and sealed by responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by design professional, indicating that products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.06 REGULATORY REQUIREMENTS

A. Copies of Regulations: Obtain copies of following regulations and retain at Site to be available for reference by parties who have reasonable need. Documents include, but are not limited to:

1. Additional documents as requested by Project Inspector, Program Manager or Architect.

1.07 SUBMITTALS

A. Reports:

1. Either Contractor (in those instances where the Contractor is responsible under the Contract Documents for testing or inspection) or the independent testing or inspection agency responsible for the testing or inspection shall submit certified written report of each inspection, test, or similar service, with copies to Project Inspector, Contractor and Architect. Submit additional copies of each written report directly to Governmental Authorities, when so directed by the Governmental Authorities.

2. Such reports shall include following:

a. Date of issue.

b. Project title and number.

c. Name, address, and telephone number of testing agency.

d. Dates and locations of samples and tests or inspections.

e. Names of individuals making tests and inspections.

f. Description of Work and test and inspection method.

g. Identification of product and Specification Section.

h. Complete test or inspection data.

1. Test and inspection results and interpretation of test results.

J. Ambient conditions at time of sample taking and testing and inspecting.

k. Comments or professional opinion on whether tested or inspected Work complies with Contract Document requirements.

l. Name and signature of laboratory inspector.

m. Recommendations on retesting and reinspection.

B. Permits, Licenses, and Certificates: For District's records, submit copies of permits, licenses, certifications and inspection reports required by Applicable Laws or requirements of Contract Documents.

1.08 QUALITY ASSURANCE

A. Specialists: Certain sections of Specifications may require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for activities indicated.

1. Requirement for specialists shall not supersede building codes and other Applicable Laws nor interfere with local trade-union jurisdictional settlements and similar conventions.

B. Testing Agency Qualifications: Agency with experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

C. Preconstruction Testing: Where required by other Sections, testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.

b. Submit specimens in timely manner with sufficient time for testing and analyzing results to prevent any Delay to the performance of the Work.

c. Fabricate and install test assemblies using installers who will perform same tasks for Project.

d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor and Project Inspector. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from Contract Documents.

D. Mockups: Before installing portions of Work requiring mockups, build mockups for each form of construction and finish required to comply with following requirements, using materials indicated for completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect. Mock-ups are not to be part of the actual Building Construction.

a. As a minimum, include the following materials for mock-up: Metal Wall Panel System, Phenolic Wall Panel System, Glazed Aluminum Storefront System with all glass types (colors) specified, Portland Cement Plaster on Lath and on CMU/Studs, ceramic tile floors and walls, acoustic wall panel systems, exterior concrete finishes including walkways, benches, planters.

b. Mockups shall be provided for all conditions and details where different materials meet as shown on the Drawings. Mockup will require details where the materials, listed in 'Example' at end of this section, intersect each other in plan and section views.

c. Mockup Layout* to *be provided in Submittal format for review prior* to *Installation* of *Mock up. Example of Submittal Mockup Layout is provided after the end* of *this specification.

2. Notify Project Inspector and Architect seven (7) days' in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction and/or modify or replace Mock-up until mock-up is approved.
5. Maintain mockups during construction in undisturbed condition as standard for judging completed Work.
6. Final disposition of mockups shall be as specified in individual Specification Sections.

1.09 QUALITY CONTROL

A. District Responsibilities: Where quality control services are indicated as District's responsibility, District will engage qualified testing agency to perform these services.
   1. District will furnish Contractor with names, addresses and telephone numbers of testing agencies engaged and description of types of testing and inspecting they are engaged to perform.
   2. Payment for these services will be made to testing and inspecting agency by the Program Manager on behalf of the District.
   3. Costs for retesting and reinspection of construction that constitutes a replacement or repair to Work that fails, or that is necessitated due to Work failing, to comply with Contract Documents will be at the expense of Contractor and without adjustment to the Guaranteed Maximum Price.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality control services specified and required by Governmental Authorities.
   1. Engage qualified testing agency to perform these quality control services.
   2. Contractor shall not employ same entity engaged by District, unless agreed to in writing by District.
   3. Notify testing agencies at least forty-eight (48) hours in advance of time when Work that requires testing or inspecting will be performed.
   4. Testing and inspecting requested by Contractor and not required by Contract Documents are Contractor's responsibility and performed at Contractor's own expense, without adjustment to the Guaranteed Maximum Price.
   5. The Contractor shall submit a statement of responsibility for the construction of lateral forces resisting system complying with 2010 CBC Section 1709A.1.

C. Special Tests and Inspections: District will engage testing agency to conduct special tests and inspections required by Governmental Authorities and that under the Contract Documents are the responsibility of District.
   1. Testing agency will notify Project Inspector, Architect and Contractor promptly of irregularities and deficiencies observed in Work during performance of its services.
   2. Testing agency will submit certified written report of each test, inspection, and similar quality control service to Project Inspector, Architect, with copy to Contractor and to Governmental Authorities.
   3. Testing agency will submit final report of special tests and inspections at Substantial Completion, which includes list of unresolved deficiencies.
   4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from Contract Documents.

5. Testing agency will retest and reinspect corrected Work. Costs of retesting that is necessitated due to a failure by the Work to comply with the Contract Documents shall be at the Contractor's expense and without adjustment to the Guaranteed Maximum Price.

D. Manufacturer's Field Services: Where indicated, Contractor shall engage factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Contractor shall report results in writing to the District Representative.

E. Retesting/Reinspection: Regardless of whether original tests or inspections were Contractor's responsibility, Contractor shall provide at its own expense and without adjustment to the Guaranteed Maximum Price the necessary services of retesting and reinspection of the Work that is replaced or repaired due to a failure of the Work to comply with requirements of Contract Documents.

F. Testing Agency Responsibilities: Testing agencies shall cooperate with Architect, Contractor and Project Inspector in performance of their duties. Testing agencies shall provide qualified personnel to perform required tests and inspections, including the following:

1. Notify Contractor, Architect, and Project Inspector promptly of irregularities or deficiencies observed in Work.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the requirements of the Contract Documents.
3. Submit certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of Contract Documents or approve or accept any portion of Work.
5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to:

1. Access to Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency or District in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Where required by testing agencies, delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Contractor shall coordinate sequence of activities to accommodate required quality-assurance and quality-control services without Delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare schedule of tests, inspections, and similar quality-control services required by Contract Documents. Submit schedule within fourteen (14) days of issuance of Notice to Proceed.

1. Distribution: Distribute schedule to Project Inspector, Architect, testing agencies, and each party involved in performance of portions of Work where tests and inspections are required.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 TESTING AGENCIES

A. Testing agencies and labs shall be DSA-Approved.

3.02 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of the Specifications. Restore patched areas and extend restoration into adjoining areas in manner that eliminates evidence of patching.

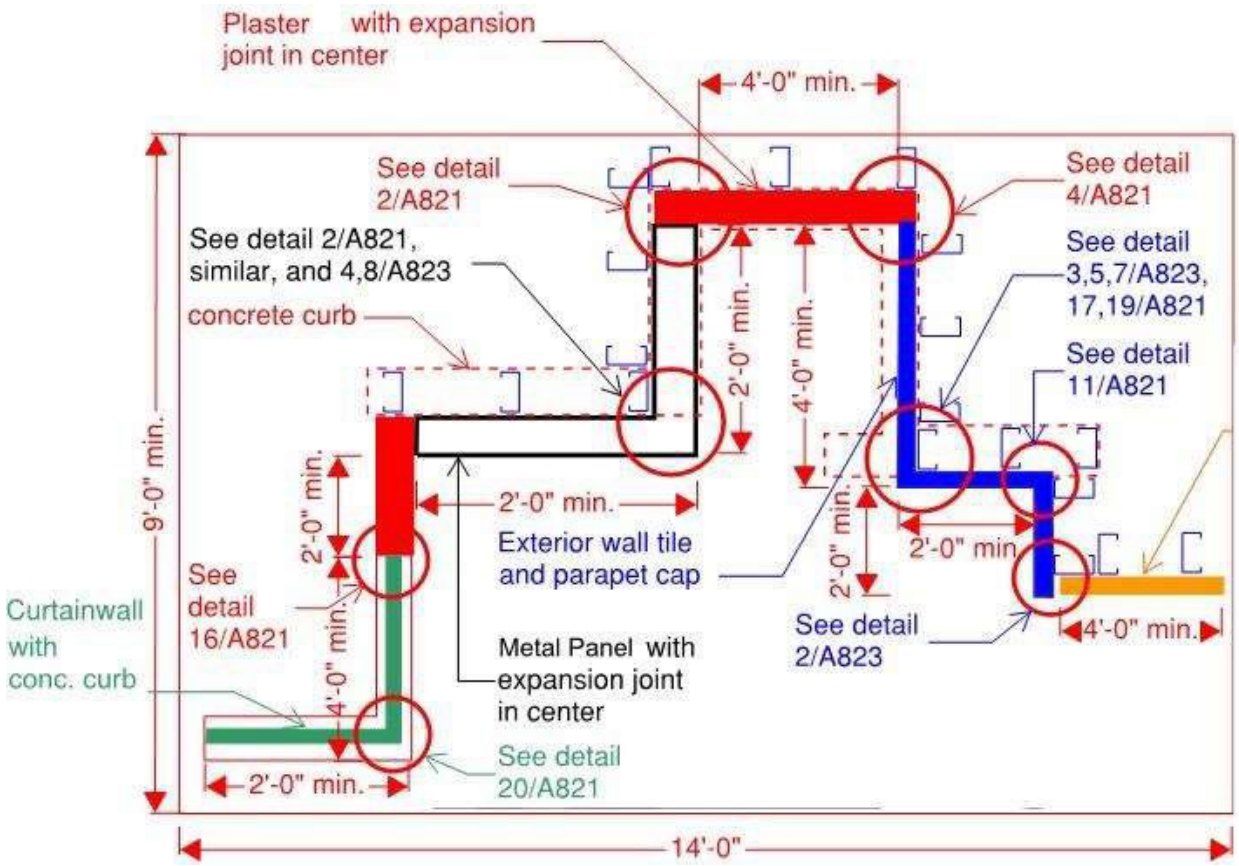
2. Comply with Contract Document requirements.

B. Protect construction exposed.

C. Repair and protection are sole Contractor's responsibility, regardless of assignment of responsibility for quality control services.

END OF SECTION
(See Mockup Layout Example on next page)

MOCK-UP LAYOUT EXAMPLE
(For reference Only-Sizes may vary)



Note: Layout is for reference only and does not represent this project actual mockup layout.
Note: Dimensions are for reference only

Items to be included in mockup, but not limited to:
Include Concrete curb and studs with plaster system mockup.
Include Concrete curb and studs with metal wall panel system mockup.
Include Concrete curb at storefront and glass mockup.
Include furring channels for phenolic panel system mockup.
Include exterior concrete slab with types of finishes and joints.
Include depressed concrete slab for all floor tile types in mockup.
Include studs for wall tile mockup.

Mockup to be approximately 4-6 feet tall.
Mockup to provide reveal joints, end and corner conditions, base conditions, and parapet conditions, etc.
Mockup to show transitions at corners of the materials listed above.

Also see specification section for each product for more information.

DOCUMENT 01 35 13
SITE STANDARDS

1. RELATED DOCUMENTS AND PROVISIONS:

A. All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

B. General Conditions, including without limitation, Site Access, Conditions, and Regulations;

C. Special Conditions;

D. Drug-Free Workplace Certification;

E. Tobacco-Free Environment Certification

F. Criminal Background Investigation/Fingerprinting Certification;

2. REQUIREMENTS OF THE DISTRICT:

A. Drug-Free Schools and Safety Requirements:

1. All school sites and other District Facilities have been declared 'Drug-Free Zones.' No drugs, alcohol and/or tobacco products are allowed at any time in any buildings and/or grounds on District property. No students, staff, visitors, or contractors are to use drugs on these sites.

2. Smoking and the use of tobacco or marijuana products in any form by all persons is prohibited on or in District property. District property includes school buildings, school grounds, school owned vehicles and vehicles owned by others while on District property. Contractor shall post: 'Non-Smoking Area' in a highly visible location on Site.

B. Language: Unacceptable and/or loud language will not be tolerated, 'Cat calls' or other derogatory language toward students or public will not be allowed. Personnel engaging such conduct are subject to removal from the Site pursuant to the General Conditions.

C. Board Policies. Board Policies of the District are applicable at the Site. All personnel shall comply with all applicable Board Policies regarding personal conduct and use of District property.

D. Disturbing the Peace (Noise and Lighting):

1. Contractor shall observe the noise ordinance of the Site at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations regarding noise and allowable noise levels.

2. The use of radios and other audio devices shall be controlled to keep all sound at a level that cannot be heard beyond the immediate area of use. District reserves the right to prohibit the use of audio devices at the Site, except for mobile communications devices.

The Contractor shall prohibit personnel at the Site from use of any audio or communications device that may jeopardize safety of persons or property.

3. If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

4. Contractor shall limit its Work so as not to disturb persons beyond the boundaries of the Site.

E. Site Activity Limitations

1. Contractor shall regulate the use of its forces and equipment as required against public or unauthorized access to the Work and to protect persons, the Work, and existing facilities from damage or injury.

2. Contractor shall regulate the use of it forces and equipment to prevent Contractor's activities from interfering with the instructional and administrative functions of the District.

3. Contractor shall conform its conduct to the requirements of the City of Simi Valley with respect to work hours and noise levels.

4. All limitations on Work activities set forth in these Special Conditions shall be incorporated into and reflected in the Construction Schedules prepared by the Contractor pursuant to the Contract Documents.

5. No adjustment of the Contract Time or the Contract Price will be allowed due to limitations on Work activities at the Site set forth in these Special Conditions.

F. Traffic:

1. Driving on the Premises shall be limited to periods when students and public are not present, if approved by the District in advance. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require.

2. All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and approved by District in advance. Any damage will be repaired to the pre-damaged condition by the Contractor.

3. District shall designate a construction entry to the Site. If Contractor requests, District determines it is required, and to the extent possible, District shall designate a staging area so as not to interfere with the normal functioning of school facilities. Location of gates and fencing shall be approved in advance with District. Gates and fencing shall be installed and maintained at Contractor's expense without adjustment of the Contract Price or the Contract Time.

4. Parking areas shall be reviewed and approved by District in advance. No parking is to occur under the drip line of trees or in areas that could otherwise be damaged.

All of the above shall be observed and complied with by the Contractor and all workers on the Site. Failure to follow these directives could result in individual(s) being suspended or removed from the work force at the discretion of the District. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the Site.

END OF DOCUMENT 01 35 13

DOCUMENT 01 35 42

CALGREEN REQUIREMENTS

1. DESCRIPTION

A. This Section includes general requirements and procedures for compliance with the current CALGreen nonresidential mandatory [and voluntary] requirements.

B. Related Sections:

1. Divisions 01 through 48 Sections, as applicable, for CALGreen requirements specific to the work of each of those Sections.

2. SUBMITTALS

A. CALGreen submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated CALGreen requirements.

B. Contractor shall develop a spreadsheet or use one furnished by the Architect [District] to track submittals required by CALGreen.

C. CALGreen Submittals:

3. Furnish documentation showing verification of CALGreen compliance as required by enforcing agency.

4. Storm Water Loss Prevention Plan: Newly constructed projects and additions which disturb less than one acre of land shall prevent the pollution of storm water runoff from the construction activities through one or more of the following measures:

a) Local ordinance.

b) Best management practices

5. Grading and Paving: Furnish drawing showing grading and paving designed to keep surface water from entering buildings.

6. Construction Waste Management Plan: Furnish a construction waste management plan complying with specified requirements.

7. Composite Wood Products: Furnish documentation showing compliance specified in these specifications.

8. Resilient Flooring: Furnish documentation showing resilient flooring materials meet the pollutant emission limits.

7) Document Compliance with 5.507.4.22

a) An acoustical analysis documenting complying interior sound levels shall be prepared by personnel approved by the architect or engineer of record.

3. SUMMARY OF CALGREEN REQUIREMENTS

A. Planning and Design:

Site Development Requirements: Comply with the applicable requirements specified in these specifications.

1. Storm Water Pollution Program: Newly constructed projects and additions which disturb less than one acre of land shall prevent the pollution of stormwater runoff from the construction activities through one or more of the following measures:

    a. Local ordinance

    b. Best management practices

2. Bicycle Parking: Comply with specified in these specifications, as applicable, for short-term and long-term bicycle parking.

3. Designated Parking: Comply with specified in these specifications, for designated parking for low-emitting, fuel-efficient and carpool/van pool vehicles.

4. Light Pollution Reduction: Comply with specified in these specifications, for outdoor lighting systems

5. Grading and Paving: Construction and grading plans shall comply with specified in these specifications.

B. Water Efficiency and Conservation:

1. Indoor Water Use: Comply with the applicable requirements of specified in these specifications, for Indoor Water Use Baseline.

2. Outdoor Water Use: Comply with the applicable requirements of specified in these specifications.

C. Material Conservation and Resource Efficiency:

1. Water Resistance and Moisture Management: Comply with requirements specified in these specifications, for Weather Protection and Moisture Control.

2. Construction Waste Reduction, Disposal and Recycling: Comply with requirements specified in these specifications.

a. Recycled and/or salvage for reuse a minimum of SO-percent of the nonhazardous construction and demolition waste or meet a local construction and demolition waste management ordinance, whichever is more stringent.

b. Where the local jurisdiction does not have a construction and demolition waste management ordinance, submit a construction waste management plan with the following:

i. Identify the materials to be diverted from disposal by efficient usage, recycling, reuse on the Project or salvage for future use or sale.

ii. Determine if materials will be sorted on-site or mixed.

iii. Identify diversion facilities where material collected will be taken.

iv. Indicate the amount of materials diverted, calculated by weight or volume, but not by both.

c. Utilize a waste management company that can provide verifiable documentation that the percentage of construction and demolition waste material diverted from the landfill complies with specified in these specifications.

d. The combined weight of new construction disposal that does not exceed 2-pounds per sq. ft. of building area may be deemed to meet the SO-percent minimum requirement.

e. Documentation shall be provided to the enforcing agency that demonstrated compliance with specified in these specifications. The waste management plan shall be updated as required and shall be accessible during construction for examination by the enforcing agency.

f. 100-percent of trees, stumps, rocks and associated vegetation and soils resulting primarily from land clearing shall be reused or recycled.

3. Building Maintenance and Operation: Comply with the requirements specified in these specifications.

a. Provide readily accessible areas that serve the entire building and are identified for the depositing, storage and collection of non-hazardous materials for recycling, including paper, corrugated cardboard, glass, plastics and metals.

b. For new buildings of 10,000-sq. ft. or more, comply with the commissioning requirements specified in these specifications. Commissioning shall be performed by trained personnel with experience on projects of comparable size and complexity. General commissioning requirements include the following. The specific requirements of each item are specified in these specifications.

i. District's or District Representative's project requirements.

ii. Basis of design.

iii. Commissioning measures shown in the Construction Documents.

iv. Commissioning plan.

v. Functional performance testing.

vi. Documentation and training.

vii. Commissioning Report.

c. For new buildings less than 10,000-sq. ft., test and adjust systems as specified in these specifications, Spec Section Commissioning,

D. Environmental Quality:

1. Pollutant Control: Comply with the requirements specified in these specifications.

a. The permanent HVAC system shall only be used during construction if necessary to condition the building or areas of addition or alteration within the required temperature range for material and equipment installation. If the HVAC system is used during construction, use return air filters with a minimum MERV of 8.

b. Cover duct openings and protect mechanical equipment during construction as specified in these specifications, conditions of the Work or conditions at the Site.

c. Finish materials shall comply with the requirement specified in these specifications, as follows:

i. Adhesives, adhesive bonding primers, adhesive primers and caulks shall meet the following requirements:

1. Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable or SCAQMD Rule 1168 VOC limits as shown in Tables 5.504.4.1 and 5.504.2.

2. Aerosol adhesives and smaller unit sizes of adhesives, and sealant or caulking compounds shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of CCR Title 17, commencing with Section 94507.

ii. Architectural paints and coatings shall comply with VOC limits in Table 1 of the ARB Architectural Coatings Suggested Control Measure, as shown in Table 5.504.4.3 unless more stringent local limits apply.

1. Aerosol paints and coatings shall meet the PWMIR Limits for ROC in Section 94522(a)(3) and other requirements, including prohibitions on use of certain toxic compounds and ozone depleting substances, ion Sections 94522(c)(2) and (d)(2) of CCR, Title 17, commencing with Section 94520 and in areas under the AQMD and Local Jurisdiction comply with the percent voe by weight of product limits of Regulation 8 Rule 49.

iii. Carpet shall meet the testing and product requirements of one of the following, as required specified in these specifications:

1. Carpet and Rug Institute's Green Label Plus Program.

2. California Department of Public Health Standard Practice for the testing of voes (Specification 01350).

3. NSF/ANSI 140 at the Gold level.

4. Scientific Certifications Systems Sustainable Choice.

5. California Collaborative for High Performance Schools (CA-CHPS) and listed in the CHPS High Performance Product Database.

6. Carpet cushion shall meet the requirements of the Carpet and Rug Institute Green Label program.

7. Carpet adhesive shall meet the requirements of Table 5.504.4.1.

iv. Composite wood products, including hardwood plywood, particleboard and medium density fiberboard, used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB's Air Toxics Control Measure for Composite Wood (17 CCR 93120 et seq.) by or before the dates specified in those sections, as shown in Table 5.504.4.5.

v. For 80% of floor area receiving resilient flooring, installed resilient flooring shall meet at least one of the following:

1. Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.

2. Compliant with the voe emission limits and testing requirements specified in the California Department of Public Health's 2010 Standard Method for the Testing and Evaluation Chambers, Version 1.1, February 2010.

3. Compliant with California Collaborative for High Performance Schools (CA-CHPS) Criteria Interpretation for EQ2.2 dated July 2012 and listed in CHPS High Performance Product Database.

4. Compliant with CDPH criteria as certified under the Green Guard Children's & Schools Programs.

d. Provide regularly occupied areas of the building with air filtration media for outside and return air prior to occupancy that provides at least a MERV of 8 or as specified in these specifications.

e. Indoor Moisture Control: Comply with the requirements specified in theses specifications.

f. Indoor Air Quality: Comply with the requirements specified in these specifications.

i. Environmental Comfort: Comply with the requirements specified in these specifications.

g. Outdoor Air Quality: Comply with the requirements specified in these specifications.

E. Summary:

1. Certain CALGreen Measures needed to comply with code are dependent on material selections, documentation, means, and methods of the work. Each item related to CALGreen may not be specifically identified as CALGreen requirements in this Section. Refer to CALGreen Code, CCR Title 24, and Part 11 for complete descriptions of measures and submittal requirements.

2. Designate an onsite field staff person contact for all CALGreen prerequisites and credit documentation, subcontractor supervision and submittal coordination and to manage the Contractor's portions of the CALGreen submittal process.

3. Documentation for CALGreen Measures shall be submitted in the format required by the CALGreen code.

4. A copy of the CALGreen code, CCR Title 24, Part 11 shall be available on-site at all times.

5. Additional information on CALGreen can be found at https://www.dgs.ca.gov/BSC/CALGreen.

F. Meetings:

1. Contractor shall conduct CALGreen compliance meetings as required. Contractor personnel who shall attend CALGreen compliance meetings include, but are not limited to:

a. Contractor's project manager.

b. District's Representative.

c. Other attendees designated by District's Representative.

d. Subcontractor representatives as appropriate to stage of work.

2. At a minimum, CALGreen compliance issues shall be discussed at the following meetings:

a. Preconstruction meetings.

b. Progress meetings.

c. Subcontractor meetings.

d. Meetings shall be scheduled as part of regularly scheduled job meetings on-site.

4. NON-RESIDENTIAL VOLUNTARY MEASURES

A. Use locally produced and/or manufactured building materials for at least 10 percent of the construction materials used for the project.

B. Recycle/reuse at least 50 percent of the demolished and/or grubbed construction materials (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard) if feasible.

C. Use 'Green Building Materials,' such as those materials that are resource-efficient and are recycled and manufactured in an environmentally friendly way, for at least 10 percent of the project.

END OF DOCUMENT 01 35 42

DOCUMENT 01 43 00
MATERIALS AND EQUIPMENT

1. RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Purchase of Materials and Equipment;

B. Special Conditions;

C. Imported Soils and Fill Materials Certification.

2. MATERIAL AND EQUIPMENT

A. Only items specified in the Contract Documents shall be used; if items specified in the Contract Documents require prior approved by the District and/or Architect, the Contractor shall use or incorporate such items into the Work only after approval is obtained.

B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

3. MATERIAL AND EQUIPMENT COLORS

A. The District and/or Architect will provide a schedule of colors.

B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

4. DELIVERY, STORAGE, AND HANDLING

A. Contractor shall deliver manufactured materials to the Site in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.

B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.

C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted; damaged .materials or equipment shall be repaired or replaced at the District's sole discretion without adjustment of the Contract Price or Contract Time.

D. Materials/equipment are not acceptable that have been warehoused for long periods of time,

stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.

E. Contractor shall store materials/equipment to cause no obstructions of sidewalks, roadways, and underground services. Contractor shall protect material and equipment furnished under Contract.

F. Contractor may store materials/equipment on Site with prior written approval by the District, all material/equipment shall remain under Contractor's control and Contractor shall remain liable for any loss, damage or destruction to the materials/equipment. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at a bonded warehouse and with appropriate insurance coverage without adjustment of the Contract Price.

G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary to return the area(s) to the condition existing before the Contractor's use. Location of storage space shall be subject to prior written approval by District.

H. Contractor may not store materials and/or equipment for Project offsite and be paid for such.

I. The Contractor store Owner Furnished/Contractor Installed products at the Site when delivered to the Site for Contractor installation. Sections C, E, F and G above and Document 01 66 00 of these Specifications shall apply to the Contractor's handling and storage of Owner Furnished/Contractor Installed products pending incorporation into the Work.

5. MANUFACTURERS

A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.

B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

6. FACILITIES AND EQUIPMENT

Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

7. MATERIAL REFERENCE STANDARDS

Where material is specified solely by reference to 'standard specifications' and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

8. WORKMANSHIP

A. Where not more specifically described in any other Contract Documents, workmanship shall

conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).

B. Work shall be executed by tradespersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

9. COORDINATION

A. Contractor shall coordinate installation of Work to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate without adjustment of the Contract Price or the Contract Time.

B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

10. COMPLETENESS

Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and as required by the Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as 'installed complete', 'operable condition', 'for use intended', 'connected to all utilities', 'terminate with proper cap', 'adequately anchored', 'patch and refinish', 'to match similar', should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

11. APPROVED INSTALLER OR APPLICATOR

Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

12. MANUFACTURER'S RECOMMENDATIONS

All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and/or the Architect.

END OF DOCUMENT 01 43 00

DOCUMENT 01 45 00

QUALITY CONTROL

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Inspector, Inspections and Tests, Uncovering of Work and Non-conforming of Work and Correction of Work;

B. Special Conditions.

2. RELATED CODES:

A. The Work is governed by requirements of Title 24, California Code of Regulations ('CCR'), and the Contractor shall keep a copy of these available at the job Site for ready reference during construction.

B. The Division of the State Architect ('DSA') shall be notified at or before the start of construction.

3. OBSERVATION AND SUPERVISION:

A. The District and Architect or their appointed representatives will review the Work and the Contractor shall provide facilities and access to the Work at all times as required to facilitate this review. Administration by the Architect and any consulting Structural Engineer will be in accordance with applicable regulations, including, without limitation, CCR, Part 1, Title 24, Section 4-341.

B. One or more Project Inspector(s) approved by DSA and employed by or under contract with the District, referred to hereinafter as the 'Project Inspector', will observe the work in accordance with CCR, Part 1, Title 24, Sections 4-333(b) and 4-342:

1. The Project Inspector shall have access to the Work wherever it is in preparation or progress for ascertaining that the Work is in accordance with the Contract Documents and all applicable code sections. The Contractor shall provide facilities and access as required and shall provide assistance for sampling or measuring materials.

2. The Project Inspector will notify the District and Architect and call the attention of the Contractor to any observed failure of Work or material to conform to Contract Documents.

3. The Project Inspector shall observe and monitor all testing and inspection activities required.

4. The Project Inspector shall have the duties and authority established by the law, code or regulation, including DSA Regulations.

C. The Contractor shall conform with all applicable laws as indicated in the Contract Documents, including, without limitation, to CCR, Part 1, Title 24, Section 4-343

4. TESTING AGENCIES:

A. Testing agencies and tests shall be in conformance with the General Documents and the requirements of Part 1, Title 24, Section 4- 335.

B. Testing and inspection in connection with earthwork shall be under the direction of the District's consulting soils engineer, if any, referred to hereinafter as the 'Soils Engineer.'

C. Contractor shall be responsible to provide soils compaction testing by a District approved third party at the Contractors expense.

D. Testing and inspection of construction materials and workmanship shall be performed by a qualified laboratory, referred to hereinafter as the 'Testing Laboratory'. The Testing Laboratory shall be under direction of an engineer registered in the State of California, shall conform to requirements of ASTM E329, and shall be employed by or in contract with the District.

5. TESTS AND INSPECTIONS:

A. The Contractor shall be responsible for notifying the District, Architect, Construction Manager and Project Inspector of all required tests and inspections. Contractor shall notify the District, Architect, Construction Manager and Project Inspector at least seventy-two hours (72) hours in advance of the need to complete requiring testing or inspection of a portion of the Work.

B. The Contractor shall provide access to **Work** to be tested and furnish incidental labor, equipment, and facilities to facilitate all inspections and tests.

C. The District will pay for first inspections and tests required by the 'CCR', and other inspections or tests that the District and/or the Architect may direct to have made, including the following principal items:

1. Tests and observations for earthwork and paving.

2. Tests for concrete mix designs, including tests of trial batches.

3. Tests and inspections for structural steel work.

4. Field-tests for framing lumber moisture content.

5. Additional tests directed by the District that establish that materials and installation comply with the Contract Documents.

6. Test and observation of welding and expansion anchors.

D. The Contractor is responsible for the following costs, fees or expenses, which shall be deducted from the Contract Price:

1. Retests or re-inspections, if required, and tests or inspections required due failure of the materials to meet required test/inspection standards or lack of required identifications of material.

2. Uncovering of work in accordance with Contract Documents.

3. Testing done on weekends, holidays, and overtime will be chargeable to the Contractor for the overtime portion.

4. Testing/inspection conducted off Site.

E. Testing and inspection reports and certifications:

1. If initially received by Contractor, Contractor shall provide to each of the following one (1) hard copy and an electronic file of the agency or laboratory report of each test or inspection or certification.

    a. The District;

    b. The Construction Manager, if any;

    c. The Architect;

    d. The Consulting Engineer, if any;

    e. Other engineers on the Project, as appropriate;

    f. The Project Inspector; and

    g. The Contractor;

    h. Uploaded to District's web-based software.

2. When the test or inspection is one required by the CCR, a copy of the report shall also be provided to the DSA.

END OF DOCUMENT 01 45 00

SECTION 01 45 25

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 – GENERAL

1.01 SUMMARY

A. SECTION INCLUDES

1. This Section specifies the requirements for test and balance of HVAC and related systems.

B. RELATED REQUIREMENTS

1. Section 23 05 00: Common Work Results for HVAC.

2. Section 23 05 48: HVAC Sound, Vibration and Seismic Control.

3. Section 23 30 00: Air Distribution.

4. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION

3.01 DEFINITIONS AND APPLICABLE PUBLICATIONS

A. For the purposes of this Section definitions are as indicated in applicable publications of AABC, ASHRAE, ANSI and SMACNA.

1. TAB: Testing, Adjusting and Balancing.

2. AABC: Associated Air Balance Council.

3. ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers.

4. ANSI: American National Standards Institute.

5. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

3.02 QUALITY ASSURANCE

A. The General Contractor shall contract directly with the test and balance agency. Tests performed by testing agencies contracted with the system's subcontractor will not be accepted. The qualifications of the agency shall comply with Article 3.02, Quality Assurance. The agency shall be responsible for furnishing labor, instruments, and tools required to test, adjust, and balance the heating, ventilating, and air conditioning (HVAC) systems and related plumbing systems, as described and/or as indicated in the Contract Documents.

B. CONTRACTOR shall obtain services of an independent, qualified testing agency acceptable to Architect to perform testing and balancing Work as specified and as follows:

1. Agency shall be currently certified by either the Associated Air Balance Council (AABC) certification shall be for Air and Hydronic Testing, Adjusting and Balancing and Sound and Vibration Measurement.

2. Work shall be in accordance with the latest edition of the AABC, National Standards. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard, then the Contract Documents shall prevail.

C. Performance Criteria: Work of this Section shall be performed in accordance with approved Testing, Adjusting, and Balancing agenda.

D. Test Equipment Criteria: Basic instrumentation requirements and accuracy/calibration required by Section Two of the AABC, Section II of the Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.

E. Verification: The Test and Balance Agency shall recheck 10 percent (minimum 10) of the measurements listed in the report. The locations shall be selected by PROJECT INSPECTOR. The recheck will be witnessed by PROJECT INSPECTOR. If 20 percent of the measurements that are retested differ from the report and are also out of the specified range, an additional 10 percent will be tested. If 20 percent fall outside the specified range, the report will be considered invalid and all test and balance work shall be repeated.

F. Due to more stringent acoustical requirements in the educational environment, the Test and Balance Agency shall recheck the air systems where the sound level is higher than the specified requirements and demonstrate compliance with the methodology specified in this document with emphasis on fan speed adjustment and balancing for optimum acoustical performance. The recheck will be witnessed by PROJECT INSPECTOR. When there are multiple air systems, a system selected by PROJECT INSPECTOR shall be rechecked. If this system is found to be not in compliance, a second system shall be checked. If the second system if also found to be not in compliance, the report will be considered invalid, and all test and balance work shall be repeated.

3.03 SUBMITTALS

A. Submit name of agency to perform the Work. Include in the submittal the certified qualifications of all persons responsible for supervising and performing actual Work of this Section. Agency shall submit a minimum of five commercial or industrial HVAC system TAB projects of similar type, size, and degree of difficulty completed within the last two years. Agency shall provide name and telephone number of contact person for each listed project.

B. Submit, for approval, 6 copies of the Agenda as indicated in Article 3.06 to test and balance all mechanical and relevant plumbing systems.

C. Preliminary Report: Review the Contract Documents, examine Work installations and submit a written report to MECHANICAL ENGINEER, PROJECT INSPECTOR indicating deficiencies in Work precluding proper testing and balancing of the Work.

D. Final TAB Report: Submit the final TAB report for review by MECHANICAL ENGINEER, PROJECT INSPECTOR outlining the conditions and Work completed on each HVAC system. All outlets, devices, HVAC equipment, etc. shall be identified, along with a numbering system corresponding to report unit identification.

E. Submit an AABC “National Project Performance Guaranty” Quality Assurance Certification”, assuring the Project systems were tested, adjusted, and balanced in accordance with the Specifications and AABC, National Standards.

F. CAD drawings: Submit single line, multi-color CAD drawings indicating outside return and supply air, volume control boxes, each outlet and inlet, room numbers, duct sizes at traverse locations, temperatures and pressures, systems balanced, components changed, and CONTRACTOR installed access points. In addition, drawings shall identify controls, equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls, and devices shall be marked on the drawings to show final settings. CAD files shall be submitted on CD-ROM upon final submittal of TAB report. Reports shall identify discrepancies between completed Work and the Contract Documents affecting the performance and longevity of the system.

3.04 GENERAL SCOPE OF WORK

A. The general scope of Work shall include but not be limited to the following:

1. Measure airflow rates of HVAC systems and make adjustments to achieve design airflow rates, tabulate results, and submit reports.

2. Measure water-flow rates of HVAC systems and make adjustments to achieve design water flow rates, tabulate results, and submit reports.

3. Measure flow velocities, temperatures, static pressures or head, rotational speed, and electrical power demand of fans, pumps, and other related HVAC system components, tabulate results, and submit reports.

4. Measure sound levels in each conditioned space, tabulate results, and submit reports.

5. Measure ambient sound levels of outdoor HVAC units and system components such as chillers and cooling towers, tabulate results, and submit reports.

6. Reports shall contain sufficient data for the system designer to evaluate system performance and solve installation problems such as system pressure profiles and pressure drops across system components

3.05 SPECIFIC SCOPE OF WORK

A. The specific scope of Work shall include the following HVAC system components as indicated on the Drawings:

1. Air Conditioning Units.

3. Exhaust Fans.

6. All Supply and Return Ductwork.

9. All associated Air Terminal Devices, i.e. Supply Diffusers, Return Registers, etc.

10. Exhaust Duct Systems.

13. Fire and Fire/Smoke Dampers.

3.06 TESTING, ADJUSTING, AND BALANCING AGENDA

A. Provide proposed materials, methods, procedures, forms, diagrams, and reports for test and balance Work.

B. Agenda to be completed by the test and balance agency and submitted to ARCHITECT, PROJECT INSPECTOR for review and approval.

C. Agenda shall include one complete set of AABC, publications listed in Sub-paragraph 3.02.B.2, applicable publications, or, in case of other test and balance agencies and or organizations, comparable publications to establish an approved, systematic, and uniform set of procedures.

D. Agenda shall also include the following detailed narrative procedures, system diagrams, and forms for test results:

1. Specific standard procedures required and proposed for each system of the Work.

2. Specified test forms for recording each procedure and for recording sound and vibration measurements.

3. Systems diagrams for each air, water, and steam system. Diagrams may be single line.

E. In addition to information recorded for standard AABC, procedures, the following information is required:

1. Fan data.

2. System number, location, manufacturer, model, and serial number.

3. Fan wheel type and size.

4. Motor horse power, type, and rpm.

5. Sheave size, type, number of grooves, and open turns on Variable Pitch Sheave.

6. Number and size of belts, motor and fan shaft sizes, center-to-center of shafts in inches, and adjustment available motor data, including nameplate data, actual amps, rated, and actual motor rpm, volts, phase, hp, kW, starter heater size, and capacity.

7. Fan design airflow and service (supply, return, outdoor air or exhaust).

8. Fan static pressure, suction/discharge, static profile, and static control point.

F. The following traverse data is required:

1. Traverse location, size of duct (inside dimensions), and area of duct in square feet.

2. Column for each hole traversed/lines for each reading.

3. Barometric pressure.

4. Temperature/Static pressure in the duct.

5. Actual CFM corrected to SCFM.

6. Notes.

G. The following air distribution data is required:

1. Room identification.
2. Outlet or intake balance sequence number.
3. Size of outlet or inlet.
4. AK Factor.
5. Design and Actual FPM and CFM.
6. Notes.

H. The following air-cooled split system condensing unit data is required:

1. Performance test results for rated capacity.
2. Unit identification number.
3. Nameplate data, manufacturer, model, and serial number.
4. Compressor nameplate and actual amps, volts, phase, and hertz.
5. RPM of motors, where applicable.
6. Refrigerant type.
7. Suction/Discharge pressure when gage installed.
8. Number of stages.
9. Low-pressure/High-pressure control setting.
10. Condenser fan sequence stages.
11. Crankcase heater watts (nameplate).
12. Hot gas bypass installed - yes/no.
13. SCFM Air Flow Measurement vs. Design CFM.

P.

Q. The following sound test data is required:

1. Area or location.
2. Sound level in dB(A) as specified in Article 3.19.
3. Sound level at the center band frequencies of eight non-weighted octaves with equipment on and off for 5 rooms selected by the PROJECT INSPECTOR.
4. Plot of corrected sound-level reading on Noise Criteria (NC) curve for the measurements in Q 3 above.

R. The following vibration test data is required:

1. Equipment identification number.

2. Vibration levels at all accessible bearings, motors, fans, pumps, casings, and isolators.

3. Measurements in mils deflection and velocity in inches per second.

4. Each measurement taken in horizontal, vertical, and axial planes as accessible.

S. The following airflow station data is required:

1. Station identification number.

2. Nameplate data including effective area.

3. Differential test pressure or velocity.

4. Calculated CFM.

5. Actual CFM (from Pitot-tube traverse form).

6. Read out CFM.

7. Notes

U. 3.07 PROCEDURES

A. Schedule the Work of this Section in order for test and balance activities to be completed prior to the date of Substantial Completion. CONTRACTOR shall place all heating, ventilating, and air conditioning equipment into operation during each day and until all HVAC adjusting, balancing, testing, demonstrations, and instructions on systems are completed. Agency shall prepare and submit reports within ten (10) days from completion of the Work of this Section to allow sufficient time for corrective measures to be completed before Substantial Completion of the Work. When an individual building or portion thereof is ready for occupancy, all equipment relative to such portion of Work shall be put into service, tested, and balanced.

B. Prior to the date of Substantial Completion, and upon completion of test and balance Work, place all exhaust fans in operation, force all air conditioning units into a 100 percent outdoor air economizer mode with heating and cooling locked out and flush the building continuously for a period of fourteen (14) days.

C. Coordinate test and balance procedures with any phased Project requirements so test and balance procedures on each phased portion of the Work will be completed prior to completion of said designated phase.

3.08 FIELD EXAMINATION

A. Before the commencement of test and balance Work, CONTRACTOR shall ascertain that following conditions are fulfilled:

1. Refrigerant systems are fully charged with specified refrigerant.

4. Over-voltage and current protection have been provided for motors.

5. Equipment has been labeled as required.

6. Curves and descriptive data on each piece of equipment to be tested and adjusted are available as required.

7. Operations and maintenance manuals have been supplied.

8. Verify that duct systems are clean of debris and leakage is minimized, access doors are closed and duct end caps are in place, and fire and volume dampers are in place and open.

11. Automatic control systems are completed and operating.

12. Start up and initial commissioning of all HVAC equipment except fans shall be by the manufacturer.

B. In addition to the above, CONTRACTOR shall establish a specific, coordinated plan which details how each area of existing building will be balanced during the various phases of the Work. The evaluation shall address, at a minimum, the following concerns:

1. OWNER operations.

2. Building safety and security policies. Prior to any fire safety or security systems shutdown at any time during the Work, CONTRACTOR shall first advise and coordinate with OWNER to ensure all concerned parties are notified.

3. Protecting furniture, computers, photocopiers, and other office equipment.

4. Protecting classroom fixtures and equipment.

5. Concerns specific and unique to building related issues.

6. Shutdown and reactivation of the fire alarm system to avoid accidental alarms during test and balance and related Work.

3.09 TEST AND BALANCE

A. For each heating, ventilating, or air conditioning system the following shall be performed, recorded, and submitted in an approved format for review. Make, type, and model of unit, and location of each piece of equipment shall be included in the report. Readings shall include but not be limited to following:

1. Air Systems**:**

a. General

1) Verify all ductwork, dampers, grilles, registers, and diffusers have been installed per design and set in the full open position. Agency shall perform the following TAB procedures in accordance with AABC. Where the requirements of the two standards are different, the more stringent requirements shall prevail. Also, if the Contract Documents impose a more stringent standard then the Contract Documents shall prevail.

b. Zone, Branch, and Main Ducts:

1) Adjust ducts to within design CFM requirements by means of Pitot-tube duct traverse.

c. Supply Fans:

1) Fan Speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys when required.

2) Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

3) Pitot-Tube Traverse: Perform a Pitot-tube traverse of main supply and return ducts, record total CFM.

4) Outside Air: Test and adjust the outside air using Pitot-tube traverse.

5) Static Pressure: Test and record system static profile of each supply fan.

6) Current and Voltage: Test and record motor voltage and amperage, and compare data with the nameplate limits. Ensure fan motor is not in or above the service factor as published by the motor manufacturer.

d. Return, Relief, and Exhaust Fans:

1) Fan Speeds: Test and adjust fan RPM to achieve maximum or design CFM. CONTRACTOR shall provide new belt pulleys where required.

2) Pitot-Tube Traverse: Perform a Pitot-tube traverse of the main return ducts to obtain total CFM.

3. Static Pressure: Test and record system static profile of each fan.

e. Diffusers, Registers and Grilles:

1) Tolerances: Test and balance each diffuser, grille, and register to within 5 percent of design requirements.

2) Identification: Identify the type, location, and size of each grille, diffuser, and register. This information shall be recorded on air outlet data sheets.

g. Duct Leakage Testing:

1) On existing ductwork, agency shall calculate duct leakage by traversing the unit and reading associated diffusers.

2) On new installations each and every section of the entire air distribution system (all supply, return, exhaust, and relief ductwork) shall be tested at 1.5 times design static pressure. All ducts shall demonstrate 5 percent leakage maximum (per CBC).

i. System Pressure Profiles:

1) Prepare pressure profiles from fan (supply, return, and exhaust) or air handling unit to extremities of system.

2) As a minimum, show pressure at each floor, main branch, and airflow measuring device.

3) Make pitot-tube traverses of all trunk lines and major branch lines where required for analysis of distribution system. Airflow measuring devices installed in ductwork, if available, may be utilized.

4) Record residual pressures at inlets of volume controlled terminals at ends of system.

5) Show actual pressures at all static pressure control points utilized for constant or variable flow systems.

k. Fan speed adjustments and balancing for optimum acoustical performance:

1) As the very first step, the speed of all fans (supply, return, and exhaust inside packaged equipment or air handling units) shall be adjusted to deliver the required fan total air quantity with all volume dampers and other flow rate control devices fully open. Adjustments shall be made with the outdoor air intake dampers, return air dampers, and relief air dampers in the minimum outdoor air position. The adjustments shall be made again in the 100 percent outdoor air position in systems with 100 percent outdoor air economizers.

2) The above adjustment shall be done with wet cooling coils, where cooling coils are provided.

3) The airflow rates at each branch duct shall be adjusted as the second step with air with all volume dampers and other flow rate control devices fully open.

4) The airflow rates at each air inlet and outlet shall be adjusted as the final step. The volume damper in the branch duct shall be used for balancing. Opposed blade dampers at air inlets and outlets where provided shall only be used for fine adjustments and shall not be closed beyond 60 percent open or when the dampers start to generate audible noise.

5) CONTRACTOR shall provide the labor and materials for all dampers, pulleys, and belt changes required for balancing. The design documents indicate the worst-case scenario with safety factors in fan static pressures for contingency. Properly coordinated and installed air systems may require a lower static pressure and a reduction in fan speed.

3.10 VERIFICATION OF HVAC CONTROLS

A. Agency shall verify in conjunction with CONTRACTOR all control components are installed in accordance with the intent of the Contract Documents and are functioning according to the design intent, including all electrical interlocks, damper sequences, air and water resets, fire stats, and other safety devices.

B. CONTRACTOR shall verify all control components are calibrated and set for design operating conditions and intent.

3.11 TEMPERATURE TESTING

A. To verify system control and operation, agency shall perform a series of three temperature tests taken at approximately two hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees Fahrenheit from the thermostat or control set point during the tests. Outside temperature and humidity shall also be recorded during the testing periods.

3.12 LIFE SAFETY CONTROLS TESTING

A. This work is to be performed by OWNER and State Fire Marshall. Do not include in agency scope of Work.

3.17 FINAL TABULATION

A. After heating, ventilating, and air conditioning components are satisfactorily tested and balanced, entire system shall be put into operation and all pressures, temperatures, gpm, cfm, velocities, etc., shall be recorded and checked against design schedules. Design requirements shall be listed on reports and final tabulation shall be within a tolerance of plus or minus five percent of design requirements.

B. Readings at various locations as described herein will be made every hour for four (4) hours, during normal working hours for three (3) days. Boilers, forced air furnaces, and chillers shall be started up far enough in advance to meet design conditions during period of testing.

3.18 VIBRATION TESTING

A. Furnish instruments and perform vibration measurements if specified in Division 23. Provide measurements for all rotating HVAC equipment half horsepower and larger, including reciprocating/centrifugal/screw/scroll compressors, pumps, fans, and motors.

B. Record initial and final measurements for each unit of equipment on test forms. Where vibration readings exceed allowable tolerance and efforts to make corrections have proved unsuccessful, forward a separate report to ARCHITECT.

3.19 SOUND TESTING

A. Perform and record sound measurements as specified in this Section and in Section 23 0548: HVAC Sound, Vibration and Seismic Control. Take additional readings if required by ARCHITECT.

B. Measuring equipment and methods shall comply with the current requirements of the AABC and ANSI S12.60. Take measurements with a calibrated Type 1 sound level meter and octave band analyzer.

C. Sound reference levels, formulae, and coefficients shall be according to ASHRAE Handbook: HVAC Applications, Chapter on Sound and Vibration Control.

D. Where sound pressure levels are specified as noise criteria or room criteria in Section 23 0548: HVAC Sound, Vibration and Seismic Control determine compliance with the Contract Documents as follows:

1. Reduce background noise as much as possible by shutting off unrelated audible equipment.

2. Measure octave band sound pressure levels with specified equipment "off".

3. Measure octave band sound pressure levels with specified equipment "on".

4. Use difference in corresponding readings to determine sound pressure due to equipment. Sound pressure level, due to equipment equals sound pressure level with equipment "on" minus factor.

DIFF.:	0	1	2	3	4	5	9-10 or More
FACTOR:	10	7	4	3	2	1	0

5. Plot octave bands of sound pressure level due to equipment for typical rooms, on a graph, which also shows, noise criteria (NC) curves.

E. Where sound levels are required in dbA, measure sound levels using the A-frequency-weighting of meter. Single value readings will be used instead of octave band analysis.

F. Measure sound levels at each octave band as NC or RC (room criteria) if indicated in the Drawings or other Spec Sections. Where measured sound levels exceed specified level, CONTRACTOR shall take all remedial action and necessary sound tests shall be repeated. Sound tests after remedial action shall be in octave band in NC or RC for the room and also at each diffuser, grille, or register in occupied areas. Sound levels shall be measured approximately five feet above floor on a line approximately 45 degrees to center of opening, on the A- and C-frequency-weighting of the measuring instrument.

G. Measure and record sound levels in decibels for each room per current ANSI S12.60.

H. Report shall include ambient sound levels, taken without air-handling equipment operating, of rooms in which above openings are located. A report shall also be made of any noise caused by mechanical vibration.

END OF SECTION

DOCUMENT 01 50 00

TEMPORARY FACILITIES AND CONTROLS

1. RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Summary of Work;

D. Schedule;

E. Testing and Inspections;

F. Field Office Trailer;

G. Site Standards

2. TEMPORARY UTILITIES:

A. Contractor shall fully restore in kind, any existing improvement or underground utility located at or in the vicinity of the Work, which becomes damaged by the Work of the project. Prior to the commencement of Work at any site, Contractor shall meet with the Project Inspector, Technology Department, and District Representative at each site to identify all know underground and above-ground improvements, and to video tape the existing conditions of all improvements surrounding (and within) the limits ofthe Project. Submit a copy of the video tape to the District within 1 week of the date of its creation.

B. Electric Power and Lighting

1. Unless the Contract Documents expressly provided that the District will provide electrical power service to the Contractor for performing the Work, the Contractor shall secure electrical power service necessary to complete the Work without adjustment of the Contract Price or the Contract Time. Contractor shall be responsible for providing temporary facilities required to deliver that power service from its existing location in the building(s) or on the Site to point of intended use. Contractor shall at the Contractor's expense remove, extend and/or relocate temporary electrical power distribution throughout the Site as rapidly as required in order to maintain progress of Work in accordance with the Construction Schedule.

2. Contractor shall verify characteristics of power available in building(s) or on the Site. Contractor shall take all actions required to make modifications where power of higher voltage or different phases of current are required. Contractor shall be fully responsible for providing that service and shall pay all costs required therefor.

3. Contractor shall furnish, wire for, install, and maintain temporary electrical lights wherever it is necessary to provide illumination for the proper performance and/or observation of the Work: a minimum of 20 foot-candles for rough work and 50 foot-candles for finish work. Contractor shall provide adequate task lighting and safe exit(s) inside building(s), as per CAL OSHA guidelines, for safety and security. If portable lights are used after dark, all light must be located so as not to direct light into neighboring property.

4. Contractor shall be responsible for maintaining existing lighting levels in the project vicinity should temporary outages or service interruptions occur.

5. Contractor shall ensure welding equipment is by electrical generators.

6. Contractor shall provide, operate and maintain such temporary exterior lighting at the Site as necessary for safety and security when the Site is unoccupied at non-daylight times.

C. Heat and Ventilation

1. Contractor shall provide temporary heat to maintain environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation and curing of materials, and to protect materials and finishes from damage due to improper temperature and humidity conditions. Portable heaters shall be standard units complete with controls.

2. Contractor shall provide forced ventilation and dehumidification, as required, of enclosed areas for proper installation and curing of materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.

3. Contractor shall pay the costs of installation, maintenance, operation, and removal of temporary heat and ventilation, including costs for fuel consumed, required for the performance of the Work.

D. Water

1. Unless the Contract Documents expressly provided that the District will provide water service to the Contractor for performing the Work, the Contractor shall secure water service necessary to complete the Work without adjustment of the Contract Price or the Contract Time To the extent water is then available in the building(s) or on the Site for use by the Contractor, Contractor may use the District's existing utilities by making prearranged payments to the District for the utilities used by Contractor and all Subcontractors. Contractor shall be responsible for providing temporary facilities required to deliver such utility service from its existing location in the building(s) or on the Site to point of intended use.

2. Contractor shall use backflow preventers on water lines at point of connection to District's water supply. Backflow preventers shall comply with requirements of Uniform Plumbing Code.

3. Contractor shall make potable water available for human consumption.

E. Sanitary Facilities

1. Contractor shall provide sanitary temporary facilities in no fewer numbers than required by law and such additional facilities as may be directed by the District for the use of all workers. The facilities shall be maintained in a sanitary condition at all times and shall be left at the Site until removal is authorized or directed by the District.

2. The Contractor, Subcontractors and their personnel are not permitted to use existing toilet facilities at or about the Site.

F. Telephone and Internet Service

1. Contractor shall arrange for the Contractor's field office to have high-speed internet access.

2. Contractor Superintendent and Project Manager shall have a cell phone and email address, and be readily accessible by cell phone or email.

3. Contractor shall pay the costs for telephone and internet service installation, maintenance, service, and removal.

G. Fire Protection:

1. Contractor shall provide and maintain fire extinguishers and other equipment for fire protection. Such equipment shall be designated for use for fire protection only and shall comply with all requirements of the California Fire, State Fire Marshall and/or its designee.

2. Where on-site welding and burning of steel is unavoidable, Contractor shall provide protection for adjacent surfaces.

H. Trash Removal:

1. Contractor shall provide trash removal on a timely basis.

I. Temporary Facilities:

1. Contractor shall provide temporary offices, utilities, storage units, fencing, barricades, chutes, elevators, hoists, scaffolds, railings and other facilities or services as required. Contractor shall be responsible for providing, installation, maintenance, supplying and all use charges for the items provided under this section and Specifications Document 01 52 13 (Field Offices).

3. CONSTRUCTION AIDS:

A. Plant and Equipment:

1. Contractor shall furnish, operate, and maintain a complete plant for fabricating, handling, conveying, installing, and erecting materials and equipment; and for conveyances for transporting workers. Include elevators, hoists, debris chutes, scaffolding and other equipment, tools, and appliances necessary for performance of the Work.

2. Contractor shall maintain plant and equipment in safe and efficient operating condition. Damages due to defective plant and equipment, and uses made thereof, shall be repaired by Contractor at no expense to the District.

B. Contractor shall use none of the District's tools and equipment for the performance of the Work.

4. BARRIERS AND ENCLOSURES:

A. Contractor shall obtain the District's written permission for locations and types of temporary barriers and enclosures, including fire-rated materials proposed for use, prior to their installation.

B. Contractor shall provide and maintain temporary enclosures to prevent public entry and to protect persons using other buildings and portions of the Site and adjacent areas, the public, and workers. Contractor shall also protect the Work and existing facilities from the elements, and adjacent construction and improvements, persons, and trees and plants from damage and injury from demolition and construction operations.

C. Protection of Areas and Improvements Surrounding the Project. Contractor shall protect any portions of the existing rooms, buildings, walkways, sidewalks, walls, landscaping, and irrigation systems, irrigation control wiring systems, data systems, electrical power systems, existing underground utilities, any other utilities, and improvements located near the Work, which may be subject to damage associated with the Work. Contractor shall fully restore in kind and to the condition existing before damage, any existing improvement or underground utility located at or near the Work, which becomes damaged by the Work of the project. Prior to the commencement of Work at any site, Contractor shall meet with the Project Inspector, and District Representative at the Site to identify all know underground and above-ground improvements, and to record the existing conditions of all improvements surrounding (and within) the limits of the Project. A copy of the video file shall be uploaded to the District web-based software or provided to the District within one (1) week of the date of its creation.

D. Contractor shall provide site access to existing facilities for persons using other buildings and portions of the Site, the public, and for deliveries and other services and activities.

E. Unless otherwise specified in the Contract Documents, temporary fencing shall be six (6) feet high chain link fence attached to post and frames in a secure manner. Posts to be core drilled. At the owner's discretion, posts may be secured with high-visibility ballast weights. Fencing is to have privacy fabric and sound blankets to prevent noise from construction activities from interfering, impeding or adversely affecting areas adjacent to the Site and the campus of the Site. Barbwire and or razor wire is not allowed.

F. Contractor shall provide sound blankets around ALL perimeter fencing. Sound blankets are to be:

1. Product: Gray IQ-21
2. Company: Insul-Quilts.

3. Contractor to provide bracing and supports for wind.

G. Contractor shall provide, at the discretion of the District, high-visibility ballast weights for all temp-fencing panels. Ballast weights are to be:

1. Product: BigFoot #0203
2. Color: Black & Yellow
3. Company: Oxford Plastics
4. Contractor to provide ballast weights for all fencing panels not cored into ground.

H. Tree and Plant Protection:

1. Contractor shall preserve and protect existing trees and plants at on, about or adjacent to the Site that are not designated for removal or required to be removed.

2. Contractor shall provide barriers to a minimum height of 4'-0' around drip line of each tree and plant, around each group of trees and plants, as applicable, in the proximity of demolition and construction operations.

3. Contractor shall not park trucks, store materials, perform Work or cross over landscaped areas. Contractor shall not dispose of paint thinners, water from cleaning, plastering or concrete operations, or other deleterious materials in landscaped areas, storm drain systems, or sewers. Plant materials damaged as a result of the performance of the Work shall, at the option of the District and at Contractor's expense, either be replaced with new plant materials equal in size to those damaged or by deductive Change Order in an amount representing the value of the damaged materials as determined by the District.

4. Contractor shall remove soil that has been contaminated during the performance of the Work by oil, solvents, and other materials, which could be harmful to trees and plants, and replace with good soil, at Contractor's expense. At the Contractor's cost, contaminated soil shall be transported and disposed in such manner established by law based on the nature of the contaminants.

5. Excavation around Trees:

a. Excavation within drip lines of trees shall be done only where absolutely necessary and with written permission from the District.

b. Where trenching for utilities is required within drip lines, tunneling under and around roots shall be by hand digging and shall be approved by the District. Main lateral roots and taproots shall not be cut. All roots 2 inches in diameter and larger shall be tunneled under and heavily wrapped with wet burlap to prevent scarring or excessive drying. Smaller roots that interfere with installation of new work may be cut with prior approval by the District. Roots must first be cut with a Vermeer, or equivalent, root cutter prior to any trenching.

c. Where excavation for new construction is required within drip line of trees, hand excavation shall be employed to minimize damage to root system. Roots shall be relocated in backfill areas wherever possible. If encountered immediately

adjacent to location of new construction, roots shall be cut approximately 6 inches back from new construction.

d. Approved excavations shall be carefully backfilled with the excavated materials approved for backfilling. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities. Do not use mechanical equipment to compact backfill. Tamp carefully using hand tools, refilling and tamping until Final Acceptance as necessary to offset settlement.

e. Exposed roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be wrapped with four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill.

f. Accidentally broken roots should be sawed cleanly 3 inches behind ragged end.

5. SECURITY:

The Contractor shall be responsible for security of materials, tools, equipment, supplies, and completed and partially completed Work at or about the Site.

6. TEMPORARY CONTROLS:

A. Noise Control

1. Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to the District a minimum of forty-eight (48) hours in advance of their performance.

B. Noise and Vibration

1. Equipment and impact tools shall have intake and exhaust mufflers.

2. Contractor shall cooperate with District to minimize and/or cease the use of noisy and vibratory equipment if that equipment becomes objectionable by its longevity. The District may reasonably restrict, limit or condition use of equipment or operations with noise levels, which interfere with academic and other student activities on the campus that the Site is located.

C. Dust and Dirt

1. Contractor shall conduct demolition and construction operations to min1m1ze the generation of dust and dirt, and prevent dust and dirt from interfering with the progress of the Work and from accumulating in the Work and adjacent areas including, without limitation, occupied facilities.

2. Contractor shall periodically water exterior demolition and construction areas to minimize the generation of dust and dirt.

3. Contractor shall ensure that all hauling equipment and trucks carrying loads of soil and debris shall have their loads sprayed with water or covered with tarpaulins, and as otherwise required by local and state ordinance.

4. Contractor shall prevent dust and dirt from accumulating on walks, roadways, parking areas, and planting, and from washing into sewer and storm drain lines.

D. Water

1. Contractor shall not permit surface and subsurface water, and other liquids, to accumulate in or about the vicinity of the Premises. Should accumulation develop, Contractor shall control the water or other liquid, and suitably dispose of it by means of temporary pumps, piping, drainage lines, troughs, ditches, dams, or other methods.

   Contractor shall provide adequate task lighting and safe exit{s) inside building{s), as per CAL OSHA guidelines, for safety and security.

E. Gas

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, metering devices and use charges, move ins/outs, connections and fees, service, extension and distribution, deliveries/pickups, rentals, storage, transportation, taxes, labor, insurance, bonds, materials, equipment and all other required miscellaneous items for the temporary gas systems and upon Substantial Completion of Work, removal of all such temporary gas systems and appurtenances.

2. Contractor shall at the Contractor's expense and without limitation remove, extend and/or relocate temporary gas systems as rapidly as required in order to provide for progress of the Work.

F. Telephone and Data

1. Contractor shall furnish, install, maintain and pay for all necessary permits, inspections, move ins/outs, extensions and distribution, devices, connections and fees, use charges, rentals, deliveries/pickups, storage, transportation, taxes, labor, insurance, bonds, material, equipment and all other required miscellaneous items for temporary phone, data service and distribution to Project site temporary offices as required by this section. The Contractor shall furnish the Contractor's Project Manager and Superintendent for the Work with mobile cellular telephones for immediate voice or text communications.

2. Contractor shall at the Contractor's expense and without limitation remove, extend and/or relocate temporary phone and data service and distribution as rapidly as required in order to provide for progress of the Work.

3. Upon Substantial Completion of the Work, Contractor shall remove all such temporary phone service, distribution, devices and appurtenances.

G. Storage Units:

1. Contractor shall provide secure and waterproof storage units for the temporary storage of furniture, equipment and other items requiring protection.

2. Contractor shall be responsible for delivery charges and will install the storage unit in an appropriate area.

3. Contractor shall remove the storage unit from the Project site when the storage unit is no longer required for the Work or upon substantial Completion of the Work.

4. Contractor shall at the Contractor's expense and without limitation remove and/or relocate storage units as rapidly as required in order to provide for progress of the Work.

H. Pollution

1. No burning of refuse, debris, or other materials shall be permitted on or near the Premises.

2. Contractor shall comply with applicable regulatory requirements and anti-pollution ordinances during the conduct of the Work including, without limitation, demolition, construction, and disposal operations.

7. JOB SIGN(S): Not Applicable

A. General:

1. Contractor shall provide and maintain a Project identification sign with the design, text, and colors designated by the District and/or the Architect; locate sign as approved by the District.

2. Signs other than the specified Project sign and or signs required by law, for safety, or for egress, shall not be permitted, unless otherwise approved in advance by the District.

B. Materials:

1. Structure and Framing: Structurally sound, new or used wood or metal; wood shall be nominal 3/4-inch exterior grade plywood.

2. Sign Surface: Minimum 3/4-inch exterior grade plywood.

3. Rough Hardware: Galvanized.

4. Paint: Exterior quality, of type and colors selected by the District and/or the Architect.

II. Fabrication:

1. Contractor shall fabricate to provide smooth, even surface for painting.

2. Size: 4'-0' x 8'-0', unless otherwise indicated.

3. Contractor shall paint exposed surfaces of supports, framing, and surface material with exterior grade paint: one coat of primer and one coat of finish paint.

4. Text and Graphics: As indicated.

8. PUBLICITY RELEASES:

Contractor shall not release any information, story, photograph, plan, or drawing relating information about the Project to anyone, including press and other public communications medium, including, without limitation, on website(s).

END OF DOCUMENT 015000

DOCUMENT 01 50 13

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. CalGreen Requirements;

D. Storm Water Pollution Control;

2. REFERENCES:

A. California Integrated Waste management Act of 1989 (AB 939)

B. California Code of Regulations Title 14, Section 18700

C. California Green Building Standards Code, 'CalGreen', Title 24, Part 11.

3. SECTION INCLUDES:

A. Administrative and procedural requirements for the following:

B. Salvaging non-hazardous construction waste.

C. Recycling non-hazardous construction waste.

D. Disposing of non-hazardous construction waste.

4. DEFINITIONS:

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

G. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.

H. Sanitary Wastes:

1. Garbage: Refuse and scraps resulting from preparation, cooking, distribution, or consumption of food.

2. Sewage: Domestic sanitary sewage.

5. PERFORMANCE REQUIREMENTS:

General: Develop waste management plan that results in end-of Project rates for salvage/recycling of fifty percent (65%} by weight (or by volume, but not a combination) of total waste generated by the Work.

6. SUBMITTALS:

A. Waste Management Plan: Submit waste management plan within 5 days of date established for commencement of the Work.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include the following information:

1. Material category.

2. Generation point of waste.

3. Total quantity of waste in tons or cubic yards.

4. Quantity of waste salvaged, both estimated and actual in tons or cubic yards.

5. Quantity of waste recycled, both estimated and actual in tons or cubic yards.

6. Total quantity of waste recovered (salvaged plus recycled) in tons or cubic yards.

7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. Submit permit or license and location of recycling or waste disposal sites. Waste Reduction Calculations: Before request for final payment, submit copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

H. CHPS Submittal: CHPS letter template for Credit ME2.0 and ME2.1, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

I. Qualification Data: For Waste Management Coordinator.

J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

K. Submittal procedures and quantities are specified in Document 01 33 00.

7. QUALITY ASSURANCE:

A. Waste Management Coordinator Qualifications: LEED Accredited Professional by U.S. Green Building Council.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements. Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.

2. Review requirements for documenting quantities of each type of waste and its disposition.

3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

5. Review waste management requirements for each trade.

8. WASTE MANAGEMENT PLAN:

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.

2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

9. PLAN IMPLEMENTATION:

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Comply with Document 01 SO 00 for operation, termination, and removal requirements. Equipment Salvage: Any existing equipment that can be salvage for resale, reuse, or salvaged for parts shall be removed in a manner preserving the equipment integrity. Removed equipment shall be palletized all the operational parts included, wrap in plastic shrink-wrap, and return as directed by the District. The District may also require any equipment be sent to a designated reseller. The following equipment maybe salvaged including but not limited to the following:

1. Light fixtures (without fluorescent Light bulbs)

2. Electrical equipment (deemed PCB free)

3. Electronic Equipment/ IDF cabinets or racks
4. Ventilation hoods
5. Refrigerators or Freezers (including Walk-ins)
6. Mechanical Units
7. Mechanical Compressors
8. Plumbing fixtures
9. Toilet room accessories
10. Windows, Doors and Frames
11. Casework
12. White Boards and framed Pin Boards
13. Pencil sharpeners/ Projections Screens
14. Masonry or bricks
15. Others as appropriate.

C. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

D. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within 3 days of submittal return.
2. Distribute waste management plan to entities when they first begin work on site. Review plan procedures and locations established for salvage, recycling, and disposal.

E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas of Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Document 01 50 00 for controlling dust and dirt, environmental protection, and noise control.

10. RECYCLING CONSTRUCTION WASTE:

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to the Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project Site. Include list of acceptable and unacceptable materials at each container and bin.

2. Inspect containers and bins for contamination and remove contaminated materials if found.

3. Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

4. Stockpile materials away from construction area. Do not store within drip line of remaining trees.

5. Store components off the ground and protect from the weather.

6. Remove recyclable waste off District property and transport to recycling receiver or processor.

D. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

2. Polystyrene Packaging: Separate and bag material.

3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project Site. For pallets that remain on Site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

E. Site-Clearing Wastes: Chip brush, branches, and trees on site.

F. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.

2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

11. DISPOSAL OF WASTE:

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project Site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Designate an on-site person to be responsible for instructing workers and overseeing the sorting and recording of waste/recyclable materials.

D. Include waste management and recycling in worker orientation and as an agenda item for regular Project meetings.

E. Recyclable and waste bin areas shall be limited to areas approved on the Waste Management Plan. Keep recycling and waste bins neat and clearly marked to avoid contamination of materials.

F. Disposal: Transport waste materials off District property and legally dispose of them.

12. ATTACHMENTS:

A. Document 015013.01 Waste Management Plan

B. Document 0150 13.02 Waste Management Monthly Progress Report

END OF SECTION 01 50 13

Construction Waste Management Plan

SECTION 01 50 13.01 PLAN

Contractor or Subcontractor _____

Project Name: _____

Project Number : _____

Date: _____

MATERIAL TYPE	REUSE	RECYCLE	DISPOSAL	ESTIMATE QUANTITY MATERIALS	SOURCE SEPERATED	COMMINGLED	HAULER Name, Address, License No., or Permit	MATERIAL DESTINATION Name, Address, License No., or Permit
Asphalt								
Land Cleaning Debris								
Soil								
Tree and Shrubs								
Concrete/Cone Brick								
Brick/Masonry Mat.								
Untreated Lumber								
Clean Dimen. Wd								
Plywood								
Paper - Bond.								
Paper - newsprint								
Cardboard and paper								
plastic								
Rigid Foam								
Ferrous Metal								
Non-Ferrous Metal								
Glass								
Gyp Board (unpainted)								
Carpet/Padding								
Paint								
Beverage Containers								
Plumbing Fixtures								
Electrical Fixtures								
Electrical Wire								

District approval: _____ date: _____

Construction Waste Management Report

SECTION 01 50 13.02 REPORT

Reporting Contractor or Subcontractor _____

Inspector Intials _____ Date: _____

Project Name: _____

Project No,: _____

Date: _____ Pay Application: _____

MATERIAL TYPE	REUSE	RECYCLE	DISPOSAL	ESTIMATE QUANTITY MATERIALS	SOURCE SEPERATED	COMMINGLED
Land Cleaning Debris						
Soil						
Tree and Shrubs						
Concrete/Cone Brick						
Brick/Masonry Mat.						
Untreated Lumber						
Clean Dimen. Wood						
Plywood						
Paper - Bond.						
Paper - newsprint						
Cardboard and paper						
plastic						
Rigid Foam						
Ferrous Metal						
Non-Ferrous Metal						
Glass						
Gyp Board (unpainted)						
Carpet/Padding						
Paint						
Beverage Containers						
Plumbing Fixtures						
Electrical Fixtures						
Electrical Wire						
SUBTOTAL TONS	0	0	0			

TOTAL WASTER IN TONS	**0**
% WASTE DIVERTED LANDFILL	**#DIV/0!**

HAULER Name, Address, License No., or Permit	MATERIAL DESTINATION Name, Address, License No., or Permit

DOCUMENT 01 52 13
FIELD OFFICES

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions;

C. Summary of Work;

D. Schedule;

E. Testing and Inspections;

F. Temporary Facilities and Controls;

G. Site Standards

2. SUMMARY:

A. General: Contractor shall provide District's Field Office Trailer and contents, for District's use exclusively, during the term of the Contract

B. Property: Trailer, furniture, furnishings, equipment, and the like, supplied by the Contractor with the Office Trailer shall remain the property of the Contractor; District property items installed, delivered, and the like by District within the Office Trailer will remain District's property.

C. Modifications: District reserves the right to modify the trailer or contents, or both, as may be deemed proper by District.

D. Condition: Trailer and contents shall be clean, neat, substantially finished, in good, proper, and safe condition for use, operation, and the like; the trailer and contents shall not be required to be new.

E. Contractor shall employ appropriate means to remove all graffiti from buildings, equipment, fences and all other items 48 hours of each occurrence.

F. Installation Timing: Provide safe, fully furnished, functional, proper, complete, and finished trailer properly ready for entire use, within ten (10) calendar days of District's notification of the issuance of Notice to Proceed.

3. SUBMITTALS:

A. General: Submit submittals to District in quantity, format, type, and the like, as specified herein.

B. Office Trailer Data: One (1) hard copy, one (1) electronic copy and uploaded into District's Web-

based Software, of manufacturer's descriptive data, technical descriptions, regulatory compliance, industry standards, installation, removal, and maintenance instructions.

C. Equipment Data: Two (2) hard copies, one (1) electronic copy and uploaded into District web-based software, of manufacturer data for each type of equipment, if directed by District.

D. Furniture and Furnishings Data: Two (2) hard copies, one (1) electronic copy and uploaded into web-based software, of manufacturer data for each type of equipment, if directed by District.

E. Plans: One (1) electronic file, one (1) hard copy, and uploaded into District's web-based software, of appropriately scaled plans of trailer layout. Plans shall include, but not be limited to: lighting; furniture; equipment; telephone and electrical outlets; and the like. At the Districts discretion, the file may be required to be uploaded to District web-based software.

F. Product Samples: One **(1)** complete and entire unit of each type, if directed by District.

4. QUALITY ASSURANCE

A. Standards: In the event that provisions of codes, regulations, safety orders, Contract Documents, referenced manufacturer's specifications, manufacturer's instructions, industry standards, and the like, are in conflict, the more restrictive and higher quality shall govern.

B. Installer: Installer or Installers engaged by Contractor must have a minimum of five (5) years of documented and properly authenticated successful experience of specialization in the installation of the items or systems, or both, specified herein.

C. Manufacturer: Contractor shall obtain products from nationally, industry recognized Manufacturer with five (5) years minimum, of immediately recent, continuous, documented, and properly authenticated successful experience of specialization in the manufacture of the product specified herein.

D. Contractor Personnel Training: Provide proper training for maintenance and operations, including emergency procedures, and the like, as directed by District.

E. Units: Shall be sound and free of defects, and shall not include any damage or defect that will impair the safety, installation, performance, or the durability of the entire Office Trailer and appurtenant systems.

5. REGULATORY REQUIREMENTS

A. General: Work shall be executed in accordance with applicable Codes, Regulations, Statutes, Enactment's, Rulings, Laws, each authority having jurisdiction, and including, but not limited to, Regulatory Requirements specified herein.

B. California Building Standards Code ("CBSC").

C. California Code of Regulations, Title 25, Chapter 3, Sub Chapter 2, Article 3 ("CCR").

D. Coach Insignia: Trailer shall display California Commercial Coach Insignia; such insignia shall be

deemed to show that the trailer is in accordance with the Construction and Fire Safety requirements of CCR.

6. FIELD OFFICE TRAILER

A. General: Provide entire Field Office Trailer of type, function, operation, capacity, and size, complete with controls, safety devices, accessories, and the like, for proper and durable installation. Partitions, walls, ceiling, and other interior and exterior surfaces shall be appropriately finished, including, but not limited to, trim, painting, wall base, floor covering, suspended or similar ceiling, and the like; provide systems, components, units, nuts, bolts, screws, anchoring devices, fastening devices, washers, accessories, adhesives, sealants, and other items of type, grade, and class required for the particular use, not identified but required for a complete, weather-tight, appropriately operating, and finished installation.

B. Manufacturers: Per the approval ofthe District Representative.

C. Program: Provide a wheel-mounted trailer with stairs, landings, platforms, ramps, stairs, platforms, and the like, in good, proper, safe, clean, and properly finished condition; with proper heavy-duty locks, and other proper and effective security at all doors, windows, and the like. Trailer shall be maintained in good, proper, safe, clean, and properly finished condition during the Contract, as follows:

1. Nominal Trailer Size: Four hundred eighty (480) square feet, minimum.

2. Stairs, Platform: Properly finished stairs, platforms, and ramps, in compliance with accessibility requirements and standards, including without limitation, the Americans With Disabilities Act.

3. Doors: Two (2), three (3) foot wide exterior doors with locksets; finished ramp, steps, and entry platform at each exterior door.

4. Keys: Submit five (5) keys for each door, window, furniture unit, and the like, there shall be no other key copies or originals available; each key shall be identified for District; and shall be labeled, or tagged or both, as directed by District.

5. HVAC: heating, cooling and ventilating equipment and equipped to adequately conduct meetings for construction operations

6. Lighting: Sixty-five (65) foot-candles illumination minimum at any point, at thirty (30) inches above finished floor throughout from fluorescent light source, exclusively, or as directed by District.

7. Electrical Outlets: One (1) duplex outlet evenly spaced every twelve (12) linear horizontal feet of wall face, and electrical service ready for use.

8. Internet Access: Provide high-speed internet access sufficient to service all hard-wired and Wi-Fi devices situated in or about the Field Office.

9. Equipment: Provide all equipment and furniture required for a working field office, including but not limited to: Copiers, desks, conference tables, bookcases, chairs, computers, etc..

7. DISTRICT OFFICE TRAILER

A. In addition to Project site temporary office facilities Contractor provides for use of Contractor, Contractor shall provide and maintain a minimum of one new (or as approved by District Representative) construction trailer on the Project site for sole use by District, Construction Manager, Project Manager, Architect and/or Project Inspector for the duration of the Work ("District Office Trailer"). The District Office Trailer shall be accessible by District, Construction Manager, Project Manager, Architect and/or Project Inspector on a 7 day a week 24-hour basis. Contractor shall provide the necessary materials and labor to provide the District Office Trailer with disable access on request by the District Representative. District Office Trailer shall include, at a minimum, the following:

1. Conference room with a table and adequate seating for twelve;

2. One bathroom

3. An open work area with dividing partitions as required by the District

4. Two enclosed, separate offices with windows and lockable doors

5. Trailer shall be furnished with two exterior entrance doors (with one located in separate office). Each door shall be furnished with both a dead bolt and cylinder lock with six (6) keys. Exterior doors and windows shall be provided with exterior mounted burglar bars. Windows shall be provided with operable window shades. Security of trailer and contents is a continuous obligation of Contractor and shall be equipped with monitored security system.

8. DISTRICT TRAILER ITEMS

A. Provide the Field Office Trailer with the following arranged into two (2) workstations:

1. Desks: Two (2) desks: thirty-six (36) inches by sixty (60) inches; steel, laminated plastic top; locking, one **(1)** or two (2) file drawers; single pedestal; steel; provide five (5) keys to District.

2. Tables: Two (2) tables; thirty-six (36) inches by sixty (60) inches; twenty-nine (29) inches high; steel, laminated plastic top tables; one (1) at each desk, as directed by District.

3. Chairs: Two (2) chairs: swivel; steel; with seat cushion and arms; one (1) at each desk.

4. Waste Baskets: Two (2) wastebaskets, one at each desk.

B. Furniture and Equipment: Provide in the space located to effect efficient and logical use.

1. File cabinet: One **(1);** four (4) drawer; lateral; steel locking, as directed by District.

2. Plan Table: One {1) plan table: thirty-six {36) inches deep by seventy-two (72) inches wide by forty-two {42) inches high; adjustable; wood or steel; with lockable plan and pencil drawers, as directed by District.

3. Drafting Stool: One (1) drafting stool; swiveling; steel; padded; adjustable; with footrest and casters, as directed by District.

4. Bookshelf: One {1) bookshelf: thirty-six {36) inches deep by seventy-two {72) inches wide by forty-two {42) inches high; adjustable; wood or steel; with lockable plan and pencil drawer, as directed by District.

5. Plan Rack: One {1) wheel mounted plan rack, as directed by District.

6. Waste Baskets: One (1) large wastebasket.

7. Coat/Hat Hanger: Wall mounted with minimum capacity for four (4) garments and ten (10) hats, as directed by District.

8. Provide broadband high-speed internet connectivity (Ethernet connected and Wi-Fi) in all trailer offices, conference area, work areas

9. Provide a broadband internet connection such as a Fiber Optic (FIOS) line or business class cable, as directed by District

10. Copier: Shall include an all-in-one color printer/ copier/ scanner and shall include the following features:

    a. Type: Ink-jet or Laser, plain paper

    b. Network: Wireless

    c. Resolution: Six hundred (600) dots per inch by six hundred (600) dots per inch, minimum, as directed by District

    d. Print Speed: Twenty (20) pages per minute, minimum

    e. Copies: Twenty (20) copies per minute, minimum

    f. Document Handler: Forty (40) sheet, minimum

    g. Collator

    h. Duplexing: Capable.

    i. Paper Size: Capable of handling paper sizes to eleven (11) inches by seventeen (17) inches.

    j. Reduction/Enlargement: Capable of reduction and enlargement

11. Maintenance: Contractor shall provide maintenance for each unit of equipment for the duration of the project plus two (2) months, and shall maintain all equipment in proper working condition. Maintenance shall include provision for replacement of toner cartridges, paper and other items required to effect proper unit use. Service agreements shall also provide for:

    a. Unlimited Service Calls.

    b. Same Day Response.

    c. All parts, labor, preventative maintenance and mileage.

    d. All chemicals, such as toner, fixing agent, and the like.

    e. System training and setup.

12. Portable Toilets/ Handwashing Station: Two (2), for Contractor use; each portable toilet shall include a urinal; each unit shall be a properly enclosed chemical unit conforming to ANSI Z4.3.

    a. Location: As directed by District.

    b. Maintenance: Maintain each unit and surrounding areas in a clean, hygienic and orderly manner, at all time. Empty, clean, and sanitize each unit each day at a location and time as directed by District.

    c. Removal: Relocate, or remove from the site, each Portable Toilet and Handwashing Station. Upon such directive by District, the Contractor shall forthwith relocate or remove each Portable Toilet and Handwashing Station and submit the affected areas to a condition which existed prior to the installation of each Portable Toilet, within three (3) calendar days, or as directed by District in writing, at no cost to District.

9. UTILITY AND SERVICES

A. Internet Service: Provide all proper connections and continuously pay for service for the duration of the Work.

B. Electrical Service: Provide all proper connections and continuously pay for service for the duration of the Work. See section 01 50 00 for more information.

10. FINISHES

A. General: Manufacturer standard finish system over surfaces properly cleaned, pretreated, and prepared to obtain proper bond; all visible surfaces shall be coated.

B. Finish: Color as selected by District from manufacturer standard palette.

11. INSTALLATION

A. General: Properly prepare area and affected items to receive the Work. Set Work accurately in location, alignment, and elevation; rigidly, securely, and firmly anchor to appropriate structure; install plumb, straight, square, level, true, without racking, rigidly anchored to proper solid blocking, substrate, and the like; provide appropriate type and quantity of reinforcements, fasteners, adhesives, self-adhesive and other tapes; lubricants, coatings, accessories, and the like, as required for a complete, structurally rigid, stable, sound, and appropriately finished installation, in accordance with manufacturer's published instructions, and as indicated. The more restrictive and higher quality requirement shall govern. Moving parts shall be properly secured, without binding, looseness, noise, and the like.

B. Installation: Install in accordance with 25 CCR 3.2.3 and as directed by District; jack up trailer and level both ways; mount on proper concrete piers with all load off wheels; provide required tie down and accessories per Section 4368 of referenced CCR, and as directed by District.

C. Rejected Work: Work, materials, unit, items, systems, and the like, not accepted by District shall be deemed rejected, and shall forthwith be removed and replaced with proper and new Work, materials, unit, items, systems, and the like at no cost to District.

D. Standard: Comply with manufacturer's published instructions, or with instructions as shown or indicated; the more restrictive and higher quality requirement shall govern.

E. Location: As directed by District.

F. Fire Resistance: Construct and install in accordance with UL requirements.

G. Maintenance: Contractor shall maintain trailer and adjacent areas in a safe, clean and hygienic condition throughout the duration of the Work, and as directed by District. Properly repair or replace furniture or other items, as directed by District. Properly remove unsafe, damaged, or broken furniture, or similar items, and replace with safe and proper items. Contractor shall pay cost of all services, repair, and maintenance, or replacement of each item.

H. Janitorial Service: Provide professional janitorial services, including, but not limited to, trash, waste paper baskets, fill paper dispensers; clean and dust all furniture, clean toilet room fixtures, files, and the like; sweep and mop resilient and similar flooring; and vacuum carpeting and similar flooring.

I. Frequency: Two (2) times per week, minimum.

J. Removal: Properly remove the Office Trailer and contents from the Site upon completion of the Contract, or as directed by District in writing. Forthwith properly patch and repair affected areas; replace damaged items with new items. Carefully and properly inventory, clean, pack, store, and protect District property; submit District property to District at a date, time and location as directed by District.

END OF DOCUMENT 015213

DOCUMENT 01 55 00

VEHICULAR ACCESS AND PARKING

1. SECTION INCLUDES

A. Signs, Signals and devices.

B. Construction Parking Control.

C. Flagmen

D. Flares and Lights.

E. Haul Routes

F. Traffic Signs and Signals

G. Removal

2. Rules of operations.

In addition to any other rules of operations required of the Contractor by the District, Contractor shall comply with the rules of operations set forth in this Paragraph.

A. Vehicles on School Grounds. This Paragraph applies to the use of vehicles on all school grounds operated by the District.

1. The District may in its sole discretion bar from school grounds any person found in violation of the requirements of this Paragraph.

2. No vehicle shall be driven more than three (3) miles per hour.

3. Drivers shall yield the right of way to pedestrians at all times.

4. If the driver of a vehicle is alone, the driver must engage an additional person to guide the vehicle to a location that will best protect the children. That person must walk beside or in front of the vehicle until it reaches the desired location.

5. When directed to stop by any school or District representative, the vehicle will stop immediately and not proceed further without authorization to do so.

6. All traffic routes must be pre-authorized by a school or District representative, to prevent damage to school property such as gates, irrigation sprinklers, signs, landscaping, and turf.

3. SIGNS, SIGNALS AND DEVICES

A. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs as required to maintain adequate standards of safety and control of vehicular movement on and off construction site.

B. Traffic Control Signals: As approved by local jurisdictions.

C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

D. Flagmen Equipment: As approved by local jurisdictions.

4. CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles and District's operations.

B. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

5. FLAGMEN

A. Provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroaches on public traffic lanes.

6. FLARES AND LIGHTS

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

7. HAUL ROUTES

A. Consult with authority having jurisdiction in establishing public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

D. Consult with District to establish construction traffic haul route [on existing campus].

8. TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install at crossroads, detours, parking areas and elsewhere as needed to direct construction and affected public traffic.

B. Install and operate traffic control devices as are necessary to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.

C. Relocate as Work progresses to maintain effective traffic control.

9. REMOVAL

A. Remove equipment and devices when no longer required.

B. Repair damage caused by installation.

C. Remove post settings to **full** depth.

END OF DOCUMENT 01 55 00

DOCUMENT 01 57 23

STORM WATER POLLUTION CONTROL

1. REQUIREMENT

A. Requirements for compliance with the Storm Water Pollution Prevention Plan (SWPPP} developed specifically for this Project are the responsibility of the Contractor.

1. SWPPP shall satisfy mandates of Federal Clean Water Act as enforced by State of California Water Resources Control Board and its Regional Water Quality Boards.

2. Preparation, implementation, and monitoring of Storm Water Pollution Prevention Plan (SWPPP} for the purpose of preventing the discharge of pollutants from the Project site into receiving waters. This includes the elimination of pollution discharges such as improper dumping, storm water that has been in contact with pollutants, erosions, spills or leakage from storage tanks or transfer areas.

3. Compliance with local, state, and federal regulations.

4. Payment of application and annual fees required by the State Water Resources Control Board (SWRCB} up until the date of Substantial Completion.

B. Related Sections

1. Other Sections of this Specification shall comply with requirements of this Section.

2. SWPPP requires compliance of all trades on Project that use or manipulate materials of any nature that can potentially enter natural storm-water drainage system.

3. Representative materials controlled by SWPPP include erosion of native soils and fill materials, leakage or spills from construction vehicles and machinery, stored fuels, concrete truck washout, chemical treatments, curing, compounds, paints, plasters, paving materials, adhesives and sealants, trash and general construction debris, pesticides, fertilizers, and any other material which can be carried by running water or percolate into earth.

2. SUBMITTALS

A. Closeout Submittals, Documents: Submit documentation certifying compliance with the SWPPP and notification of Agencies of completion of operations.

3. REGULATORY BACKGROUND

A. After January 1, 2001, as required by Federal Water Pollution Control Act (Clean Water Act} and regulations of U.S. Environmental Protection Agency and of State of California Water Resources Control Board, any construction activity of ONE acre or more must be covered by National Pollutant Discharge Elimination System (NPDES} permit.

B. The Act further decrees fines of as much as $27,500 per day per violation.

C. It is implicit that SWPPP satisfies requirements of NPDES permit.

D. If the District is cited for violation of Clean Water Act due to failure of SWPPP to address requirement, Contractor shall be liable for any fines or penalties that might be imposed by regulatory agency and the Contractor shall be obligated to perform mandated corrective measures at the sole cost and expense of the Contractor.

E. If District, Architect, or Project Inspector becomes aware of violations of SWPPP, they will immediately inform Contractor in writing. Contractor shall immediately cease violation and shall restore site, at his own expense, to same conditions it was in before violation, to approval of the District.

F. Should Contractor continue to fail or refuse to comply with SWPPP requirements, or to repair results of violation to the District's approval, such failure or refusal shall be deemed an event of Contractor default under the Contract Documents.

4. MATERIALS

A. Provide all temporary and permanent storm water pollution prevention equipment, material, and facilities as required by or as necessary to comply with SWPPP.

5. IMPLEMENTATION

A. Measures required in SWPPP shall be executed as dictated by SWPPP itself.

B. District will establish Project File with State Water Resources Board at http://smarts.waterboards.ca.gov.

C. Contractor shall prepare and submit Notice of Intent (NOi) to comply with terms of this General Permit prior to commencement of construction activity.

1. An annual fee required by the agency, paid by Contractor shall accompany Notice of Intent; no adjustment of the Contract Price shall be allowed for the annual fee. Notice of Intent will not be processed if not accompanied by fee.

2. Copies of General Permit and Notice of Intent form may be obtained from California Water Resources Board website.

3. Concurrent with commencement of construction activities, Contractor shall develop, implement and retain at project site, a Storm Water Pollution Protection Plan and a monitoring program and reporting plan in accordance with the General Permit.

D. Contractor shall be responsible for paying the necessary permit fees and complying with State Water Resources Control Board Order No. 92-08-DWQ, and any successor or similar order implementing provisions of the Clean Water Act relating to storm water discharges.

E. Contractor shall obtain the necessary General Permit from the State Water Resources Control Board and develop and implement Storm Water Pollution Prevention Plan in accordance with the State Water Resources Control Board requirements prior to commencing any portion of

construction that will disturb land (i.e.; excavation, grading, etc.).

F. The plan shall address all potential sources of pollutants which may enter the storm water system, it must explain what steps will be taken during construction to minimize the risk of storm water contamination and must address management procedures to be utilized during construction to prevent pollution discharges such as spills, leaking, and dumping.

G. A copy of said plan shall be provided to District, Architect, Project Inspector and Construction Manager, if applicable and upon request Contractor shall certify, in writing, compliance with the relevant rules, regulations and laws.

H. Additional information regarding State Water Resources Control Board requirements can be obtained from State Water Resources Control Board, Division of Water Quality.

I. During construction, make changes as necessary for proper functioning of SWPPP measures.

J. At completion of work, Contractor shall remove temporary SWPPP measures and dispose of any pollutants in legal manner offsite, or as otherwise required by SWPP.

K. Prepare and file closeout documentation certifying compliance with the requirements of the SWPPP in original form to the Approving Agencies and copies to the District, Architect, Project Inspector and Construction Manager, if applicable.

END OF DOCUMENT 01 57 23

DOCUMENT 0157 23.01 ATTACHMENT A

DISTRICT Project Number	**LAWNDALE ELEMENTARY SCHOOL DISTRICT As OWNER ATTACHMENT 'A' STORM WATER POLLUTION PREVENTION SITE MONITORING REPORT**	STATE OF CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

Site Name: _____

Project Description: _____ Contract Number _____

I. Type of Examination: (Use one form for each type of examination):

☐ Prior to Anticipated Storm Event ☐ After Actual Storm Event ☐ Monthly

Date Examined: _____

II. Check the response for each SWPPP question below:

1	Do you have an approved Storm Water Pollution Prevention Plan (SWPPP) and a BMP Handbook on the Project site?	☐	☐
2.	Does your SWPPP incorporate an up-to-date erosion control plan?	☐	☐
3.	Is the erosion control installed per plan?	☐	☐
4.	Is the Work at a stage where the erosion control plan cannot be constructed, is the erosion control at the Maximum Extent Practicable for the stage you are in?	☐	☐
5.	Did you observe the presence of any floating materials such as oil, grease, pieces of wood, paper, etc., odor, toxics, and/ or sediments?	☐	☐
6.	If yes, what is it that you observed? _____		

III. Check the status of the following items as observed:

Item #	SWPPP Items	Acceptable	Not Acceptable	Repairs Required	Date Repairs Completed
1.	De-silting Basins (Cleaned)	☐	☐	☐	
2.	Water Quality Basin	☐	☐	☐	
3.	Silt Fences	☐	☐	☐	
4.	Hay bales/ Check dams/ Sandbags	☐	☐	☐	
5.	Berms and Dikes	☐	☐	☐	
6.	Sand/Gravel Inlet	☐	☐	☐	
7.	Slope Protection - Polymer and Mulch	☐	☐	☐	
8.	Vegetation/ Re-vegetation	☐	☐	☐	
9.	Dust Control	☐	☐	☐	

10.	Surface Erosion	☐	☐	☐	
11.	Slope Instability	☐	☐	☐	
12.	Storage	☐	☐	☐	
13.	Disposal	☐	☐	☐	
14.	Spills	☐	☐	☐	
15.	Clean-up	☐	☐	☐	
16.		☐	☐	☐	
17.		☐	☐	☐	

IV. Describe any problems or required repairs checked above and the necessary actions needed:

Item	Description of Problem or Required Repair	Action Needed

Examination Performed by CONTRACTOR:

By {Print Name, Title and Sign) Date

Verified by IOR:

Print Name, Title and Sign Date

END OF DOCUMENT 01 57 23.01 ATTACHMENT 'A'

_____ DISTRICT Project Number	0157 23.02 ATTACHMENT B **LAWNDALE ELEMENTARY SCHOOL DISTRICT As OWNER** **ATTACHMENT "B"** **GENERAL CONSTRUCTION ACTIVITY STORM WATER PERMIT COMPLIANCE**	STATE OF CALIFORNIA STATE WATER BOARD WDID NO._____
Site Name: _____		_____
Project Description:		Contract Number

ANNUAL CERTIFICATION

I certify the Project has met the following conditions: All elements of the Storm Water Pollution Prevention Plan are in place; construction materials and equipment maintenance waste have been disposed of properly; and the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements, and the appropriate use permits have been obtained.

CONTRACTOR: _____

Print Name: _____ Title: _____

Signature: _____ Date: _____

SUBSTANTIAL COMPLETION CERTIFICATION

I certify the Project has been completed and the following conditions have been met: All elements of the Storm Water Pollution Prevention Plan have been completed; construction materials and equipment maintenance waste have been disposed of properly; the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements and the appropriate use permits have been obtained; and a post-construction storm water operation, and management plan is in place.

CONTRACTOR: _____

Print Name: _____ Title: _____

Signature: _____ Date: _____

END OF DOCUMENT 01 57 23.02
ATTACHMENT "B"

DOCUMENT 01 64 00

OWNER-FURNISHED PRODUCTS

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions;

B. Special Conditions; and

C. Materials and Equipment.

2. SECTION INCLUDES:

Requirements for the following:

A. Installing Owner-furnished materials and equipment.

B. Providing necessary utilities, connections and rough-ins.

3. DEFINITIONS

A. Owner: District, who is providing/furnishing materials and equipment.

B. Installer Contactor: Contractor, who is installing the materials and equipment furnished by the District. Notwithstanding installation of Owner furnished materials and equipment by a Subcontractor, the Contractor is responsible for compliance with the requirements of this Section.

4. PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Receive, store and handle products in accordance with the manufacturer's instructions.

B. Protect equipment items as required to prevent damage during storage and construction.

5. GENERAL PRODUCT REQUIREMENTS:

A. Installer Contractor's Responsibilities:

1. Verify mounting and utility requirements for Owner-furnished materials and equipment items.

2. Provide mounting and utility rough in for all items where required.

3. Rough in locations, sizes, capacities, and similar type items shall be as indicated and required by product manufacturer.

B. Owner and Installer Contractor(s) Responsibilities:

1. General: District and Installer Contractor(s) will coordinate deliveries of materials and equipment to coincide with the construction schedule.

2. District will furnish specified materials and equipment delivered to the site. District/vendor's representative shall be present on Site at the time of delivery to comply with the contract requirements and Specifications Section 01 43 00, Materials and Equipment, Section 4(1).

3. The Owner furnishing specified materials and equipment is responsible to provide manufacturer guarantees as required by the Contract to the Installer Contractor.

4. The Installer Contractor shall:

    a. Review, verify and accept the approved manufacturer's submittal/Shop Drawings for all materials and equipment required to be installed by the Installer Contractor and furnished by the District. Any discrepancies, including but not limited to possible space conflicts, should be brought to the attention of the Project Manager and/or Program Manager, if applicable.

    b. Coordinate timely delivery. Installer Contractor shall receive materials and equipment at Site when delivered and give written receipt at time of delivery, noting visible defects or omissions; if such declaration is not given, the Installer Contractor shall assume responsibility for such defects and omissions.

    c. Store materials and equipment until ready for installation and protect from loss and damage. Installer Contractor is responsible for providing adequate storage space.

    d. Coordinate with other bid package contractors and field measurement to ensure complete installation.

    e. Uncrate, assemble, and set in place.

    f. Provide adequate supports.

    g. Install materials and equipment in accordance with manufacturer's recommendations, instructions, and Shop Drawings, supply labor and material required, and make mechanical, plumbing, and electrical connections required to operate equipment.

    h. Be certified by equipment manufacturer for installation of the specific equipment supplied by the District.

    i. Provide anchorage and/or bracing as required for seismic restraint per Title 24, UBC Standard 27-11 and all other applicable codes.

    j. Provide the contract-required warranty and guarantee for all work, materials, equipment, and installation upon its completion and acceptance by the District.

Guarantee includes all costs associated with the removal, shipping to and from the Site, and re-installation of any equipment found to be defective.

C. Compatibility with Space and Service Requirements:

1. Equipment items shall be compatible with space limitations indicated and as shown on the Contract Documents and specified in other sections of the Specifications.

2. Modifications to equipment items required to conform to space limitations specified for rough in shall not cause additional cost to the District.

D. Manufacturer's printed descriptions, specifications, and instructions shall govern the Work unless specifically indicated or specified otherwise.

6. FURNISHED MATERIALS AND EQUIPMENT

A. All furnished materials and equipment are indicated or scheduled on the Contract Documents.

7. INSTALLATION

A. Install equipment items in accordance with the manufacturer's instructions.

B. Set equipment items securely in place, rigidly or flexibly mounted in accordance with manufacturers' directions.

C. Make electrical and mechanical connections as indicated and required.

D. Touch-up and restore damaged or defaced finishes to the District's satisfaction.

8. CLEANING AND PROTECTION

A. Repair or replace items not acceptable to the Architect and/or District.

B. Upon completion of installation, clean equipment items in accordance with manufacturer's recommendations, and protect from damage until final acceptance of the Work by the District.

END OF DOCUMENT 01 64 00

SECTION 01 66 00

PRODUCT DELIVERY, STORAGE AND HANDLING

1. RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;

B. Special Conditions.

2. PRODUCTS

Products are as defined in the General Conditions.

A. Contractor shall not use and/or reuse materials and/or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.

B. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

3. TRANSPORTATION AND HANDLING

A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.

B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.

C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

4. STORAGE AND PROTECTION

A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate-controlled enclosures.

B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.

C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.

1. Storage shall be a secure and bonded warehouse.

D. Payment will not be made by the District for materials stored off-site, until the materials are incorporated into the Work. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.

F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

END OF DOCUMENT 01 66 00

DOCUMENT 01 71 23

FIELD ENGINEERING

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Investigation, and Soils Investigation Report;

B. Special Conditions;

C. Site-Visit Certification.

2. REQUIREMENTS INCLUDED:

Contractor shall provide and pay for field engineering services by a California-registered engineer, required for the project, including, without limitations:

A. Survey work required in execution of the Project.

B. Civil or other professional engineering services specified, or required to execute Contractor's construction methods.

3. QUALIFICATIONS OF SURVEYOR OR ENGINEERS:

Contractor shall only use a qualified licensed engineer or registered land surveyor, to whom District makes no objection.

4. SURVEY REFERENCE POINTS:

A. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.

B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition Contractor shall:

1. Make no changes or relocation without prior written notice to District and Architect.

2. Report to District, Construction Manager, Project Inspector and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

3. Require surveyor to replace Project control points based on original survey control that may be lost or destroyed.

5. RECORDS:

Contractor shall maintain a complete, accurate log of all control and survey work as it progresses.

6. SUBMITTALS:

A. Contractor shall submit name and address of Surveyor and Professional Engineer to District, Construction Manager and Architect prior to its/their work on the Project. If the District, Construction and Architect do not accept the Contractor's proposed Surveyor and/or Professional Engineer, the Contractor shall re-submit proposed Professional Engineer and/or Surveyor for acceptance. Notwithstanding acceptance of the Contractor's Professional Engineer and/or Surveyor, the Contractor is responsible for the services of the Professional Engineer and Surveyor including without limitation, their work product and instruments of service.

B. On request of District, Construction Manager, Project Inspector or Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.

C. Contractor shall submit a certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or nonconformance with Contract Documents.

7. COMPLIANCE WITH LAWS:

Contractor is responsible for meeting all applicable codes, OSHA, safety and shoring requirements.

8. NONCONFORMING WORK:

Contractor is responsible for any re-surveying required by correction of nonconforming work.

END OF DOCUMENT 017123

DOCUMENT 01 73 29
CUTTING AND PATCHING

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Inspector, Inspections, and Tests, Integration of Work, Nonconforming Work, and Correction of Work, and Uncovering Work;

B. Special Conditions;

C. Hazardous Materials Procedures and Requirements;

D. Hazardous Materials Certification;

E. Lead-Based Paint Certification;

F. Imported Fill and Soils Materials Certification.

2. CUTTING AND PATCHING:

A. Contractor shall be responsible for all cutting, fitting, and patching, including associated excavation and backfill, required to complete the Work or to:

1. Make several parts fit together properly.

2. Uncover portions of Work to provide for installation of ill-timed Work.

3. Remove and replace defective Work.

4. Remove and replace Work not conforming to requirements of Contract Documents.

5. Remove Samples of installed Work as specified for testing.

6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

7. Attaching new materials to existing remodeling areas - including painting (or other finishes) to match existing conditions.

B. In addition to Contract requirements, upon written instructions from the District, Contractor shall uncover Work to provide for observations of covered Work in accordance with the Contract Documents; remove samples of installed materials for testing as directed by District; and remove Work to provide for alteration of existing Work.

C. Contractor shall not cut or alter Work, or any part of it, in such a way that endangers or compromises the integrity of the Work, the Project, or work of others.

3. SUBMITTALS:

A. Prior to any cutting or alterations that may affect the structural safety of Project, or work of others, and well in advance of executing such cutting or alterations, Contractor shall submit written notice to District pursuant to the applicable notice provisions of the Contract Documents, requesting consent to proceed with the cutting or alteration, including the following:

1. The work of the District or other trades
2. Structural value or integrity of any element of Project.
3. Integrity or effectiveness of weather-exposed or weather-resistant elements or systems.
4. Efficiency, operational life, maintenance or safety of operational elements.
5. Visual qualities of sight-exposed elements.

B. Contractor's Request shall also include:

1. Identification of Project.
2. Description of affected Work.
3. Necessity for cutting, alteration, or excavations.
4. Effects of Work on District, other trades, or structural or weatherproof integrity of Project.
5. Description of proposed Work:
    a. Scope of cutting, patching, alteration, or excavation
    b. Trades that will execute Work.
    c. Products proposed to be used.
    d. Extent of refinishing to be done.
6. Alternates to cutting and patching.
7. Cost proposal, when applicable.
8. The scheduled date the Contractor intends to perform the Work and the duration of time to complete the Work.
9. Written permission of other trades whose Work will be affected.

4. QUALITY ASSURANCE:

A. Contractor shall ensure that cutting, fitting, and patching shall achieve security, strength, weather protection, appearance for aesthetic match, efficiency, operational life, maintenance, safety of operational elements, and the continuity of existing fire ratings.

B. Contractor shall ensure that cutting, fitting, and patching shall successfully duplicate undisturbed adjacent profiles, materials, textures, finishes, colors, and that materials shall match existing construction. Where there is dispute as to whether duplication is successful or has been achieved to a reasonable degree, the District's decision shall be final.

5. PAYMENT FOR COSTS:

A. Cost caused by ill-timed or defective Work or Work not conforming to Contract Documents, including costs for additional services of the District, its consultants, including but not limited to the Construction Manager, the Architect, the Project Inspector(s), Engineers, and Agents, will be paid by Contractor and/or deducted from the Contract by the District.

B. District shall only pay for cost of Work if it is part of the original Contract Price or if a change has been made to the contract in compliance with the provisions of the General Conditions. Cost of Work performed upon instructions from the District, other than defective or nonconforming Work, will be paid by District on approval of written Change Order. Contractor shall provide written cost proposals prior to proceeding with cutting and patching.

6. MATERIALS:

A. Contractor shall provide for replacement and restoration of Work removed. Contractor shall comply with the Contract Documents and with the Industry Standard(s), for the type of Work, and the Specification requirements for each specific product involved. If not specified, Contractor shall first recommend a product of a manufacturer or appropriate trade association for approval by the District.

B. Materials to be cut and patched include those damaged by the performance of the Work.

7. INSPECTION:

A. Contractor shall inspect existing conditions of the Site and the Work, including elements subject to movement or damage during cutting and patching, excavating and backfilling. After uncovering Work, Contractor shall inspect conditions affecting installation of new products.

B. Contractor shall report unsatisfactory or questionable conditions in writing to District as indicated in the General Conditions and shall proceed with Work as indicated in the General Conditions by District.

8. PREPARATION:

A. Contractor shall provide shoring, bracing and supports as required to maintain structural integrity for all portions of the Project, including all requirements of the Project.

B. Contractor shall provide devices and methods to protect other portions of Project from damage.

C. Contractor shall, provide all necessary protection from weather and extremes of temperature and humidity for the Project, including without limitation, any work that may be exposed by cutting and patching Work. Contractor shall keep excavations free from water.

9. ERECTION, INSTALLATION AND APPLICATION:

A. With respect to performance, Contractor shall:

1. Execute fitting and adjustment of products to provide finished installation to comply with and match specified tolerances and finishes.

2. Execute cutting and demolition by methods that will prevent damage to other Work and provide proper surfaces to receive installation of repairs and new Work.

3. Execute cutting, demolition excavating, and backfilling by methods that will prevent damage to other Work and damage from settlement.

B. Contractor shall employ original installer or fabricator to perform cutting and patching for:

1. Weather-exposed surfaces and moisture-resistant elements such as roofing, sheet metal, sealants, waterproofing, and other trades.

2. Sight-exposed finished surfaces.

C. Contractor shall execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes as shown or specified in the Contract Documents including, without limitation, the Drawings and Specifications.

D. Contractor shall fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Contractor shall conform to all Code requirements for penetrations or the Drawings and Specifications, whichever calls for a higher quality or more thorough requirement. Contractor shall maintain integrity of both rated and non-rated firewalls, ceilings, floors, etc.

E. Contractor shall restore Work that has been cut or removed. Contractor shall install new products to provide completed Work in accordance with requirements of the Contract Documents and as required to match surrounding areas and surfaces.

F. Contractor shall refinish all continuous surfaces to nearest intersection as necessary to match the existing finish to any new finish.

END OF DOCUMENT 017329

DOCUMENT 017600

ALTERATION PROJECT PROCEDURES

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Integration of Work, Purchase of Materials and Equipment, Uncovering of Work and Non-conforming Work and Correction of Work and Trenches;

B. Special Conditions.

2. PRODUCTS FOR PATCHING AND EXTENDING WORK:

A. New Materials: As specified in the Contract Documents including, without limitation, in the Specifications, Contractor shall match existing products, conditions, and work for patching and extending work.

B. Type and Quality of Existing Products: Contractor shall determine by inspection, by testing products where necessary, by referring to existing conditions and to the Work as a standard.

3. EXAMINATION:

A. Contractor shall verify that demolition is complete and that areas are ready for installation of new Work.

B. By beginning restoration Work, Contractor acknowledges and accepts the existing conditions.

4. PREPARATION:

A. Contractor shall cut, move, or remove items as necessary for access to alterations and renovation Work. Contractor shall replace and restore these at completion.

B. Contractor shall remove unsuitable material not as salvage unless otherwise indicated in the Contract Documents. Unsuitable material may include, without limitation, rotted wood, corroded metals, and deteriorated masonry and concrete. Contractor shall replace materials as specified for finished Work.

C. Contractor shall remove debris and abandoned items from all areas of the Site and from concealed spaces.

D. Contractor shall prepare surface and remove surface finishes to provide for proper installation of new Work and finishes.

E. Contractor shall close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity. Contractor shall insulate ductwork and piping to prevent condensation in exposed areas. Contractor shall insulate building cavities for thermal and/or acoustical protection, as detailed.

5. INSTALLATION:

A. Contractor shall coordinate Work of all alternations and renovations to expedite completion and to accommodate District occupancy.

B. Designated Areas and Finishes: Contractor shall complete all installations in all respects, including operational, mechanical work and electrical work.

C. Contractor shall remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring Products and finishes to original or specified condition.

D. Contractor shall refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

E. Contractor shall install products as specified in the Contract Documents, including without limitation, the Specifications.

6. TRANSITIONS:

A. Where new Work abuts or aligns with existing, Contractor shall perform a smooth and even transition. Patched Work must match existing adjacent work in texture and appearance.

B. When finished surfaces are cut so that a smooth transition with new Work is not possible, Contractor shall terminate existing surface along a straight line at a natural line of division and make a recommendation for resolution to the District and the Architect for review and approval.

7. ADJUSTMENTS:

A. Where removal of partitions or walls results in adjacent spaces becoming one, Contractor shall rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

B. Where a change of plane of 1/4 inch or more occurs, Contractor shall submit a recommendation for providing a smooth transition to the District and the Architect for review and approval.

C. Contractor shall trim existing doors as necessary to clear new floor finish and refinish trim as required.

D. Contractor shall fit Work at penetrations of surfaces.

8. REPAIR OF DAMAGED SURFACES:

A. Contractor shall patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.

B. Contractor shall repair substrate prior to patching finish.

9. CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS:

A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored by Contractor to their original condition or better, where indicated.

B. Contractor shall protect and replace, if damaged, all existing guard posts, barricades, and fences.

C. Contractor shall give special attention to avoid damaging or killing trees, bushes and/or shrubs on the Premises and/or identified in the Contract Documents, including without limitation, the Drawings.

10. FINISHES:

A. Contractor shall finish surfaces as specified in the Contract Documents, including without limitations, the provisions of all Divisions of the Specifications.

B. Contractor shall finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, Contractor shall refinish entire surface to nearest intersections.

11. CLEANING:

A. Contractor shall continually clean the Site and the Premises as indicated in the Contract Documents, including without limitation, the provisions in the General Conditions and the Specifications regarding cleaning.

END OF DOCUMENT 01 76 00

DOCUMENT 01 77 00

CONTRACT CLOSEOUT AND FINAL CLEANING

1. RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Completion of Work;

B. Special Conditions;

C. Progress Payment Procedures

D. Schedule of Work

E. Construction Waste Management

F. Project Record Documents;

G. Operations and Maintenance Data;

H. Warranties;

I. Record Documents;

J. Commissioning; If applicable

K. Temporary Facilities and Controls

2. CLOSEOUT PROCEDURES

Contractor shall comply with all closeout provisions as indicated in the General Conditions.

3. FINAL CLEANING

A. Contractor shall execute final cleaning prior to final inspection.

B. Contractor shall clean interior and exterior glass and surfaces exposed to view; remove temporary labels, tape, stains, and foreign substances, polish transparent and glossy surfaces, wax and polish new vinyl floor surfaces, vacuum carpeted and soft surfaces.

C. Contractor shall clean equipment and fixtures to a sanitary condition.

D. Contractor shall replace filters of operating equipment.

E. Contractor shall clean debris from roofs, gutters, down spouts, and drainage systems.

F. Contractor shall clean Site, sweep paved areas, and rake clean landscaped surfaces.

G. Contractor shall remove waste and surplus materials, rubbish, and construction facilities from the Site.

4. ADJUSTING

Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

5. RECORD DOCUMENTS AND SHOP DRAWINGS

A. Contractor shall legibly mark each item to record actual construction, including:

1. Measured depths of foundation in relation to finish floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permit surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail

5. Details not on original Contract Drawings

6. Changes made by modification{s).

7. References to related Shop Drawings and modifications.

B. Contractor will provide a complete set of Record Drawings to the District: one **{1)** hard copy, one {1) electronic file and upload one {1) set into District web-based software.

C. Contractor shall submit all required documents to District and/or Architect prior to or with its final Application for Payment.

6. INSTRUCTION OF DISTRICT PERSONNEL

A. Before final inspection, at agreed upon times, Contractor shall instruct District's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. For equipment requiring seasonal operation, Contractor shall perform instructions for other seasons within six months.

C. Contractor shall provide instructions by manufacturer's representatives if installers are not experienced in operations and maintenance procedures. Installer to provide District Representative with Operations and Training agenda two (2) weeks prior to the requested training. Three (3) optional dates and times for the training shall be proposed to the District Representative. District Representative will schedule training with District Maintenance and Operation Departments. Training Agenda to include:

1. Systems Overview

2. Maintenance manuals
3. Spare parts and materials
4. Tools
5. Lubricants
6. Fuels
7. Identification of systems
8. Control Sequences
9. Hazards
10. Cleaning
11. Warranties and bonds
12. Maintenance agreements and similar continuing commitments

D. As part of instruction for operation equipment, demonstrate the flowing procedures:

1. Start-up
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization

E. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

F. Contractor shall prepare and insert additional data in Operation and Maintenance Manual when the need for such data becomes apparent during instruction.

G. Contractor shall use operation and maintenance manuals as basis for instruction. Contractor shall review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

H. Contractor shall prepare instruction video of each training. Provide District with one (1) hard copy,

one (1) electronic copy of each training and upload each copy into District web-based software, into the folder directed by the District.

7. SPARE PARTS AND MAINTENANCE MATERIALS

A. Two (2) weeks prior to Substantial Completion of the Work, Contractor shall submit a list of extra stock items to District Representative. Identify quantity of material to be turned over and the approximate size of boxes.

B. Contractor shall provide products, spare parts, maintenance, and extra materials in quantities specified in the Specifications and in Manufacturer's recommendations.

C. Provide notification to District Representative when extra material is ready to be turned over. Contractor is responsible to collect and store all extra stock until a turnover time is agreed upon.

D. Contractor to turn over materials at a location directed by the District Representative.

E. Contractor shall provide District all required Operation and Maintenance Data.

8. PRODUCTS (not used)

9. EXECUTION (not used)

END OF DOCUMENT 01 77 00

DOCUMENT 01 78 23

OPERATION AND MAINTENANCE DATA

1. RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Completion of the Work;

B. Special Conditions.

2. QUALITY ASSURANCE

Contractor shall prepare instructions and data by personnel experienced in maintenance and operation of described products.

3. FORMAT

A. Contractor shall prepare data in the form of an instructional manual entitled "OPERATIONS AND MAINTENANCE MANUAL & INSTRUCTIONS" ("Manual").

B. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two-inch maximum ring size. When multiple binders are used, Contractor shall correlate data into related consistent groupings.

C. Cover: Contractor shall identify each binder with typed or printed title "OPERATION AND MAINTENANCE MANUAL & INSTRUCTIONS", and shall list title of Project and identify subject matter of contents.

D. Contractor shall arrange content by systems process flow under section numbers and sequence of Table of Contents of the Contract Documents.

E. Contractor shall provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: The content shall include Manufacturer's printed data, or typewritten data on 24-pound paper.

G. Drawings: Contractor shall provide with reinforced punched binder tab and shall bind in with text; folding larger drawings to size of text pages.

4. CONTENTS, EACH VOLUME

A. Table of Contents: Contractor shall provide title of Project; names, addresses, and telephone numbers of the Architect, any engineers, sub-consultants, Subcontractor(s), and Contractor with name of responsible parties; and schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: Contractor shall list names, addresses, and telephone numbers of

Subcontractor(s) and suppliers, including local source of supplies and replacement parts.

C. Product Data: Contractor shall mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Contractor shall supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Contractor shall not use Project Record Documents as maintenance drawings.

E. Text: The Contractor shall include all information as required to supplement product data. Contractor shall provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Contractor shall bind in one copy of each.

G. The Contractor shall provide the above in paper hard-copy format or electronic/digital files as requested by the District.

5. MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials, and Finishes: Contractor shall include product data, with catalog number, size, composition, and color and texture designations. Contractor shall provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Contractor shall include Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Contractor shall include product data listing applicable reference standards, chemical composition, and details of installation. Contractor shall provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: Contractor shall include all additional requirements as specified in the Specifications.

E. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly-sheet and space for insertion of data.

6. MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System: Contractor shall include description of unit or system, and component parts and identify function, normal operating characteristics, and limiting conditions. Contractor shall include performance curves, with engineering data and tests, and complete nomenclature, and commercial number of replaceable parts.

B. Contractor shall include color-coded wiring diagrams as installed.

C. Maintenance Requirements: Contractor shall include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

D. Contractor shall include manufacturer's printed operation and maintenance instructions.

E. Contractor shall include sequence of operation by controls manufacturer.

F. Contractor shall provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

G. Contractor shall provide control diagrams by controls manufacturer as installed.

H. Contractor shall provide Contractor's coordination drawings, with color-coded piping diagrams as installed.

I. Contractor shall provide charts of valve tag numbers, with location and function of each key.

J. Contractor shall provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

K. Additional Requirements: Contractor shall include all additional requirements as specified in Specification(s).

L. Contractor shall provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

7. SUBMITTALS

A. Contractor shall submit to the District for review two (2) copies of preliminary draft or proposed formats and outlines of the contents of the Manual within thirty (30) days of Contractor's start of Work.

B. For equipment, or component parts of equipment put into service during construction and to be operated by District, Contractor shall submit draft content for that portion of the Manual within ten (10) days after acceptance of that equipment or component.

C. Contractor shall submit two (2) hard copies, one (1) electronic copy and upload electronic copy to District web-based software (in the folder directed by the District) of a complete Manual in final form prior to final Application for Payment. Copy will be returned with District comments. Contractor must revise the content of the Manual as required by District prior to District's approval of Contractor's final Application for Payment.

D. Contractor must submit two (2) hard copies, one (1) electronic copy and upload electronic copy to District web-based software (in the folder directed by the District) of revised Manual in final form within ten (10) days after final inspection.

END OF DOCUMENT 01 78 23

DOCUMENT 01 78 36

WARRANTIES

1. RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Warranty/Guarantee Information;

B. Special Conditions.

2. FORMAT

A. Binders: Contractor shall use commercial quality, 8-1/2 by 11 inch, three-side rings, with durable plastic covers; two-inch maximum ring size.

B. Cover: Contractor shall identify each binder with typed or printed title 'WARRANTIES' and shall list title of Project.

C. Table of Contents: Contractor shall provide title of Project; name, address, and telephone number of Contractor and equipment supplier, and name of responsible principal. Contractor shall identify each item with the number and title of the specific Specification, document, provision, or section in which the name of the product or work item is specified.

3. PRODUCT WARRANTIES; PROJECT WARRANTY

A. Contractor shall separate each warranty for materials or equipment incorporated into the Work with index tab sheets keyed to the Table of Contents listing, providing full information and using separate typed sheets as necessary. Contractor shall list each applicable and/or responsible Subcontractor(s), supplier(s), and/or manufacturer(s), with name, address, and telephone number of each responsible principal(s) for each material/equipment.

B. Contactor shall provide all material and equipment warranty documents on a USB and uploaded into District web-based software. Each tab in the binder should be a separate file.

1. File should be identified per the binder cover and table of contents.

C. Contractor shall provide a Warranty Guarantee form for each warranty.

D. The Contractor shall complete and submit the form of Project Warranty/Guarantee included in the Contract Documents.

E. Refer to Document 01 78 23 for additional warranty requirements.

4. PREPARATION

A. Contractor shall obtain materials/equipment warranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within ten {10) days after completion of the applicable item or work. Except for items put into use with District's permission,

Contractor shall leave date of beginning of time of warranty until the date of completion is determined.

B. Contractor shall verify that materials/equipment warranty documents are in proper form, contain full information, and are notarized, when required.

C. Contractor shall co-execute materials/equipment warranty submittals when required.

D. Contractor shall retain warranties until time specified for submittal.

5. TIME OF SUBMITTALS:

A. For equipment or component parts of equipment put into service during construction with District's permission, Contractor shall submit a draft warranty for that equipment or component within ten (10) days after acceptance of that equipment or component.

B. Contractor shall submit for District approval all warranties and related documents within ten (10) days after date of completion. Contractor must revise the warranties as required by the District prior to District's approval of Contractor's final Application for Payment.

C. For items of work delayed beyond date of completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as start of warranty period.

6. COMMENCEMENT OF WARRANTIES

A. Unless otherwise expressly provided in the Contract Documents, the commencement date of materials/equipment warranties and the Contractor's Project Warranty/Guarantee shall be the date of Final Acceptance of the Work. Final Acceptance shall be as defined in the General Conditions.

END OF DOCUMENT 01 78 36

DOCUMENT 01 78 39

RECORD DOCUMENTS

1. RELATED DOCUMENTS AND PROVISIONS:

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Documents on Work;

B. Special Conditions.

2. GENERAL:

A. Contractor shall maintain at each Project Site one (1) set of marked-up plans and shall transfer all changes and information to those marked-up plans, as often as required in the Contract Documents, but in no case less than once each month. Contractor shall submit to the Project Inspector one set of reproducible vellums of the Project Record Drawings ('As-Builts') showing all changes incorporated into the Work since the preceding monthly submittal. The As-Builts shall be available at the Project Site. The Contractor shall submit one hard copy, one electronic on a USB, and uploaded to District web-based software.

B. Label and date each Record Drawing "RECORD DOCUMENT" in legibly printed letters.

C. All deviations in construction, including but not limited to pipe and conduit locations and deviations caused by without limitation Change Orders, Construction Claim Directives, RFI's, and Contractor shall, accurately and legibly record Addenda.

D. Locations and changes shall be done by Contractor in a neat and legible manner and, where applicable, indicated by drawing a "cloud" around the changed or additional information.

E. Contractor is NOT to paste RFIs to the Record As-Builts unless completely new details have been provided. All changes/modifications are to be corrected on the drawings.

3. RECORD DRAWING INFORMATION:

A. Contractor shall record the following information:

1. Locations of Work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines, and conduits.

2. Actual numbering of each electrical circuit.

3. Locations of significant Work concealed inside each building whose general locations are changed from those shown on the Contract Drawings.

4. Locations of all items, not necessarily concealed, which vary from the Contract Documents.

5. Installed location of all protection anodes.

6. Deviations from the sizes, locations, and other features of installations shown in the Contract Documents.

7. Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stubouts, invert elevations, etc.

8. Sufficient information to locate Work concealed in each building with reasonable ease and accuracy. In some instances, this information may be recorded by dimension. In other instances, it may be recorded in relation to the spaces in the building near which it was installed.

B. Contractor shall provide additional drawings as necessary for clarification.

C. Contractor shall provide reproducible record drawings, made from final Shop Drawings marked 'No Exceptions Taken' or 'Approved as Noted.'

4. RECORD SPECIFICATIONS

Contractor shall mark each section legibly to record manufacturer, trade name, catalog number, and supplier of each Product and item of equipment actually installed.

5. MAINTENANCE OF RECORD DOCUMENTS

A. Contractor shall store Record Documents apart from documents used for construction as follows:

1. Provide files and racks for storage of Record Documents.

2. Maintain Record Documents in a clean, dry, legible condition and in good order.

B. Do not use Record Documents for construction purposes.

C. District to receive one (1) hard copy, one (1) electronic copy and uploaded to the District web-based software at end of Project. Record Documents are to be posted with all addenda, change orders, RFIs submittal references, CCDs, ASIs, etc.

END OF DOCUMENT 01 78 39

SECTION 02 41 16

DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:

1. Protection of existing improvements to remain.
2. Cleaning existing improvements to remain.
3. Disconnecting and capping utilities.
4. Removing debris, waste materials, and equipment.
5. Removal of items for performance of the Work.
6. Salvageable items to be retained by the Owner.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 01 11 00 - Summary of Work.
3. Section 01 50 00 - Construction Facilities and Temporary Controls.
4. Section 01 73 29 - Cutting and Patching.
5. Section 01 74 19 - Construction and Demolition Waste Management.
6. Division 23 –- HVAC.
7. Division 26 –- Electrical.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

1.03 QUALITY ASSURANCE

A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.

B. Prior to commencement of Work, schedule a walkthrough with the OAR, to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.

C. Coordinate demolition for the correct sequence, limits, and methods. Schedule demolition Work to create least possible inconvenience to the public and facility operations.

D. Related Standard: ANSI/ASSE A10.6.

1.04 PROJECT CONDITIONS

A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.

B. Repair damage to existing improvements or damage due to excessive demolition.

C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.

D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the OAR. Items shall be cleaned, packaged and labeled for storage.

B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

A. Protection:

1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.

2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.

B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the OAR.

3.02 DEMOLITION

A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.

B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.

C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.

B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.

C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.

B. Woodwork: Cut or remove to a joint or panel line.

C. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.

D. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.

E. Glass: Remove broken or damaged glass and clean rebates and stops of glazing channels.

F. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.

G. Gypsum Board: Remove to a panel joint line on a stud or support line.

H. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.

I. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

A. Clean existing materials to remain with appropriate tools and equipment.

B. Protect existing improvements during cleaning operations.

C. Debris shall be dampened by fog water spray prior to transporting by truck.

D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.

E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.

F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Cast-in-place normal weight and lightweight concrete, placement and finishing.

1.02 REFERENCES

A. American Concrete Institute (ACI) Publication:

1. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 – Specifications for Structural Concrete.
3. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
4. ACI 305R - Specification for Hot Weather Concreting.
5. ACI 306.1 – Standard Specification for Cold Weather Concreting.
6. ACI 308R – Guide to External Curing of Concrete.
7. ACI 318 - Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1905A.

B. American Society for Testing and Materials (ASTM) Standards:

1. ASTM C31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 - Standard Specification for Concrete Aggregates.
3. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
5. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulphate or Magnesium Sulphate.
6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.

8. ASTM C150 - Standard Specification for Portland Cement.

9. ASTM C156 – Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.

10. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.

11. ASTM C172 – Standard Practice for Sampling Freshly Mixed Concrete.

12. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

13. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

14. ASTM C289 - Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).

15. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

16. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

17. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

18. ASTM C567 - Standard Test Method for Determining Density of Structural Lightweight Concrete.

19. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

20. ASTM C845 - Standard Specification for Expansive Hydraulic Cement

21. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.

22. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

23. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.

24. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.

25. ASTM C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

26. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

27. ASTM C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).

28. ASTM D1751 - Standard Test Method for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

29. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

30. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

31. ASTM E1155 - Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.

32. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

33. ASTM E1745 - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

34. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

35. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

36. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.

37. ASTM F3010 – Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use under Resilient Floor Coverings.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating locations of cast-in-place concrete Work and accessory items such as vapor barriers. Include details and locations of reinforcing, embedded items, and interfacing with other Work. Indicate dimensions and compressive strength.

B. Mix Design Data: Submit concrete mix designs as specified herein and in Article 2.02.

1. Submit name, address and telephone number of the concrete production facility which the contractor intends to engage to design the concrete mixes. Submit name and qualifications of the proposed concrete technologist.

2. Mix Design: Submit a concrete mix design for each strength and type of concrete indicated in the drawings or specified. Include water/cement ratio, source, size and amount of coarse aggregate and admixtures. Predict minimum compressive strength, maximum slump and air content percentage. Clearly indicate locations where each mix design will be used.

a. Water/cement ration for concrete slabs on grade shall be 0.50 maximum.

3. Test Reports: Submit copies of test reports showing that the proposed mixes produce concrete with the strengths and properties specified. Include tests for cement, aggregates and admixtures. Provide gradation analysis.

C. Material Samples: Submit Samples illustrating concrete finishes and hardeners, minimum 12-inch by 12-inch.

D. Certificates: Submit certification that each of the following conforms to the standards indicated:

1. Portland cement: ASTM C150.

2. Normal weight concrete aggregates: ASTM C33.

3. Lightweight concrete aggregates: ASTM C330.

4. Aggregates: Submit evidence that the aggregate is not reactive in the presence of cement alkalis. In the absence of evidence, aggregate shall be tested by one of the methods in ASTM C33 Appendix XI, Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate. Aggregates deemed to be deleterious or potentially deleterious may be used with the addition of a material that has been shown to prevent harmful expansion in accordance with Appendix XI of ASTM C33, when approved by the building official, in accordance with ACI 318 Section 26.4.1.2.1(a)(1) as modified by CBC Section 1903A5A.

5. Curing materials: ASTM C171.

E. Admixtures: Submit product data for proposed concrete admixtures.

1.04 QUALITY ASSURANCE

A. Continuous inspection shall be provided at the batch plant and for transit-mixed concrete to run check sieve analysis of aggregate, check moisture content of fine aggregate, check design of mix, check cement being used with test reports, check loading of mixer trucks, and certify to quantities of materials placed in each mixer truck.

B. Inspection shall be performed by a representative of a testing laboratory selected by the OWNER. OWNER will pay for inspection costs. Notify the laboratory 24 hours in advance of time concrete is to be mixed. Notify the laboratory of postponement or cancellation of mixing within at least 24 hours of scheduling time.

C. CONTRACTOR shall assist the testing laboratory in obtaining and handling samples at the project site and at the source of materials.

D. Continuous batch plant inspection requirement may be waived in accordance with CBC Section 1705A.3.3.1. Waiver shall be in writing, including DSA approval. When batch plant inspection is waived by DSA, the following requirements shall be met:

1. Approved inspector of the testing laboratory shall check the first batching at the start of work and furnish mix proportions to the licensed weightmaster.

2. Licensed weightmaster shall positively identify materials as to quantity and certify to each load by a ticket.

3. Tickets shall be transmitted to the Inspector by a truck driver with load identified thereon. The Inspector will not accept the load without a load ticket identifying the mix and will keep a daily record of placements, identifying each truck, its load and time of receipt and approximate location of deposit in the structure and will transmit a copy of the daily record to DSA.

4. At the end of the project, the weightmaster shall furnish an affidavit to DSA certifying that all concrete furnished conforms in every particular to proportions established by mix designs.

E. Special Inspections and Tests shall be in accordance with CBC Chapter 17A, Reinforcement and Anchor testing per CBC Section 1903A and Specification Section 01 4523.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store cement and aggregate materials so as to prevent their deterioration or intrusion by foreign matter. Deteriorated or contaminated materials shall not be furnished.

B. Packaged materials shall bear the manufacturers and brand name label and shall be stored in their original unbroken package in a weather tight place until ready for use in the work.

1.06 PROJECT CONDITIONS

A. Cold Weather Requirements: Batching, mixing, delivering and placing of concrete in cold weather shall comply with the applicable requirements of ACI 306.1.

B. Hot Weather Requirements: Batching, mixing, delivering and placing of concrete in hot weather shall comply with the applicable requirements of ACI 305R.

C. Concrete temperature of freshly mixed concrete shall be determined per ASTM C1064.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cement: ASTM C150. Portland Cement.

B. Aggregates: Conform to the following standards:

1. Normal weight concrete: ASTM C33.

2. Lightweight concrete: ASTM C330, with fine aggregates per ASTM C33.

3. Aggregate shall be tested for Potential Alkali Reactivity of Cement-Aggregate Combinations per ASTM C289.

4. Nominal maximum size of coarse aggregate shall be no larger than:

a. 1/5 the narrowest dimension between sides of forms, nor

b. 1/3 the depth of slabs, nor

c. 3/4 the clear spacing between individual reinforcing bars or wires, bundles of bars, individual tendons, or ducts.

d. CONTRACTOR may request the ARCHITECT and DSA waiver of the above limitations reported per ACI 318, provided that the workability and methods of consolidation are such that the concrete can be placed without honeycombs or voids.

C. Water: Water for concrete mixes, curing and cleaning shall be potable and free from deleterious matter.

D. Admixtures: Shall be shown capable of maintaining essentially the same composition and performance throughout the work as the product used in establishing concrete proportions in accordance with ACI 318, Section 3.6.

1. Admixtures containing chlorides or sulfides are not permitted.

2. Air-entraining admixtures shall comply with ASTM C260. Air-entrained admixtures shall not be used for floor slabs to receive steel trowel finish.

3. Admixtures for water reduction and setting time modification shall conform to ASTM C494.

4. Admixtures for producing flowing concrete shall conform to ASTM C1017.

5. Fly ash, pozzolan and ground granulated blast-furnace slag: Modify ACI 318 Sections 3.6.6 and 3.6.7 as follows:

a. Fly ash or other pozzolan used as a partial substitution for ASTM C150 Portland cement shall meet the following requirements:

1) Shall conform to ASTM C618 for Class N or F materials (Class C is not permitted).

2) [15] percent by weight of fly ash or other pozzolans shall substitute for ASTM C150 Portland cement provided the mix design is proportioned per ACI 318, Section 318 5.3.

6. Admixtures containing ASTM C845 expansive cements shall be compatible with the cement and produce no deleterious effects.

7. Silica fumes used as an admixture shall conform to ASTM C1240.

E. Reinforcement Fibers: Chop strands of alkali-resistant polypropylene or nylon fibers added to the concrete mix for protection against shrinkage cracks.

F. Expansion Joint Fillers: Preformed strips, non-extruding and resilient bituminous type, of thickness indicated, conforming to ASTM D1751.

G. Curing:

1. Curing Paper: Shall conform to ASTM C171 and consist of two sheets of kraft paper cemented together with a bituminous material in which are embedded cords or strands of

fiber running in both directions. The paper shall be light in color, shall be free of visible defects, with uniform appearance.

2. Elevated slabs and slabs on grade may be cured at CONTRACTOR's option with curing and proactive water vapor emission and alkalinity control system. Products shall be approved by OWNER's Office of Environmental Health and Safety.

   a. VaporSeal 309, by Floor Seal Technology, Inc., or equal.

      1) ASTM C156: 0.39 kg/m².

      2) ASTM C309: Exceeds requirements.

      3) ASTM C1315: Exceeds requirements.

      4) ACI 308R-01 Compliant.

   b. Remedial Treatment: Water vapor emission and alkalinity control treatment, MES 100 by Floor Seal Technology, Inc. or equal.

      1) ASTM E96: <0.1 Perms.

      2) ASTM D1308: 14pH Resistant.

      3) ASTM D7234: 500+psi 100% concrete failure.

      4) ASTM F2170: 100%RH resistant.

      5) VOC Content: <100 g/L, meets SCAQMD Rule #1113.

      6) ASTM F3010: Meets Requirements.

   c. Self-leveling Compounds: Ardex Engineered Cements, K15, or V1200, Schonox ZM Rapid, US Self Leveler Armstrong, S-194, or equal.

H. Floor Hardener: Water soluble, inorganic, silicate-based curing, hardening, sealing and dustproofing compound. Aquaseal W20 by Monopole Inc., Kure-N-Harden by BASF, Chem Hard by L&M, Liqui-Hard by W. R. Meadows, or equal.

I. Underlayment: Two component latex underlayment for filling low spots in concrete for both interior and exterior applications, from featheredge to a maximum of 3/8 inch in thickness. Underlayment shall be non-shrink and suitable for repairing exposed concrete surfaces and for underlayment of carpet, resilient, tile and quarry floor coverings. La-O-Tex by TexRite, Underlay C, RS by Mer-Krete Systems, Underlayment 962 by C-Cure, or equal.

J. Vapor Barrier: Refer to Section 07 2600, Vapor Barriers.

K. Stair Treads and Nosings: Two part stair tread and nosing with ribbed abrasive bars. Fabricated from 6063-T5 or 6063-T6 extruded aluminum, mill finish. Anti-slip abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Color shall extend uniformly throughout filler.

   1. American Safety Tread: TP-311R.

2. Balco Inc.: DST-330.

3. Nystrom: STTB-P3.375E.

4. Wooster Products Inc.: WP-RN3SG.

5. Equal.

L. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 7 days; of consistency suitable for application and a 30 minute working time.

2.02 CONCRETE MIX

A. Mix shall be signed and sealed by a Civil or Structural Engineer currently registered in the State of California.

B. Strength of Concrete: Strengths and types of concretes shall be as indicated in the Drawings. Unless otherwise indicated or specified, concrete shall be provided with minimum 28-day strength of 3000 psi (f'c).

C. Concrete mix shall meet the durability requirements of ACI 318, Chapter 4.

D. Concrete proportioning shall be determined on the basis of field experience and/or trial mixtures shall in accordance with ACI 318, Section 5.3. Proportions of materials shall provide workability and consistency to permit concrete to be placed readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.

E. Ready-Mixed Concrete: Mix and deliver in accordance with requirements of ASTM C94.

PART 3 - EXECUTION

3.01 GENERAL

A. Surfaces to receive concrete shall be free of debris, standing water, and any other deleterious substances before start of concrete placing.

B. Time of Placing: Do not place concrete until reinforcement, conduits, outlet boxes, anchors, hangers, sleeves, bolts, and other embedded materials are securely fastened in place. Contact the Inspector at least 24 hours before placing concrete; do not place concrete until inspected by the Project Inspector.

C. Pouring Record: A record shall be kept on the Project site of time and date of placing concrete in each portion of structure. Such record shall be maintained on the Project site until Substantial Completion and shall be available for examination by the ARCHITECT and DSA.

3.02 TOLERANCES

A. Concrete construction tolerances shall be as specified in ACI 117 and as modified herein.

B. Floor Flatness (F_F) and Floor Levelness (F_L) shall be as indicated below:

	Specified Overall Value		Minimum Local Value	
	F_F	F_L	F_F	F_L
Slabs on ground: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	15	10
Slab on ground: carpet.	25	20	17	15
Slab on ground: thinset tile and resilient flooring.	35	25	24	17
Suspended slabs: mechanical and electrical rooms, parking structures and mortar bed set tile and quarry flooring.	20	15	N/A	N/A
Suspended slabs: carpet.	25	20	N/A	N/A
Suspended slabs: thinset tile and resilient flooring.	35	20	N/A	N/A

C. Refer to ACI 302.1R, Tables 8.1 and 8.2 Slab on Ground and Suspended Flatness/Levelness Construction Guide, for recommended concrete placing and finishing methods.

D. Floor Flatness and Floor Levelness shall be tested in accordance to ASTM E1155. Floor measurements shall be made within 48 hours after slab installation, and shall precede removal of shores and forms.

3.03 PREPARATION

A. For installation of vapor barrier refer to Section 07 2600, Vapor Barriers.

B. Reglets and Rebates:

1. Form reglets and rebates in concrete to receive flashing, frames and other equipment as detailed and required. Coordinate dimensions and locations required with other related Work.

2. If concrete slabs on grade adjoin a wall or other perpendicular concrete surface, form a reglet in wall to receive and carry horizontal concrete Work. Reglet shall be full thickness of the slab and shall be 3/4 inch wide, unless otherwise indicated. Requirement does not apply to exterior walks, unless specifically indicated.

C. Screeds: Install screeds accurately and maintain at required grade or slab elevations after steel reinforcement has been installed, but before starting to place concrete. Install screeds adjacent to walls and in parallel rows not to exceed 8 feet on centers.

3.04 INSTALLATION

A. Conveying and Placing:

1. Concrete shall be placed only under direct observation of the Project Inspector. Do not place concrete outside of regular working hours, unless the Inspector has been notified at least 48 hours in advance.

2. Concrete shall be conveyed from mixer to location of final placement by methods that will prevent separation or loss of materials.

3. Concrete shall be placed as nearly as practicable to its final position to avoid segregation due to re-handling or flowing. No concrete that has partially hydrated or has been contaminated by foreign materials shall be placed, nor shall re-tempered concrete or concrete which has been remixed after initial set be placed.

4. In placing concrete in columns, walls or thin sections, provide openings in forms, elephant trunks, tremies or other recognized devices, to prevent segregation and accumulation of partially hydrated concrete on forms or metal reinforcement above level of concrete being placed. Such devices shall be installed so that concrete will be dropped vertically. Unconfined vertical drop of concrete from end of such devices to final placement surface shall not exceed 6 feet.

5. Concrete shall be placed as a continuous operation until placing of panel or section is completed. Top surfaces of vertically formed lifts shall be level.

6. Concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.

7. Where conditions make consolidation difficult or where reinforcement is congested, batches of mortar containing same proportions of cement, sand, and water as provided in the concrete, shall first be deposited in the forms to a depth of at least one inch.

B. Cold Weather:

1. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. All ground with which concrete is to come in contact shall be free from frost. No frozen materials or materials containing ice shall be used.

2. The temperature of concrete at the time of placement shall not be below the minimum temperatures given in Table 3.1 of ACI 306.1.

3. Concrete shall be maintained at a temperature of at least 50° F. for not less than 72 hours after placing or until it has thoroughly hardened. Cover concrete and provide sufficient heat as required. When necessary, aggregates shall be heated before mixing. Special precautions shall be taken for protection of transit-mixed concrete.

C. Hot Weather:

1. Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.

2. Maintain concrete temperatures indicated in Table 2.1.5 of ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square feet of exposed concrete per hour.

3. Cool concrete using methods indicated in ACI 305R Appendix B.

4. Place and cure concrete as specified in ACI 305R Chapter 4.

D. Compaction and Screeding:

1. Tamp freshly placed concrete with a heavy tamper until at least 3/8 inch of mortar is brought to surface. Concrete shall then be tamped with a light tamper and screeded with a heavy straightedge until depressions and irregularities are eliminated, and surface is true to finish grades or elevations. Remove excess water and debris.

2. Where slabs are to receive separate cement finish or mortar setting bed, continued tamping to raise mortar to surface is not performed. Laitance shall be removed by brushing with a stiff brush or by light sandblasting to expose clean top surface of coarse aggregate.

E. Floating and Troweling:

1. When concrete has hydrated sufficiently, it shall be floated to a compact and smooth surface. After floating, wait until concrete has reached proper consistency before troweling. Top surfaces shall receive at least 2 troweling operations with steel hand trowel. Prior to and during final troweling, apply a fine mist of water frequently with an atomizing type fog sprayer. Omit troweling for slabs to receive a separate cement finish.

2. For interior finish slabs, final troweling shall provide a hard, impervious, and non-slip surfaces, free from defects and blemishes. Finished surface shall be within tolerances indicated in Article 3.02. Avoid burnishing. Do not add cement or sand to absorb excess moisture.

a. Floor of Walk-In Refrigerator: Finish as specified above, to a smooth finish.

b. Floor of Gymnasium Locker Rooms: After floating, and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Floors sloped for drainage should be brushed in the direction of flow.

3. Vertical concrete surfaces shall be finished smooth and free from marks or other surface defects.

3.05 CURING

A. Length of time, temperature and moisture conditions for curing concrete shall be in accordance with ACI 318, Section 5.11.

B. Forms containing concrete, top of concrete between forms, and exposed concrete surfaces after removal of forms shall be maintained in a thoroughly wet condition for at least 7 consecutive days after placing.

C. If weather is hot or surface has dried out, spray surface of concrete slabs and paving with fine mist of water, starting not later than 2 hours after final troweling and continuing until sunset. Surface of finish shall be kept continuously wet until curing medium has been installed.

D. Immediately after finishing, monolithic floor slabs shall be covered with curing paper. Paper shall be lapped 4 inches at joints and sealed with waterproof sealer. Edges shall be cemented to finish. Repair or replace paper damaged during construction operations.

E. When curing slabs with proactive water vapor emission and alkalinity control system:

1. Coordinate and schedule application of curing compound with concrete pour schedule, while conforming to manufacturer's application instructions.

2. When the surface of the concrete has hardened sufficiently to sustain foot traffic pre-cure slabs with liquefied product application following manufacturer's written instructions. Application shall be by trained applicators.

3. Monitor Environmental Conditions: Set up weather station 20 to 30 inches above freshly placed concrete. Record temperature, humidity and wind velocity measurements at 15 minute maximum intervals.

4. Calculate Evaporation Rate: Use recorded weather information in combination with nomograph per ACI 308R, Figure 4.1, Guide to Curing Concrete, to evaluate relevant evaporation rate.

5. When the bleed water rate of the concrete is approximately equal to the surface water evaporation rate, spray curing compound material throughout surface of slabs and decks, following manufacturer's written instructions. Application shall be by trained applicators.

6. Perform the following tests at least 28 days after placement of concrete and prior to floor covering installation. Submit to OAR test results indicating locations that do not comply with scheduled flooring installation requirements.

   a. Calcium chloride testing per ASTM F1869.

   b. Relative humidity testing per ASTM F2170.

   c. Alkalinity testing per ASTM F710.

   d. Perform concrete bond layer humidity meter testing to determine substrate surface acceptability.

7. Areas emitting moisture and alkalinity at rates exceeding floor covering manufacturer's published ASTM F1869 limits, shall receive a corrective coating, at no cost to the OWNER, as follows:

   a) Mask and protect adjacent walls and floor surfaces from effects of scarification and application of remedial treatment.

   b) Scarify slab surface in area of application by shot blasting or other method acceptable to corrective coating manufacturer.

   c) Prepare and fill cracks, control joints and cold joints.

   d) Apply two-component modified epoxy penetrant and coating with roller and squeegee over required treatment area; saturate surfaces to ensure a through mechanical bond.

e) Clean and fill divots, chips, voids and other surface irregularities with one hundred percent Portland cement based patching compound or cementitious fill.

f) Apply cementitious surfacing over coating in areas to receive resilient and wood floor coverings to facilitate adhesion; apply to a thickness of 1/8 inch.

3.06 FILLING, LEVELING AND PATCHING

A. Concrete slabs exhibiting high or low spots and indicated to receive resilient floor covering or soft floor covering, shall have surfaces repaired. High spots shall be honed, or ground with power-driven machines to required tolerances. Low spots shall be filled with latex underlayment, installed in strict accordance with manufacturer's written recommendations.

B. Holes resulting from form ties or sleeve nuts shall be solidly packed, through exterior walls, by pressure grouting with cement grout, as specified. Grouted holes on exposed surfaces shall be screeded flush and finished to match adjoining surfaces.

C. Cement Base: Cement base shall be of the height, thickness, and shape detailed. Base shall be reinforced with one inch mesh, 18 gage, zinc-coated wire fabric. Base finish mixture shall be one part Portland cement, 2 parts of fine aggregate and one part pea gravel. Colored cement base shall include a chemically inert mineral oxide pigment in the mix.

3.07 FINISHING

A. Soda and Acid Wash: Concrete surfaces to receive plaster, paint or other finish, and which have been formed by oil coated forms, shall be scrubbed with a solution of 1-1/2 pounds of caustic soda to one gallon of water. Surfaces where smooth wood or waste molds have been furnished shall be scrubbed with a solution of 20 percent muriatic acid. Wash with clean water after scrubbing.

B. Sacking: Exposed concrete curbs, walls, and other surfaces shall be sacked by an application of Portland cement grout, floated, and rubbed. Sacking shall not be performed until patching and filling of holes has been completed. Entire sacking operation for any continuous area shall be started and completed within the same day.

1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having consistency of thick paint. Wet surface of concrete sufficiently to prevent absorption of water from grout. Apply grout uniformly with a brush or spray gun, then immediately float surface with a cork or other suitable float, scouring wall vigorously.

2. While grout is still plastic, finish surface with a sponge-rubber float, removing excess grout. Allow surface to dry thoroughly, then rub vigorously with dry burlap to completely remove dried grout. No visible film or grout shall remain after rubbing with burlap.

C. Sandblasting: Exterior concrete surfaces to receive stucco dash coat finish, where plywood or other smooth forms have been furnished, shall be uniformly sand-blasted with sharp quartz sand under sufficient air pressure to remove dirt, form oil and other foreign materials, and roughen surface to provide a proper bond. Such surfaces shall be thoroughly washed with clean water after sandblasting.

D. Abrasive: Concrete stair treads, landings, ramps and steps on interior and exterior of buildings, and interior exposed concrete floors in shop buildings shall receive an abrasive finish.

E. Floor Hardener: Exposed interior concrete floors throughout shall be treated with floor hardener.

1. Protect adjacent surfaces. Clean surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, laitance, dust and dirt are removed prior to application.

2. Apply hardener in accordance with manufacturer's instructions as soon as concrete is firm enough to work on after final troweling.

F. Cement Grout and Dry-Pack Concrete: Cement grout shall be mixed at the Project site and shall be composed of one volume of Portland cement and 2-1/2 volumes of fine aggregate. Materials shall be mixed dry with sufficient water added to make mixture flow under its own weight. When grout is used as a dry pack concrete, add sufficient water to provide a stiff mixture, which can be molded into a sphere.

G. Broom Finish: Exterior stair treads and landings shall be provided with a non-slip broom finish in addition to abrasive finish specified.

H. Abrasive Stair Nosing: Nosing shall be installed according to manufacturers written recommendations.

3.08 EXPANSION AND CONSTRUCTION JOINTS

A. Construction Joints: Details and proposed location of construction joints shall be as indicated on the Drawings, located to least impair strength of structure, in accordance with the following:

1. Thoroughly clean contact surface by sand blasting entire surface not earlier than 5 days after initial placement.

2. A mix containing same proportion of sand and cement provided in concrete plus a maximum of 50 percent of coarse aggregate shall be placed to a depth of at least one inch on horizontal joints. Vertical joints shall be wetted and coated with a neat cement grout immediately before placing of new concrete.

3. Should contact surface become coated with earth, sawdust, or deleterious material of any kind after being cleaned, entire surface shall be re-cleaned before applying mix.

B. Expansion Joints: Provide expansion joints where indicated in walks and exterior slabs. Space approximately 20 feet apart, unless otherwise indicated. Joints shall extend entirely through slab with joint filler in one piece for width of walk or slab. Joint filler shall be 3/8 inch thick, unless otherwise indicated.

C. Tooled Joints: Slabs, walks and paving shall be marked into areas as indicated with markings made with a V-grooving tool. Marks shall be round-edged, free from burrs or obstructions, with clean cut angles and shall be straight and true. Walks, if not indicated, shall be marked off into rectangles of not more than 12 square feet and shall have a center marking where more than 5 feet wide.

3.09 TESTING

A. Molded Cylinder Tests:

1. Inspector or testing lab personnel will prepare cylinders and perform slump tests. Samples for concrete strength shall be taken in accordance to ASTM C172. Each cylinder shall be dated, given a number, point in structure from which sample was obtained, mix design number, mix design strength and result of accompanying slump test noted.

2. Separate tests of molded concrete cylinders obtained at same place and time shall be made at age of three days, seven days, and 28 days. A strength test shall be the average of the compressive strength of two cylinders, obtained from the same sample of concrete and tested at 28 days or at test age designated for determination of f'c.

3. Test cylinders shall be prepared at the Project site and stored in testing laboratory in accordance with ASTM C31, and tested in accordance with ASTM C39.

B. Core Test: At request of the ARCHITECT, cores of hardened concrete shall be cut from portions of hydrated structures for testing, in accordance with CBC and ASTM C42.

1. Provide 4 inch diameter cores at representative places throughout the structure as designated by the ARCHITECT.

2. In general, provide sufficient cores to represent concrete placed with at least one core for each 4,000 square feet of building area, and at least 3 cores total for each Project.

3. Where cores have been removed, fill voids with drypack, and patch the finish to match the adjacent existing surfaces.

C. Concrete Consistency: Measure consistency according to ASTM C143. Test twice each day or partial day's run of the mixer.

D. Adjustment of Mix: If the strength of any grade of concrete for any portion of Work, as indicated by molded test cylinders, falls below minimum 28 days compressive strength specified or indicated, adjust mix design for remaining portion of construction so that resulting concrete meets minimum strength requirements.

E. Air Content Testing: Measure in accordance to ASTM C173 or ASTM C231, for each composite sample taken in accordance to ASTM C172.

F. Defective Concrete:

1. Should strength of any grade of concrete, for any portion of Work indicated by tests of molded cylinders and core tests, fall below minimum 28 days strength specified or indicated, concrete will be deemed defective Work and shall be replaced or adequately strengthened in a manner acceptable to the ARCHITECT and DSA.

2. Concrete Work that is not formed as indicated, is not true within 1/250 of span, not true to intended alignment, not plumb or level where so intended, not true to intended grades and levels, contains sawdust shavings, wood or embedded debris, or does not fully conform to Contract provisions, shall be deemed to be defective Work and shall be removed and replaced.

G. Concrete for Equipment Pads, Mechanical and Electrical Work: Unless otherwise indicated, strength shall have a minimum f'c = 3,000 psi. Exposed concrete shall be provided with a hand trowel finish with radius corners and edges. Form and place concrete where necessary as described in Section 03 1000 Concrete Forming and Accessories, and reinforced as described in

Section 03 2000 Concrete Reinforcing. Calcium chloride shall not be furnished in any concrete mix provided for the installation of underground electrical conduits. For concrete encasement of more than one conduit, furnish 3/4 inch maximum aggregate.

3.10 CLEAN UP

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

3.11 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Joint sealants.

2. Preparation for application of sealants.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Division 09 - Finishes.

1.02 REFERENCES

A. ASTM Standards:

1. ASTM C834 - Standard Specification for Latex Sealants.

2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

3. ASTM-C1193 - Standard Guide for Use of Joint Sealants.

4. ASTM C1311 - Standard Specification for Solvent Release Sealants.

5. ASTM C1521 – Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

6. ASTM D2377 - Standard Test Method for Tack-Free Time of Caulking Compounds and Sealants

7. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating sealant joint locations, with full-size sealant joint details.

B. Product Data: Submit manufacturer's literature for each sealant material.

C. Material Samples: Submit Samples indicating color range available for each sealant material intended for installation in exposed locations.

D. Certifications: Submit manufacturer's certification materials comply with requirements specified.

E. Site Samples: At locations required, provide a Sample of sealant for each typical installation, approximately 24 inches long, including joint preparation, backing, sealant and tooling. Allow backing to extend 6 inches beyond end of sealant for inspection of substrate.

F. Test Reports: Submit manufacturer's adhesion compatibility test reports according to ASTM C1521 for each substrate.

G. CxSP will review the Submittals of this Section as part of the Commissioning of Thermal and Moisture Protection.

1.04 QUALITY ASSURANCE

A. Qualifications of Installer: The Work of this section shall be installed by a firm which has been in the business of installing similar materials for at least five consecutive years; and can show evidence of satisfactory completion of five projects of similar size and scope. Installer shall have applicators trained and approved by manufacturer for performing this Work.

B. Commissioning of Thermal and Moisture Protection: Refer to Field Quality Control article for testing of sealants.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store in accordance with manufacturer's recommendations. Provide a uniform ambient temperature between 60 and 80 degrees F.

1.06 WARRANTY

A. Manufacturer: five-year material warranty.

B. Installer: two-year installation/application warranty.

PART 2 - PRODUCTS

2.01 GENERAL

A. Furnish sealants meeting following in-service requirements:

1. Normal curing schedules are permitted.

2. Non-staining, color fastness (resistance to color change), and durability when subjected to intense actinic (ultraviolet) radiation are required.

B. Furnish the products of only one manufacturer unless otherwise required, sealant colors as selected to match the adjoining surfaces.

2.02 MANUFACTURERS

A. Sealants must be approved by LAUSD's Office of Environmental Health and Safety (OEHS). Check OEHS website for approved products. Not all products by a manufacturer are approved by OEHS.

2.03 MATERIALS

A. Sealants:

1. Sealant 1: Acrylic latex, one-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.

   a. Tremco Inc., Acrylic Latex Caulk.

   b. Pecora Corporation, AC-20.

   c. Equal.

2. Sealant 2: Butyl sealant, one-part, non-sag, solvent-release-curing sealant complying with ASTM C1311, gun grade and formulated with a minimum of 75 percent solids.

   a. Tremco Inc., Tremco Butyl Sealant.

   b. Pecora Corp., BC-158.

   c. Equal.

3. Sealant 3: Silicone sealant, one-part non-acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 50.

   a. Dow Corning Corp., Dow Corning 791, 795.

   b. General Electric Co., Silpruf SCS 2000, SCS 9000 NB.

   c. Tremco, Inc., Spectrem 2.

   d. Pecora Corp., 864.

   e. Equal.

4. Sealant 4: One-part mildew-resistant silicone sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

   a. Dow Corning Corp., Dow Corning 786.

   b. General Electric Co., Sanitary 1700.

   c. Tremco, Inc., Proglaze White.

   d. Equal.

5. Sealant 5: One-part non-sag urethane sealant, complying with ASTM C920, Type S, Grade NS, Class 25.

a. Sika Corporation, Sikaflex -221e.

b. Equal.

6. Sealant 6: Multi-part pouring urethane sealant, complying with ASTM C920, Type M, Grade P, Class 25.

a. Sika Corporation, Sikaflex 2C NS/SL.

b. Equal.

7. Sealant 7: Acoustical sealant, non-drying, non-hardening permanently flexible conforming to ASTM D2377.

a. Pecora Corp., BA-98 Acoustical Sealant.

b. Equal.

B. See 07 8413 - Penetration Firestopping for rated sealants.

C. Joint Backing: ASTM D1056; round, closed cell Polyethylene Foam Rod; oversized 30 to 50 percent larger than joint width, reticulated polyolefin foam.

D. Primer: Non-Staining Type. Provide primer as required and shall be product of manufacturer of installed sealant.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer.

F. Sealants shall have normal curing schedules, shall be nonstaining, color fast and shall resist deterioration due to ultraviolet radiation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that joint openings are ready to receive Work and field tolerances are within the guidelines recommended by sealant manufacturer.

3.02 SURFACE PREPARATION

A. Joints and spaces to be sealed shall be completely cleaned of all dirt, dust, mortar, oil, and other foreign materials which might adversely affect sealing Work. Where necessary, degrease with a solvent or commercial degreasing agent. Surfaces shall be thoroughly dry before application of sealants.

B. If recommended by manufacturer, remove paint and other protective coatings from surfaces to be sealed before priming and installation of sealants.

C. Preparation of surfaces to receive sealant shall conform to the sealant manufacturer's specifications. Provide air pressure or other methods to achieve required results. Provide masking tape to keep sealants off surfaces that will be exposed in finished Work.

D. Etch concrete or masonry surfaces to remove excess alkalinity unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5 percent solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

E. Perform preparation in accordance with ASTM C1193.

F. Protect elements surrounding Work of this section from damage or disfiguration.

3.03 SEALANT APPLICATION SCHEDULE

	Location	Type	Color
A.	Exterior and Interior joints in horizontal surfaces of concrete; between metal and concrete masonry and mortar.	Sealant 6	To match adjacent material
B.	Exterior door, entrance and window frames. Exterior and interior vertical joints in concrete and masonry metal flashing.	Sealant 3 or 5	To match adjacent material
C.	Joints within glazed curtain wall system. Skylight framing system. Aluminum entrance system glass and glazing.	Sealant 3	Translucent or Black
D.	Interior joints in ceramic tile and at plumbing fixtures.	Sealant 4	Translucent or White
E.	Under thresholds.	Sealant 2	Black
F.	All interior joints not otherwise scheduled	Sealant 1	To Match Adjacent Surfaces
G.	Heads and sills, perimeters of frames and other openings in insulated partitions	Sealant 7	Match Adjacent Surfaces

3.04 APPLICATION

A. Provide sealant around all openings in exterior walls, and any other locations indicated or required for structure weatherproofing and/or waterproofing.

B. Sealants shall be installed by experienced mechanics using specified materials and proper tools. Preparatory Work (cleaning, etc.) and installation of sealant shall be as specified and in accordance with manufacturer's printed instructions and recommendations.

C. Concrete, masonry, and other porous surfaces, and any other surfaces if recommended by manufacturer, shall be primed before installing sealants. Primer shall be installed with a brush that will reach all parts of joints to be filled with sealant.

D. Sealants shall be stored and installed at temperatures as recommended by manufacturer. Sealants shall not be installed when they become too jelled to be discharged in a continuous flow from gun. Modification of sealants by addition of liquids, solvents, or powders is not permitted.

E. Sealants shall be installed with guns furnished with proper size nozzles. Sufficient pressure shall be furnished to fill all voids and joints solid. In sealing around openings, include entire perimeter of each opening, unless indicated or specified otherwise. Where gun installation is impracticable, suitable hand tools shall be provided.

F. Sealed joints shall be neatly pointed on flush surfaces with beading tool, and internal corners with a special tool. Excess material shall be cleanly removed. Sealant, where exposed, shall be free of wrinkles and uniformly smooth. Sealing shall be complete before final coats of paint are installed.

G. Comply with sealant manufacturer's printed instructions except where more stringent requirements are indicated on Drawings or specified.

H. Partially fill joints with joint backing material, furnishing only compatible materials, until joint depth does not exceed 1/2-inch joint width. Minimum joint width for metal to metal joints shall be 1/4 inch. Joint depth shall be not less than 1/4 inch and not greater than 1/2 inch.

I. Install sealant under sufficient pressure to completely fill voids. Finish exposed joints smooth, flush with surfaces or recessed as indicated. Install non-tracking sealant to concrete expansion joints subject to foot or vehicular traffic.

J. Where joint depth prevents installation of standard bond breaker backing rod, furnish non-adhering tape covering to prevent bonding of sealant to back of joint. Under no circumstances shall sealant depth exceed 1/2 inch maximum, unless specifically indicated on Drawings.

K. Prime porous surfaces after cleaning. Pack joints deeper than 3/4 inch with joint backing to within 3/4 inch of surface. Completely fill joints and spaces with gun applied compound, forming a neat, smooth bead.

3.05 MISCELLANEOUS WORK

A. Sealing shall be provided wherever required to prevent light leakage as well as moisture leakage. Refer to Drawings for condition and related parts of Work.

B. Install sealants to depths as indicated or, if not indicated, as recommended by sealant manufacturer but within following general limitations:

1. For joints in concrete walks, slab and paving subject to traffic, fill joints to a depth equal to 75 percent of joint width, but not more than ¾ -inch deep or less than 3/8 inch deep, depending on joint width.

2. For building joints, fill joints to a depth equal to 50 percent of joint width, but not more than ½-inch deep or less than ¼-inch deep.

3.06 FIELD QUALITY CONTROL

A. Commissioning of Thermal and Moisture Protection: CONTRACTOR shall perform field adhesion tests of sealants of the work of the Sections listed below in accordance with manufacturer's instructions and ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken. Number of tests shall be per ASTM C1521, Destructive Procedure.

1. Section 08 4113 – Aluminum Entrances and Storefronts.

2. Section 08 4413 – Glazed Aluminum Curtain Walls.

3. Section 08 5113 – Aluminum Windows.

4. Section 08 6323 – Metal-Framed Skylights and Sloped Glazing.

3.07 CLEANING

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.08 CURING

A. Sealants shall cure in accordance with manufacturer's printed recommendations. Do not disturb seal until completely cured.

3.09 PROTECTION

A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Gypsum board wall and ceiling systems.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 07 92 00 - Joint Sealants.

3. 09 90 00 Painting Coating.

1.02 PROJECT REQUIREMENTS

A. Design Requirements: Provide systems capable of resisting deflection as required by CBC and authorities having jurisdiction.

B. Regulatory Requirements: Comply with CBC requirements for design and installation.

1.03 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings indicating complete suspension system including connections, anchorage, and trim features.

B. Material Samples: Submit 18 inch by 18 inch Samples of the texture coat of gypsum board panels with edges taped.

C. Product Data: Submit manufacturer's catalog data for each product proposed for installation.

1.04 QUALITY ASSURANCE

A. Comply with following as a minimum requirement:

1. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for finishing Gypsum Board.

2. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

3. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.

4. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

5. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

6. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

7. ASTM C1396 - Standard Specification for Gypsum Board.

8. ASTM C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

9. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

10. Underwriters Laboratories (ULI) requirements and listings for fire-rated materials and products classification.

11. GA-214 - Gypsum board finish shall conform to requirements of GA 214, Application and Finishing of Gypsum Panel Products, published by the Gypsum Association, and as specified herein.

12. GA-216 – Application and Finishing of Gypsum Panel Products.

13. GA 600 - Gypsum board shall conform to requirements of GA 600 Fire Resistance Design Manual, published by the Gypsum Association.

14. American National Standards for the Installation of Ceramic Tile.

15. ANSI A118.11 – Test Methods and Specification for Cementitious Backer Units.

16. The Interior Guide, published by the Wall and Ceiling Conference (WWC).

B. Qualifications: Installer shall have a minimum 5 years experience in installing and finishing gypsum board.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, factory sealed packages, containers or bundles bearing brand name and name of manufacturer.

B. Materials shall be kept dry. Gypsum board shall be neatly stacked flat; avoid sagging and damage to edges, ends, and surfaces.

C. Fire-rated materials shall have fire classifications numbers attached and legible.

D. Provide all means necessary to protect gypsum board systems before, during, and after installation.

E. Gypsum board showing any evidence of water damage shall not be installed. Gypsum board showing evidence of water damage after installation shall be removed and replaced.

1.06 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTMC840, GA 216 requirements or gypsum board manufacturer's written instructions, whichever is more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet moisture damaged and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Georgia-Pacific.

B. National Gypsum Co.

C. U.S. Gypsum Co.

D. Or equal.

2.02 MATERIALS

A. Gypsum Board Type X (fire-resistant) or Type C or Type ULIX as required by fire rated design and acoustic requirements: 5/8 inch thick, 4-foot wide and up to 16-foot long conforming to ASTM C1396 with long edges tapered.

B. Impact Resistant Gypsum Board, Type X (fire-resistant): 5/8 inch thick or Type C as required by fire rated design and acoustic requirements, 4-foot wide and up to 16-foot long complying with the following:

1. Fire resistant rated gypsum core with additives to enhance impact resistance, faced with moisture and mold resistant paper and reinforcing fiber mesh. Comply with ASTM C1629 level 3 hard body impact resistance.

C. NOT USED

D. Gypsum Liner, Type X (fire-resistant): 1 inch thick 24-inch wide, up to 14-foot long, conforming to ASTM C1396 or C1658.

1. Resistance to Mold Growth: Minimum score of "10" when tested in accordance to ASTM D3273.

E. NOT USED

2.03 ACCESSORIES

A. Metal Trim: Paper-faced metal drywall beads and trim meeting ASTM C1047, as manufactured by USG/Beadex, or equal. Trim units shall be of size and type to fit gypsum board construction and shall include corner beads, casings, edge trim and other shapes indicated and required. Provide 30 year warranty against edge cracking.

B. Joint Compound for gypsum board products: meeting the following requirements:

1. Shall conform to ASTM C475.

2. In areas subject to moisture after installation such as bathrooms and locker areas use setting type joint compound.

3. Interior areas not subject to moisture after installation use drying Type Joint compound.

C. Joint Tapes for gypsum boards: Shall conform to ASTM C475.

D. Joint mortar and Tape for Cement board: Meet ANSI 118.4.

E. Finishing Materials: Texture coat finish material shall be manufactured by U.S. Gypsum, Hamilton, Murlux, Parex, Rapid Set-Cement, Eisenwall, Mortar Mix, Stucco Mix, Stucco Patch, One Pass, Westpac or equal.

F. Acoustical Sealant: Non-hardening, non-shrinking, for use in conjunction with gypsum board, as recommended by Board Manufacturer and conforming to ASTM C919. Sealant shall maintain fire and sound rating assembly.

G. Fasteners:

1. Self-drilling, bugle-head drywall screws; in conformance to ASTM C1002. No. 6 Type S or S12, 1 5/8-inch long for metal framing,

2. Wood framing: Screws: Type W 1 5/8-inch minimum length for single-layer panels. Screws shall be furnished with a corrosion-resistant treatment.

3. Adhesive: as recommended by board manufacturer and in compliance to ASTM C557.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Metal Trim:

1. Provide corner beads at outside corners and angles, metal casing where gypsum board terminates at uncased openings, metal edge trim where board edges abut horizontal and vertical surfaces of other construction.

2. Install trim in accordance with manufacturer's directions with appropriate joint compound. Install trim in longest practical pieces.

B. Gypsum Board:

1. Install gypsum board in conformance with ASTM C840, fire rated design, and sound rating.

2. Gypsum board shall be cut by scoring and breaking or by sawing, working from face side. Where board meets projecting surfaces it shall be scribed and neatly cut. Unless conditions require otherwise, gypsum board shall be installed first to ceilings, then to walls. End joints shall occur over a support. Install panels of maximum practical length so a minimum number of end joints occur.

3. End joints shall be staggered and joints on opposite sides of a partition shall be arranged to occur on different studs. Joint layout at openings shall be installed so no end joints will align with edges of openings.

4. Except where specified otherwise, fasteners shall be spaced not less than 3/8 inch from edges and ends of gypsum board. Do not stagger fasteners at adjoining edges and ends.

5. Install gypsum board vertically or horizontal as permitted by specific UL Design at walls. Fasten board with screws spaced not to exceed 8 inches on centers around perimeter of boards and 8 inches on centers on intermediate studs. Space screws at 8 inches on centers along top and bottom runners. Screws shall be driven to provide screwhead penetration just below gypsum board surface without breaking surface paper.

6. Install gypsum board to ceiling framing with long dimension at right angles to furring channels, or wood framing members, and fasten with specified screws or nails spaced 6 inches to 7 inches on centers across board. Screws or nails shall be not less than 1/2 inch from side joints and 3/8 inch from butt end joints. Abutting end joints shall occur over furring channels and end joints of boards shall be staggered. Support cutouts or openings in ceilings with furring channels.

7. Install access doors, furnished under another section, in correct location, plumb, or level, flush with adjacent construction, and securely fastened to framing.

C. Cement Board Backer System: NOT USED

3.02 TOLERANCES

A. System shall appear smooth and monolithic with no exposed joints.

3.03 JOINT TREATMENT AND FINISHING

*At completion of specified taping and finishing, install one coat of drywall primer as specified hereafter

B. Levels: Install joint compound, tape, and finishing compound on joints in wall gypsum board as required for specified levels of finish.

C. Levels 2 through 5:

1. Install joint compound and finishing compound over screw heads. Treat all inside corners with joint compound, tape, and finishing compound. Treat outside corners with corner beads and finishing compound.

2. Provide metal casing beads at all edges of gypsum board, which abut ceiling, wall, or column finish, and elsewhere as required, such as openings, offsets, etc. Install all exposed joints, trims, and attachments non-apparent following installation of paint or other finishes. If joints and fasteners are visibly apparent, correct defects as required.

3. All cut edges and openings around pipes and fixtures shall be sealed with a water-resistant flexible sealant.

4. When entire installation is completed, correct and repair broken, dented, scratched or damaged gypsum board before installation of finish materials by other trades.

D. Levels 3 and 4: Install one coat of high solids tinted topcoat primer over entire surface, Westpac Prep Coat, Tuff Hide Primer, and Hamilton Smooth Coat.

E. Level 5: Apply a skim coat over entire surface Westpac topping, USG topping, and Hamilton topping.

3.04 REQUIRED LEVELS OF FINISH

A. Finishes shall conform to GA 214

B. Unless otherwise indicated or specified, levels of finish required shall be as follows:

1. Level 1: Plenum areas above ceilings, insides of shafts, and other concealed areas. Taping to be as required for fire rated assemblies.

2. Level 2: Water-resistant gypsum board backing for high moisture areas to be covered with a water resistant surface other than tile, vinyl or paint, i.e stainless steel cladding etc.

3. Level 3: Backing for vinyl wall covering and adhered acoustic tile. Also, provide where textured finish is indicated.

4. Level 4: Exposed painted gypsum board in classrooms, utility rooms, and similar spaces not requiring Level 5 finish. To be painted per Section 09 9000, Painting and Coating, with a paint sheen shall not be greater than a “flat” finish.

5. Level 5: Exposed, painted gypsum board in offices and corridors. To be painted per Section 09 9000, Painting and Coating, with a “non-flat paint” - a paint material specifically manufactured to produce greater than 10 gloss units (GU) at an 60° and greater than 35 gloss units (GU) at an 85° angle when measured using a gloss meter.

3.05 TEXTURE COAT: NOT USED

3.06 CLEAN-UP

A. Remove rubbish, debris, and waste materials and legally dispose of off Project site.

3.07 PROTECTION

A. Protect Work of this section until Substantial Completion.

END OF SECTION

SECTION 09 90 13

PAINTING OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Interior and exterior painting.

B. Related Requirements:

1. Division 01 - General Requirements.

2. Section 07 92 00 - Joint Sealants.

3. Section 09 29 00 - Gypsum Board.

1.02 REGULATORY REQUIREMENTS

A. Workers shall be trained in EPA's (Environmental Protection Agency); Renovation, Repair and Painting (RRP), the lead-related construction course that satisfies the requirements specified in 40 CFR, Part 745, Section 745.90.

B. The Lead Related Construction Work, specified herein, shall be performed by a company, partnership, corporation, sole proprietorship or individual doing business, association, or other business entity; a Federal, State, Tribal, or local government agency; or a nonprofit organization, shall satisfy the requirements specified in 40 CFR, Part 745, Section 745.89, as a Lead-Safe Certified Firm.

C. Prior to commencement of Asbestos Related Construction Work, personnel required to construct and enter the Work Area or handle Asbestos Containing Materials shall have received adequate training, minimum of 16 hours of O&M training comprised of 2 hours of Awareness Training and 14 hours of Special O&M Training, in accordance with the requirements by 40 CFR, Part 763, Subpart E (AHERA) and Title 8, Section 1529, of the California Code of Regulations.

D. Paint materials shall comply with Food and Drug Administration's (FDA) Lead Law and current rules and regulations of local, state and federal agencies governing use of paint materials.

E. Paint color requirements for CALOSHA: CALOSHA requires the following items be painted as prescribed:

1. Gas Mains and Valves shall be painted "gun metal gray" (medium gray).

2. Fire Valves and Raisers shall be painted OSHA's "safety red".

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00: Submittal Procedures.

1. Submit a complete list of materials to be furnished stating supplier and distributor's names with product recommendations.

2. Submit manufacturer's standard color samples for each type of paint specified. Once colors have been selected, submit six samples of each color selected for each type of paint, on standard 8 ½ by 11 spray-out panel.

3. Before any coating is applied, submit to Project Inspector samples of each color to be used on contract. If more than one batch of material and color is to be used, samples from each batch shall be submitted.

B. Paint and Enamel Spray-Outs:

1. Samples of Paint and Enamel shall be submitted on standard 8 ½ by 11 Leneta Opacity-Display Charts. Each display chart shall have color in full coverage. Sample shall be prepared using material from batch to be used on actual job. Identify school on which paint is to be used, batch number, color number, type of material, name of manufacturer and name of CONTRACTOR.

2. Furnish samples of colors to Project Inspector. Samples shall be kept on the job until painting is completed.

3. CONTRACTOR shall be responsible for finish color on surface to be painted; where different materials of same color are specified to be applied on same, or adjoining surfaces, final color match shall match color sample on those surfaces.

C. Elastomeric coating shall be submitted in duplicate samples of texture coating. Samples shall be not less than 2 ½-inch by 3 ½-inch in size and on adequate backing.

D. Provide the current SCAQMD permit for each HEPA Vacuum and Portable Mechanical Ventilation System before they are brought onto the Project site.

E. Materials and color samples shall be approved before a job start meeting will be scheduled.

1.04 QUALITY ASSURANCE

A. Certification of Materials: With every delivery of paint materials manufacturer shall certify, on form supplied by OWNER that materials comply with requirements of this Section.

B. Paint materials shall be approved by OWNER'S Office of Environmental Health and Safety (OEHS) Chemical Evaluation Program and comply with applicable requirements of Food and Drug Administration's (FDA) Lead Law and South Coast Air Quality Management District (SCAQMD).

C. Painters working on Lead related work shall be trained at a minimum, in EPA's Renovation, Repair and Painting (RRP) Rule.

1.05 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to project site in original unbroken containers bearing manufacturer's name, brand number, batch number, and Safety Data Sheets.

B. Open and mix ingredients on premises in presence of Project Inspector. Immediately remove rejected materials from premises.

1.06 METAL STORAGE CONTAINER

A. Storage and Mixing of Materials: Store materials and mix only in spaces designated for purpose by Project Inspector. Keep such spaces clean and take necessary precautions to prevent fire. Hang out oily rags singly in open air. Stack paint containers so that manufacturer's labels are clearly displayed.

B. Paint, combustible materials, gasoline driven equipment, etcetera shall not be stored or left in any school building overnight.

C. In event that equipment and material storage sheds must be placed on asphalt pavement less than six months old, each wheel, leg or other supporting member shall be centered on a 4-foot by 8-foot by ¾ inch thick sheet of plywood. Shed shall be set down in such a manner as to prevent damage to pavement. CONTRACTOR shall be responsible for any damage to pavement caused by improper placement of shed.

1.07 ENVIRONMENTAL CONDITIONS

A. Temperature: Do not apply exterior paint in damp, rainy weather or until surface has dried from effects of such weather. Do not apply paint, interior or exterior, when temperature is below 55 degrees F., humidity is above 80%, or above manufacturer’s stated recommended temperature, or when dust conditions are unfavorable to proper workmanship.

1.08 WARRANTY

A. Manufacturer shall provide a three year material warranty from date of Substantial Completion.

B. CONTRACTOR warrants work executed and materials furnished under Contract shall be free from defects of materials and application for a period of three years from date of Substantial Completion.

C. Elastomeric coating shall be warranted for a period of five years from date of Substantial Completion.

1.09 PROTECTION

A. Fire alarm boxes, fire sprinkler heads, smoke detectors and intrusion alarm systems shall be uncovered and available to perform function that it was designed for each and every night.

B. Pressure relief grilles with barometric damper leading to a corridor or an exterior shall be masked off before spraying and then uncovered immediately after spraying.

C. Conspicuously post sufficient “Wet Paint” signs continuously to alert public and school personnel to existing conditions until paint is completely dried.

D. Provide and maintain barriers, guards, lights, warning signs, etcetera for complete protection and as directed by the Project Inspector.

E. Do not impede emergency egress.

1.10 REMOVAL AND REINSTALLATION OF SECURITY GRILLES: NOT USED

1.11 MOVING EQUIPMENT

A. Perform handling and moving of furniture, equipment, casework, books, and supplies, or items impeding project and re-installing in their original location, except as otherwise directed by OAR.

1.12 MISCELLANEOUS

A. Provide and maintain barriers, guards, lights, warning signs, etcetera for complete protection and as directed by the OAR. Provide access to doors and openings. Do not store equipment or material near openings or traffic lanes that could be hazardous during an emergency.

1.13 DEFINITION OF TERMS

A. Work shall include labor, material, equipment and scaffolding required for cleaning and preparation of surfaces to receive painters finish and for painting and varnishing, as herein specified. Perform work unless specifically noted otherwise.

B. Painting shall include complete preparation and finish or refinishing in accordance with requirements specified herein. Drywall shall be treated same as specified for plaster.

C. Wherever woodwork is specified to be refinished, it will include wood finish member (trim), movable cabinets with doors and center cut doors, windows and sash, screen doors, screens, sash poles, movable and fixed bulletin boards and chalkboards, etcetera.

D. Plastic, impregnated plywood, hardwood, metal, asbestos board (if painted), and mastic coated wood surfaces shall be treated in same manner as specified for “woodwork”.

E. Whenever “Paint or Enamel” is referred to in these specifications, it shall be taken to mean types of waterborne materials and water reducible materials.

F. Whenever “edges” are referred to in these specifications, it shall be taken to mean every edge (which include tops and bottoms).

G. Work shall be done by skilled and experienced painters in a professional manner. Painters must wear presentable white uniforms consistent with industry standard and personal ID Badges.

1. Provide ID badges identifying the following:

a. Employee's name.

b. Employee's photo.

c. Company Position (i.e. apprentice, journeyman, foreman).

d. Company name and logo.

e. Company phone number.

1.14 SCAFFOLDING

A. Scaffolding and aerial lifts shall be made available to OWNER, without cost, to make repairs. OWNER will coordinate its work with that of CONTRACTOR's to avoid delays to the work.

1.15 SCHEDULING OF WORK

A. Schedule work through the OAR.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

A. Factory mix paint materials to correct color, gloss, and consistency for installation to maximum extent feasible.

B. Paint materials shall be by one manufacturer.

C. Paint materials shall be "Premium Plus or Ultra Premium Grade".

D. Acceptable manufacturers, unless otherwise noted:

1. Dunn-Edwards Corporation Paints.

2. Vista Paints.

3. Frazee Paints and Wall coverings.

4. Sherwin Williams.

5. PPG Paints.

6. Equal.

E. Gloss degree standards shall be as follows:

High Gloss	70 and above	Eggshell	30 to 47
Semi-Gloss	48 to 69	Satin	15 to 29

2.02 MURAL PAINT MATERIALS

A. Manufacturer: Behr, Premium Plus Ultra Exterior Flat, Behr Premium Plus Exterior Semi-Gloss Enamel, or equal.

B. Anti-Graffiti Coating: Per Section 09 9623 Graffiti-Resistant Coatings.

PART 3 – EXECUTION

3.01 REMOVE AND REINSTALL

A. Remove coat hooks, name plates, label frames, sash lifts, sash locks, pencil sharpeners, flag brackets, drawer handles and locks, window coverings, switch and receptacle plates, removable bulletin boards, mirrors, maps and thermometer. Reinstall all of the above after painting is completed.

B. Remove exposed nails, hooks, tacks, screws, staples and pins in surface to be painted and patch holes with a matching material. Remove interior and exterior obsolete screens, grille hangers, fasteners and patch holes.

C. Remove and reinstall Venetian blinds and channels ensuring security latches are secure. When removed, blinds and channels shall be marked with its location and reinstalled in the same location.

D. CONTRACTOR shall replace map and picture hooks as directed by the Project Inspector.

E. Paper labels shall be soaked off and glue residue from tape removed.

F. Remove metal or plastic room numbers, letters, signs, and, after painting is complete, clean and reinstall them neatly.

G. Sash locks shall be reset in accordance with instructions for locking doors and windows each night.

3.02 REPLACEMENT SCREWS AND HARDWARE

A. Hardware shall be replaced using new screws, of same diameter, but one size longer than those removed. Screws used must be of finish design and material to match hardware.

B. Remove paint from hardware, including paint from previous painting.

3.03 GENERAL PREPARATION OF EXISTING PAINTED SURFACES

A. Previously painted surfaces will be assumed to contain lead.

B. Trenching: Before any cleaning or sandblasting operation is started, soil at base of building shall be trenched to a depth of six inches and eight inches wide. After completing painting application and allowing sufficient drying time, trench shall be refilled.

C. Insure a consistently uniform horizontal, vertical and curved surface, with a maximum deformation of 1/8 inch in a five foot span on an exterior stucco/masonry finish. For stucco/masonry repair, apply an exterior patching material specified in Section 09 2423, bringing the surface flush with the existing finish while matching the existing building textured finish.

D. Glass, fiberglass and polycarbonate on exterior shall be traced neat and clean with approximately, but no more than 1/16 inch overlay. Paint specks, smears or splatters shall be immediately removed and surface cleaned.

E. Miscellaneous Exterior Surfaces; Freestanding exterior school signs, windbreaks, baffles, benches, scoreboards, fences and gates (excluding chain link), decorative panels, interior and exterior surfaces of display cases, storage and supply cabinets, including both sides and edges shall be prepared and primed as specified under “Doors.” They shall receive number of coats of paint as detailed under “Colors and Number of Paint Coats.”

F. Examine surfaces to receive paint finish. Surfaces which are not properly prepared, and cleaned or which are not in condition to receive finish specified, shall be corrected before paint is applied. Painting shall not be done on existing painted surfaces until surfaces are approved by the Project Inspector.

G. Remove items fastened to existing painted surfaces and patch holes with a material and re-fasten in original location upon completion of painting work.

H. Existing painted surfaces indicated to be painted, shall be prepared as follows:

1. Wood, plaster and metal surfaces shall be washed with TSP (tri-sodium phosphate) substitute to remove dirt, grease and other foreign materials and rinsed with clean water and then sand papered and dusted off. Surfaces shall have wax completely removed before washing, which includes base, shoe base, and concrete base.

2. Checked, cracked, blistered, scaled, peeling, and alligatored paint on wood and metal surfaces shall have paint removed down to original finished surface, then hand-sanded and dusted clean.

    a. Surfaces shall then be considered as new work.

    b. Woodwork shall be hand sanded smooth after each and every coat, except last coat. Coats shall be free from dust, dirt or other imperfections.

    c. Steel sash and aluminum sash to be painted must be steel-wooled and dusted off. Sash putty shall be hand sanded smooth and dusted off.

    d. Remove lint and grease from screens, vents, hoods, et cetera that are to be painted.

3.04 OTHER SURFACE PREPARATION REQUIREMENTS

A. Existing painted surfaces shall be prepared and made ready to receive new coat of paint or other finish coating materials by any of following methods:

1. Checked, cracked, blistered, scaled loose, and alligator paint on wood and metal surfaces on exterior or interior of facilities shall be wet scraped and wet sanded to a smooth solid surface, H.E.P.A. vacuumed, wet wiped as specified per EPA RRP and then painted as specified. Wet scraping and or wet sanding shall be performed only when school is not in session, and students and staff are not on site.

2. Trenching: Before any cleaning or sandblasting operation is started, soil at base of building shall be trenched to a depth of six inches and eight inches wide. After completing painting application and allowing sufficient drying time, trench shall be refilled.

3. Sandblasting and/or pressure washing shall not be allowed without prior approval from the OWNER's Facilities Environmental Technical Unit. Only low pressure hydro-washing, below 750 psi, shall be allowed on all exterior surfaces.

4. Hydro-washing: Exterior masonry and plaster on buildings, bungalows, pavilions, and appurtenances must be washed with a cleaner using hydro-washing equipment, or as directed by Project Inspector, to remove grease, dirt and foreign materials and then rinsed with clean water to remove residue. Surfaces must be allowed to dry for at least five days or as determined by Project Inspector. Care shall be taken to prevent water from entering buildings through vents, et cetera. Immediately following hydro-washing, areas surrounding buildings must be rinsed down. Ensure no rinse water enters storm drains.

    a. Exposed mastic, concrete, and/or plaster surfaces shall be cleaned with a cleaner, using hydro-cleaning equipment. This process is to remove dirt, foreign materials, grease, and oil and rinsed with clean water to remove residues.

    b. Before hydro-washing efflorescence must be brushed off and surface treated with a 10 percent solution of Muriatic Acid, neutralized with a 10 percent solution of ammonia water and then rinsed with clean water.

    c. Painted surfaces that will be directly or indirectly impacted by hydro-washing shall have paint stabilized to remove loose, flaky or peeling paint using the wet method. Wood, metal, and other exterior non-masonry/stucco surfaces shall be primed where stabilization has occurred prior to application of cleaner and hydro-washing.

    d. Hydro-washing is not intended to remove loose, flaky or peeling paint or paint chips. Water generated from cleaning and hydro-washing process shall be collected and stored in DOT approved container and examined for the presence of paint chips. The visible paint chips shall be separated from the waste water and be disposed of as assumed RCRA hazardous waste or be characterized to determine disposal requirements. The remaining wastewater must be characterized for proper disposal in accordance with Specification 02-8333, Lead Abatement and Lead Related Construction Work.

    e. At no time shall water from hydro-washing process be directed to soil, such as planted area, sewer system, storm drain, be allowed to flow off OWNER

property to adjoining public or private property, or to flow across asphalt or cement concrete and allowed to dry.

f. Hazardous waste generated by this process requires that the Office of Environmental Health and Safety (OEHS) be notified. Hazardous waste shall be being transported under a Uniform Hazardous Waste Manifest approved by OEHS prior to disposal. CONTRACTOR shall ensure the manifest is completed as required by code and then submit it to OEHS for approval. The OAR will sign the manifest once it is accurately completed and approved by OEHS prior to transport.

5. Sandblasting: Shall be performed when school is not in session and when students are not present. Premises shall be left in a clean condition and ready for use by occupants by end of any day prior to beginning of school session. Work shall be coordinated with Project Inspector and the OAR. Only wet blasting shall be allowed. Masonry or stucco surfaces shall be sandblasted to remove mastic, paint and other materials to original plaster brown coat or formed concrete surface. Rinse with clean water to remove residue. Adjacent surface, plants and shrubs shall be protected from damage due to sandblasting operations.

a. Immediately upon completion of sandblasting operation, roof, gutters and areas around buildings, etcetera shall be cleaned of sand and debris resulting from sandblasting operation. No sand or debris shall be hosed or swept into drains.

b. Metal surfaces including decorative metal and fencing requiring sandblasting shall be sandblasted to white metal and primed same day with a metal primer per manufacturer's recommendation.

6. Sandblasting and Pressure Washing of materials containing asbestos or lead are abatement activities and will only be performed by companies and individuals with prior Facilities Environmental Technical Unit (FETU) approval.

3.05 CRACKS AND VOIDS

A. Voids between wall and ceiling surfaces and wood or metal trim or scribed edges where finish exists or is specified to be applied and including picture molding, must be filled with putty, filler or latex sealing compound.

B. Areas where finish plaster coat is loose must have that portion removed to a solid surface. Surfaces that are broken, cracked, or damaged and areas where finish plaster coat has been removed must be coated with compatible bonding agent. Surface will then be given a cement plaster finish coat consisting of one-part Plastic Portland Cement to three parts sand to match existing finish. Cracks shall be "V-eed" out, filled, finished flush with and textured to match adjoining surfaces, per OWNER Representative's approval.

C. Neutralize walls showing effects of alkali.

3.06 FILLER ON SIDING AND WOODWORK: NOT USED

3.07 SEALING SASH, DOOR FRAMES: NOT USED

3.08 MASTIC REPAIR AND ELASTOMERIC REPAIR

A. Surface must be clean, firm and free of oil, wax and chalk. Mildew must be killed. Surface must be rinsed and allowed to dry.

B. Use primers as recommended by manufacturer for each substrate.

C. May be applied with airless spray equipment, using a 22 to 34 orifice tip and do not apply when surface or air temperature is below 50 degrees F.

D. Apply elastomeric with a ½ inch to 1 ½-inch roller cover or an air-atomized spray texture pump system. Do not over-roll.

E. Spreading rate:

Fine texture:	Approx. Mil thickness	Wet	18 Mils
	at 80 square feet per gallon	Dry	9 Mils
Medium texture:	Approx. Mil thickness	Wet	18 Mils
	at 60 square feet per gallon	Dry	9 Mils
Heavy texture:	Approx. Mil thickness	Wet	39 Mils
	At 40 square feet per gallon	Dry	26 Mils

NOTE: Coverage will vary depending upon texture desired and surface. Direction will be given by an OWNER representative.

F. Dry time: To touch: 1 to 1 ½ hours

To re-coat: 24 hours

G. Finish will be uniform in texture and free of imperfections.

H. Elastomeric coatings will receive at least two coats of paint.

I. Hairline cracks: Two coats of elastomeric coating to bridge hairline cracks.

J. Small to medium cracks and imperfections: elastomeric coating to fill and span cracks up to 1/32 inch. Cracks 1/32 inch width or greater shall be treated with an elastomeric sealant (recommended by paint manufacturer) prior to applying elastomeric coating.

K. Medium to large cracks and imperfections: Cracks from 1/32 inch to 1/8 inch shall be treated with a brush-grade elastomeric sealant applied in a 2-inch wide band; crowned at center and feathered at edges to conceal repair.

L. Large cracks: Cracks 1/8 inch to ½ inch shall receive a urethane sealant (recommended by paint manufacturer), “rake out” crack to conform to manufacturer’s specifications and applied as directed for medium to large cracks.

M. Cracks, holes and damaged spots larger than ½ inches: Damaged areas shall be given a cement plaster finish coat consisting of one-part plastic Portland cement to three-parts plaster sand to match existing finish. When finished, it shall be flush with and match existing texture of adjoining surface.

N. Texture match: Crack repairs shall be finished to match texture of adjoining surfaces, per Project Inspector's approval. Hand held plaster hopper guns may be used. Exercise care to ensure that areas finished by hand held plaster machines match in color, texture and thickness to adjoining surfaces. A compatible bonding agent shall be used.

3.09 REPAIR OF PLASTER

A. Exterior areas, where finish plaster coat is loose, shall have that portion removed to a solid surface. Surfaces that are broken, cracked, or damaged and areas where finish plaster coat has been removed shall be coated with compatible bonding agent. Surface will then be given a cement plaster finish coat consisting of one-part Plastic Portland Cement to three parts plaster sand to match existing finish. Cracks shall be "veed-out", filled, finished flush with and textured to match adjoining surfaces, per Project Inspector's approval.

1. If existing plaster was a machine applied, dash coat, apply final application of finish coat over patched areas by machine to match existing adjacent machine texture. Use a finish plaster material with a bonding admixture mixed according to manufacturer's recommendation.

2. Cracks, holes, and damaged spots larger than ½ inch, see Article Mastic Repair and Elastomeric Repair.

B. Exterior plaster designated to be painted shall receive three coats. First coat shall be sealer. Second and third coats shall 100 percent acrylic gloss enamel unless otherwise indicated.

C. Interior plaster patching shall receive four coats. First coat shall be pigmented sealer. Second coat shall be enamel undercoat. Third and fourth coats shall gloss or semi-gloss enamel as indicated.

3.10 REPAIR OF SPALLING CONCRETE

A. Remove surface contamination, broken and spalled concrete to a sound concrete base. Concrete shall be removed to a depth of one-half inch minimum around rebar. Sides of areas to be repaired shall be straight, not tapered or sloped.

B. Spalled or loose concrete shall be removed using an electric or compressed air chipping hammer.

C. Clean exposed rebar by sand/media blasting, remove debris and dust and treat steel with a sealant compatible to patching materials same day. Project Inspector shall approve sealant application prior to any patching materials being applied.

D. Repair concrete to match existing concrete surfaces using Sika Top 123 Gel Mortar, DAP Concrete Patch, Quikrete Fast-Setting Concrete, or equal.

E. Sealant and patching materials shall be applied by qualified applicator.

3.11 SPRAYING CEMENT PLASTER

A. Masonry/plaster material must be a 100 percent acrylic flat paint, color as directed. Material must be applied in strict conformity to manufacturer's directions. There must be at least 24 hours drying time between first coat which shall be factory tinted 10 percent to 15 percent lighter (or darker) in color than finish coat. Manufacturer shall be acquainted with conditions of surfaces to be refinished and provide written specifications for the job including special primers or additives needed for adhesion sealing of first coat of paint and general performance of materials. Finished surface must be uniform and free of imperfections. Each coat applied to surface must be sprayed using "Cross-Off" method of application by spraying horizontally with a 50 percent overlap on returns and doubling back with a vertical stroke with a 50 percent overlap on returns.

3.12 CAFM BUILDINIG NUMBERS: NOT USED

3.13 STAINED AND VARNISHED SURFACES: NOT USED

3.14 SASH PUTTY: NOT USED

3.15 PUTTY

A. Holes, open joints of siding, woodwork and sash glazing shall, after surrounding areas have been prepared as specified above, be knife puttied. On stained woodwork, putty must be colored to match stain. Puttying shall be done after first coat of paint or varnish has been applied. Latex sealant may be used on open joints and woodwork. Putty and/or sealant shall be spot primed before finish coat is applied. Putty or latex sealant shall not be used on handball walls or basketball backstops.

3.16 FILLER ON SIDING AND WOODWORK: NOT USED

3.17 MIXING AND APPLICATION

A. Colors of coatings shall be as directed by Project Inspector.

B. Three coats of paint shall be applied as follows:

1. First coat: primer or undercoat, shall be white or may be tinted up to 50% lighter or darker than the finish coat at the discretion of the installer.

2. Second coat shall be factory tinted in range of 10 percent to 15 percent lighter or darker than finish coat.

3. Third coat shall be factory tinted to color selected but allowing for tint variations in more than one color for application to different surfaces. Color combinations in rooms and for surfaces shall be varied in accordance with color letter.

C. Any number of colors may be used on any portion of work. OWNER reserves right to change colors before work is started in an area or on a particular surface.

D. Various colors may require additional coats of paint complete coverage. No additional allowances will be made. CONTRACTOR is responsible for consulting color letter and knowing color and coverage.

E. Surfaces to be finished and each coating shall be separately inspected by Project Inspector and checked for mill thickness. The requirements are two mils each coat wet and three mils dry after three coats. Notice that such work is ready for inspection shall be given to Project Inspector. Should such notice not be given before succeeding coat is put on, finish applied shall be removed or an additional coat shall be applied, as directed by Project Inspector. Allow at least one day drying time between coats for exterior work or as directed by Project Inspector for proper drying.

F. Roof work to be painted Q8-38T Birch Gray.

3.18 PAINT ROLLERS, BRUSH AND SPRAY

A. Paint rollers may be used on interior plaster, drywall, masonry, stucco and plywood surfaces, nap not to exceed 1/2 inch in length.

B. First coat on wood overhang and ceilings must have material applied by roller and then must be brushed out in a professional manner to leave surface free of imperfections. Finish coat may be sprayed.

C. Other surfaces shall have coatings applied with brushes of proper size.

D. Spray work shall be permitted only on radiators, acoustic plaster, acoustic tile, fiberboard, wood fiber acoustical units, masonry and plaster or as directed by Project Inspector.

3.19 PRIMING: NOT USED

3.20 FIRE AND LIFE SAFETY EQUIPMENT: NOT USED

3.21 DOORS: NOT USED

3.22 RAMPS, STAIRS AND HANDRAILS: NOT USED

3.23 THRESHOLDS: NOT USED

3.24 INTERIOR AND EXTERIOR WOODWORK: NOT USED

3.25 ENAMEL FINISH: NOT USED

3.26 CABINETS: NOT USED

3.27 PLYWOOD WALLS: NOT USED

3.28 INTERIOR PLASTER AND DRYWALL WORK – WALLS AND CEILINGS

A. Where ceilings are specified to be painted, beams, cornices, coves, ornamental features, staff work, plaster grilles, etcetera shall be included.

B. Ceilings shall be white, unless otherwise noted. Includes classrooms, storage rooms, offices, arcades, etcetera. Boiler room and fan room ceiling color shall match adjacent walls.

C. Where walls are specified to be painted, columns, staff work, piers, returns, reveals, soffits of stairs, both sides of stair railings, soffits and reveals of windows and other openings shall be included.

D. Grease, ink spots and marks of indelible pencils shall be completely removed by use of water and abrasive soap powder without injury to finished surface.

E. First coat may be thinned per paint manufacturer's recommendation with a thinner prepared specifically for material used. Coats shall be flowed on freely. First coat must be prepared so as to stop suction, and should any dead spots appear, they shall be touched up before next coat is applied. The last coat shall be a uniform surface, free of defects.

3.29 AREAS REQUIRING ENAMEL: NOT USED

3.30 UNPAINTED METAL

A. Unpainted bronze, brass, copper work, window grilles, stairways, handrails, chain-link fences, stainless steel, open metal shelving, porcelain metal faced cabinets and aluminum will not be painted, unless otherwise specified.

3.31 PAINTED METAL

A. Exposed structural steel, miscellaneous/ornamental iron, sheet metal work, guards, steel sash, gates, painted aluminum, basketball rims, etcetera shall have surfaces cleaned and prepared as specified. The areas from which original painter's finish has been removed shall be spot primed with metal primer to match adjoining surfaces and then surfaces shall be given a prime coat of metal primer, second and third coats as specified. Copper pipe shall be painted with one coat of enamel undercoat per manufacturer's recommendation, a second and third coat of enamel as specified.

B. Painted ornamental iron rails and gates, metal ceilings (metal decking, etcetera) stairs, pipe columns, and pipe rails shall be prepared and finished as specified herein. Metal decking and metal roll-up doors may be sprayed.

C. Exterior surfaces (except bottom) of exterior metal storage containers, including both sides of door(s) and edges shall be prepared and painted with three coats of paint consisting of first coat of primer, second coat and third coat of exterior high gloss enamel. Exterior metal storage container(s) must be sprayed.

3.32 METAL COVERED DOORS, RADIATORS: NOT USED

3.33 LIGHT FIXTURES: NOT USED

3.34 FLAG AND LIGHT POLES: NOT USED

3.35 METAL SHOWERS AND DRESSING ROOMS: NOT USED

3.36 PAPER TOWEL BOXES: NOT USED

3.37 METAL SURFACES: NOT USED

3.38 METAL LOCKER FINISH: NOT USED

3.39 PAINTING OF MECHANICAL WORK

A. Exposed heating, ventilating, air conditioning, plumbing, electrical equipment, apparatus, piping, ducts, coverings, etcetera shall be cleaned, prepared and painted as specified herein for that item.

1. In finished areas, these items must be finished with one coat of primer and two coats of enamel to match adjoining wall or ceiling finish as specified herein.

B. Radiator branches, risers, returns, radiators, supports and other types of heating equipment in finished spaces shall be finished with three coats of paint to match adjoining finish as specified herein. Gas steam radiators shall be disconnected and reconnected by OWNER.

C. Register faces and grilles, unless plated, must be given three coats of paint to match adjoining finish as specified.

D. Ventilators and interior sheet metal ducts must be treated and finished as specified for interior metal work.

E. Coverings on pipes in finished rooms must be finished same as adjoining wall or ceiling surfaces. Do not break surface of any wrapped pipes.

F. Labels on fire alarm systems, bells, pulls must be covered and kept intact. Fire alarm bells and pulls to be painted red gloss paint.

G. Covering on boilers, tanks, pipes, etcetera in boiler room and heater room must be primed and then finished with gloss enamel.

H. Valves, pipe hangers, flanges, unions, drain pipes, soil lines, exposed blow-off pipes, boiler fronts, smoke boxes, breeching, iron boiler bases, metal stacks, water column/pipe connections, damper regulators, manholes, safety valve connections, boiler appurtenances, etcetera, located in boiler room must be painted with two coats of a boiler paint as recommended by paint manufacturer.

I. Pumps, fans, fan housing, belt guards, including supports, motors, or other equipment, cover plated to sump pump, tank, manhole covers/rings mounted in floors including conduits and piping in boiler or fan rooms must be primed and then finished with two coats of gloss enamel as specified herein.

J. Mechanical work not specifically mentioned must be painted as specified for other work of same character.

K. Finished bronze, brass fittings, plated work, name plate and fusible links and chains must be cleaned of paint.

L. Pressure relief grilles with barometric dampers leading to a corridor or to exterior must be masked off before spraying any material.

M. Automatic sprinkler valves, gas meters and water meters must be painted as specified herein.

3.40 ELECTRICAL CABINETS

A. Front side of doors and exposed lip around doors to electrical cabinets in finished areas must be finished same as walls.

3.41 ACOUSTICAL PLASTER, TILE, FIBERBOARD: NOT USED

3.42 CORK AND FIBERBOARD TACK BOARDS: NOT USED

3.43 CHALKBOARDS: NOT USED

3.44 LETTERING: NOT USED

3.45 HARDWARE AND AUTOMATIC DOOR CLOSERS: NOT USED

3.46 GAS FIRED UNITS: NOT USED

3.47 CLEANING

A. Glass, polycarbonate and fiberglass on interior and exterior where painting has been done shall be cleaned of paint and varnish. Glass, fiberglass and polycarbonate that are scratched or damaged by painting work, shall be replaced with material to match original.

B. Finished bronze, copper, brass fittings, plated work, name plate and fusible links and chains shall be cleaned of paint.

C. Before applying finish coat of material to exterior sash with security grilles, CONTRACTOR shall clean window panes with a cleaner.

D. Dispose of debris, waste or unused materials, off site. Use of school dumpsters is strictly prohibited.

E. Remove paint from hardware, including paint from previous painting.

F. CONTRACTOR shall free sash and leave it in an easy operating condition.

G. Glass, fiberglass and polycarbonate on exterior shall be traced neat and clean with no more than 1/16 inch overlay. Paint specks, smears or splatters shall be immediately removed and surface cleaned.

H. Rooms, Buildings, and Campuses must be cleaned of paint debris, including dust caused by painting project to approval of Project Inspector and OAR.

3.48 POST OCCUPANCY WORK

A. Two months after substantial completion, OAR will arrange a date and time when the CONTRACTOR must return to the site to check and free sashes that were painted so they are in proper operating condition.

END OF SECTION

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. This Section provides the basic mechanical requirements that apply to the Work of Division 23.

B. Related Requirements:

1. Division 01: General Requirements.
2. Division 26: Electrical.

1.02 REGULATORY REQUIREMENTS

A. Materials, fabrication, equipment, and installation shall comply with industry standards and code requirements. Where manufacturer's recommendations exceed industry standards, the manufacturer's recommendation shall establish the minimum standard. As a minimum, standards from the following organizations shall apply:

1. AMCA - Air Movement and Control Association.
2. ANSI - American National Standards Institute.
3. ASME - American Society of Mechanical Engineers.
   a. ASME Boiler and Pressure Vessel Code.
   b. ASME B31 - Code for Pressure Piping.
4. AHRI - Air-Conditioning, Heating, and Refrigeration Institute.
5. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers.
6. ASTM - American Society for Testing and Materials.
   a. ASTM A53 - Specification for Welded and Seamless Pipe.
7. CSA - Canadian Standards Association.
8. FM Global - Factory Mutual Global
9. IAPMO - International Association of Plumbing and Mechanical Officials.
10. NFPA - National Fire Protection Association.
11. OSHA - Occupational Safety and Health Administration.
12. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association.
13. UL - Underwriters Laboratories Inc.
14. Intertek (ETL Certification).

B. Materials, fabrication, equipment, and installation shall comply with federal, state, and local codes including, but not limited to, the following:

1. CBC, California Building Code, and CMC, California Mechanical Code.

a. Latest edition as adopted by the City of Lawndale, the County of Los Angeles, and the State of California including amendments effective on the Effective Date of the Contract.

2. California Code of Regulations, Title 8, Industrial Relations, Division 1, Chapter 4, Division of Industrial Safety.

3. OSHA - Occupational Safety and Health Administration.

4. CDPH – California Department of Public Health.

C. Specifications or Drawings shall not be construed to permit deviation from the requirements of governing codes unless approval has been obtained from legally constituted authorities having jurisdiction, and the Architect. The Contract Documents may contain more stringent requirements than those legally required.

D. Permits and Fees: Refer to the General and Supplementary Conditions.

1.03 SUBMITTALS

A. Provide submittals in accordance with Section 01 3300: Submittal Procedures and with specific requirements of Division 23 sections, as applicable.

B. After Architect's approval, the above information shall become the basis for inspecting and testing materials and actual installation procedures performed in the Work.

C. Shop Drawings: Submit one additional copy when control diagrams having line voltage connections are indicated. Shop Drawings shall be specifically prepared for the Work of this Project. Drawings prepared in accordance with requirements of Section 01 3113: Project Coordination and Section 01 3300 may be provided by the Architect to serve as a background for the Shop Drawings. Shop Drawings shall comply with the requirements of Section 01 3113 and Section 01 3300 and shall indicate at a minimum:

1. Complete system layout of equipment, components, ductwork, and piping, indicating service clearances, duct and pipe sizes, fitting types and sizes, top or bottom of duct and pipe elevations, distances of ducts, pipes and equipment from building reference points and hanger / support locations. All the above items shall be coordinated on the shop drawings according to the requirements of Section 01 3113.

2. Schedule and description of equipment, ductwork, piping, fittings, valves, dampers, and controllers.

1.04 PROJECT RECORD DOCUMENTS

A. Comply with provisions of Section 01 7700: Contract Closeout.

B. Project Record Drawings:

1. Provide a complete set of mechanical and control system drawings in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks and plotter pen color/line thickness settings on CD-ROM. Also submit one set of full size reproducible plots on vellum and three sets of prints.

2. Before Contract Completion, deliver corrected and completed prints to the CLIENT. Delivery of project record documents to the CLIENT does not relinquish responsibility of furnishing required information omitted from project record documents.

C. Operation and Maintenance Manuals:

1. Submit operation and maintenance manuals in required form and content. If no revisions are required, furnish one additional copy. If revisions are required, one copy

shall be returned with instructions for changes; perform such changes and return manuals. Manuals shall be bound in accordance to Section 01 7700. Deliver manuals to the CLIENT. Submit an electronic copy of the entire manual in PDF file format.

2. Contents of Manual:

a. Title sheet with Project name, including names, addresses and telephone number of Contractor, installer, and related equipment suppliers.

b. Manufacturer's operating instructions including, but not limited to, the following:

1) Identification of components and controls.

2) Pre-start checklist and start-up procedures.

3) Normal operation settings and checklists.

4) Pre-shut down checklist and shut down procedures.

5) Trouble shooting checklist and guidelines.

6) Recommendations for optimum performance.

7) Warnings and safety precautions on improper or hazardous operational procedures or conditions

c. Manufacturer's product data and parts and maintenance booklet for each item of equipment furnished under Division 23 that includes the following as a minimum:

1) Manufacturer’s model, identification and serial numbers.

2) Exploded view of assembly drawings identifying each component or part with the relevant part number.

3) Directory of manufacturer’s representatives, service contractors and part distributors.

4) Maintenance and trouble-shooting instructions, including schedule for preventive maintenance, periodic inspection and cleaning criteria.

d. Project Record Drawings: Complete set of mechanical and control system drawings in 50 percent reduced print format shall be furnished with the manual. Submit the above record drawings on CD-ROM in AutoCAD and, if available, BIM, complete with external reference drawings, fonts, blocks, and plotter pen color/line thickness settings.

e. Testing, Adjusting, and Balancing reports: Submit as specified in Section 01 4525.

f. Los Angeles County industrial waste permits.

g. Valve directory complete with location, function, size, and model of each valve with reference to the project record drawings.

h. Equipment and component identification chart complete with location, function, size, and model of each equipment or component with reference to the project record drawings.

1.05 COORDINATION

A. Contract Documents indicate extent and general arrangement of Work under Division 23. Contractor shall coordinate work in accordance with Section 01 3113 requirements and make

adjustments as required to provide maximum headroom, a neat arrangement to keep passageways and openings clear to provide accessibility and provisions for maintenance, and to meet code requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Deliver materials to Project site in their original unopened containers with labels intact and legible at time of delivery. Store in strict accordance with manufacturer's recommendations.

B. Do not store plastic pipe or materials in direct sunlight.

1.07 PRELIMINARY OPERATION

A. CLIENT may require any portion of mechanical Work to be operated before Substantial Completion. Such operation shall be in addition to regular tests, demonstrations and instructions required under the Contract Documents, and shall be performed as required.

B. Notify the Project Inspector at least 24 hours in advance of lighting or re-lighting pilots.

1.08 TRAINING OF OWNER PERSONNEL

A. Training of Owner’s personnel shall include:

1. A minimum of 8 hours of on-site overview of the overall Mechanical System.

2. Refer to Division 23 sections for specific training on each of the components of the Mechanical System.

3. A minimum of 8 hours of on-site overview identifying location and function of all Control Valves and Actuator assemblies.

4. A minimum of 40 hours of (in classroom) software training for a minimum of 20 LAUSD personnel on EMS/BMS if such systems are utilized in the project. Training shall be conducted at control contractor training facility with computer setup for each person attending.

B. Contract shall include the cost of training Owner operation and maintenance personnel in operating, adjusting, maintenance, trouble-shooting, and Project site repair of each component, equipment, or system provided under this Contract.

C. Operational and maintenance training shall be conducted on the Project site, unless indicated otherwise.

D. Upon completion of Owner training, a completion certificate indicating the nature of the training and a description of the systems, complete with equipment and component lists shall be issued to each trainee. The certificate should be issued in duplicate with one copy retained by CLIENT.

E. An attendance sheet with the names and signatures of all participants attending the training shall be submitted to the CLIENT and kept as part of the project documents.

1.09 GUARANTEES AND DAMAGE RESPONSIBILITY

A. Sound of water flowing in piping shall not be transmitted to building structure. Operation of mechanical system shall not produce operational sounds that can be heard outside of rooms enclosing apparatus or equipment.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Unless otherwise specified, materials and equipment shall be new, in good and clean condition. Equipment, materials, and components shall be of the make; type and model number noted on Drawings or specified. Pieces of equipment of the same type shall be by the same manufacturer.

B. Whenever an item is listed by a single proprietary name, with or without model number and type, it shall be for purpose of design only, to indicate characteristics and quality desired. Proprietary designation listed on Drawings, or listed first in Specifications, is used as a basis for design to establish a standard for quality and performance and space requirements.

C. HVAC equipment products from different manufacturers are never identical. Equipment approved as being equal is interpreted as being equivalent in capacity, performance and quality. The dimensions, weight, configuration and utility requirements could be quite different from the equipment used as the basis of design. Due to these differences, additional coordination and adjustments by the Contractor are required. For the equipment to be deemed truly equal, the additional coordination and adjustments by the Contractor should not incur any additional cost to the Owner and any additional labor to the design team.

D. Equipment and materials indicated or required to be installed outdoors shall be of the type that is designed, manufactured, listed or approved by authorities having jurisdiction for outdoor installation by being resistant to the adverse effects of weather. All the additional protective measures against outdoor weather required by the manufacturers' installation instructions and prevalent practice shall be provided.

E. For substitution of materials or products, refer to the General Conditions.

PART 3 – EXECUTION

3.01 SERVICE INTERRUPTIONS, OFF-SITE, GAS AND WATER

A. Schedule Work so there shall be no service interruptions of existing systems or systems during normal hours of operation of affected systems and facilities.

B. When service interruptions are mandatory, arrange in advance with the CLIENT as to time and date of such interruptions.

C. Systems, which are interrupted, shall be returned back into operation in such manner that they will function as originally intended.

3.02 CUTTING, NOTCHING, AND BACKING

A. Conform to California Building Code, Title 24, Part 2, for notches and bored holes in wood and for pipes and sleeves embedded in concrete and for cuts in steel, as detailed on structural Drawings.

B. Where pipes or ducts pass through, or are located within one inch of any construction element, install a resilient pad, 1/2 inch thick minimum, to prevent contact.

C. Furnish all necessary provisions for recesses, chases, and accesses and provide blocking and backing as necessary for proper reception and installation of mechanical Work.

3.03 LOCATION OF PIPING AND EQUIPMENT

A. Location of piping, apparatus and equipment as indicated on Drawings is approximate and shall be altered to avoid obstructions, preserve headroom, and provide free and clear openings and passageways.

B. Trenches parallel to footings shall not be closer than 18 inches to the face of footings and shall not be below a plane having a downward slope of 2 horizontal to one vertical, from a line 9 inches above bottom of footing.

C. Pipe in tunnels shall be installed close to one side of tunnel to provide maximum space for passage. Pipe shall not be installed through crawl hole unless otherwise specified or detailed on Drawings.

D. Place equipment in locations and spaces indicated, disassemble and/or reassemble equipment as required by Project conditions.

3.04 TESTS AND TESTING

A. Tests shall be as required under the applicable sections of Division 23, including this Section.

B. Tests required by other sections of the Contract Documents include the following:

1. Test and balance of mechanical equipment and systems: Refer to Section 01 4525: Testing, Adjusting, and Balancing for HVAC.

2. Hydrostatic test of boilers: Refer to Section 01 4525: Testing, Adjusting, and Balancing.

3. Test of smoke and fire detectors: Refer to Division 26: Electrical.

C. Additional tests may be required in the case of products, materials, and equipment if:

1. Submitted items are altered, changed, or cannot be determined as exactly conforming to the Contract Documents.

2. Performance testing and results may also be required on certain items which are as specified, including fan, and pump performance.

D. Piping Tests:

1. Perform tests required to demonstrate that operation of mechanical systems and their parts are in accordance with Specifications covering each item or system, and furnish materials, instruments and equipment necessary to conduct such tests. Tests shall be performed in presence of the Project Inspector, and representatives of any governmental agency having jurisdiction. Work shall not be concealed or covered until required results are provided.

2. If required tests are not performed, Owner may provide in accordance with the Contract Documents.

3. Pressure gages furnished in testing shall comply with CPC. Air shall be bled from lines requiring hydrostatic or water tests.

4. Systems shall be pressure-tested in accordance with pipe testing schedule below. Pipe test shall indicate no loss in pressure after a minimum duration of 4 hours at test pressures indicated. Where local codes require higher test pressures than specified herein for fire sprinkler systems, local codes shall govern.

5. Fuel gas lines shall be first tested with piping exposed, before backfilling trenches or lathing; second with piping in finished arrangement, backfilled and paved where required, and walls finished.

6. Refrigerant piping may be tested with a halide detector or calibrated electronic testing equipment.

7. Piping systems may be tested as a unit or in sections, but entire system shall successfully meet requirements specified herein, before final testing by the Project Inspector.

8. Repair of damage to pipes and their appurtenances or to any other structures resulting from or caused by these tests, shall be provided.

E. Pipe Testing Schedule:

System Tested	Test Pressure (psig)	Test With:
Steam piping, hot water heating system piping and chilled water piping	150	Water
Vacuum pump or condensate pump discharge and condensate return piping	150	Water
Refrigeration piping		
R-22	400	Dry nitrogen
R-134a	300	Dry nitrogen
R-401a	300	Dry nitrogen
R-401b	300	Dry nitrogen
R-404a	500	Dry nitrogen
R-407c	500	Dry nitrogen
R-410a	600	Dry nitrogen
R-507	500	Dry nitrogen
Radiant panel piping	150	Water

F. Equipment Performance Assurance Tests:

1. Before operating any equipment or systems, a thorough check shall be performed to determine that systems have been flushed and cleaned as required and that equipment has been properly installed, aligned, lubricated, and serviced. Factory instructions shall be checked to verify installations have been completed and recommended lubricants have been installed in bearings, gearboxes, crankcases, and similar equipment. Particular care shall be furnished in lubricating bearings to avoid damage by over-lubrication and blowing out seals. Equipment shall also be checked for damage that may have occurred during shipment, after delivery, or during installation. Damaged equipment, products, and materials shall be replaced or repaired as required.

2. Upon completion of the above, adjust the system settings to within normal operating conditions to prevent the system from being damaged upon start-up.

3. Run-test the equipment after start-up for five consecutive days. Tests shall include operation of heating, ventilating, and air conditioning equipment and systems for a period of not less than two 8 hour periods at 90 percent of the full specified heating and cooling capacities. If equipment passes, install new filters. If equipment fails, it shall be adjusted and retested until system meets all applicable codes.

4. Equipment Start-up Reports: For each equipment or system on which start-up is performed, submit 8 copies of start-up report for review by the Architect.

   a. The start-up report shall include the manufacturer's standard start-up form completed and signed by the start-up technician.

5. Provide, maintain, and pay costs for equipment, instruments, and operating personnel as required for specified tests.

6. Provide electric energy and fuel required for tests.

7. Final adjustment to equipment or systems shall meet specified performance requirements.

8. Equipment, systems, or Work deemed defective during testing shall be replaced or corrected as required. Test until satisfactory results are provided.

G. Specific Coordinated Plan for Test and Balance:

1. Provide a narrative of the operational intent that clearly describes the function and sequence of operation of each component, equipment, or system installed. Instruct designated Owner personnel in the operation of the installed systems.

2. Prior to final test and balance, mechanical equipment and systems shall be operated and tested as indicated in Paragraph 3.04.F above to demonstrate satisfactory overall operation of the installed systems.

3. Immediately before starting tests, air filter media shall be cleaned or renewed. Roll-type filters shall be advanced to provide new clean media. Cleanable type media shall be thoroughly cleaned and re-oiled with new, clean oil as recommended by manufacturer if they are of viscous impingement type. Disposable type filters shall be replaced with new filters. Replaceable media shall be replaced with new media.

4. An accurate means of measuring air flow and temperatures shall be furnished to balance air supply, return, and exhaust systems so uniform temperatures occur in every room and design airflow is obtained through registers, diffusers, and grilles.

5. Systems shall be adjusted to provide airflows indicated including maximum fresh air and maximum return air. Dampers shall be checked for proper settings and operation. Air and water inlet and leaving temperatures at coils shall be checked. Complete operational data including airflows, room temperatures, fan speeds, motor currents, plenum, and duct static pressures shall be tabulated.

6. Welding performed as part of this Division may be subject to radiographic inspections at random in accordance with requirements specified in Section 23 0513: Basic HVAC Materials and Methods.

3.05 NOISE AND VIBRATION REDUCTION

A. Correct noise or vibration caused by mechanical systems. Provide all necessary adjustments to specified and installed equipment and accessories to reduce noise to the lowest possible level

B. Correct noise or vibration problems caused by failure to install work in accordance with Contract Documents. Include all labor and materials required as a result of such failure. Pay for re-testing of corrected noise or vibration problems by the project acoustical consultant including travel, lodging, test equipment expenses, etc.

3.06 PROTECTION, CARE AND CLEANING

A. In addition to storage criteria of the General Conditions, and provisions under Section 01 5000: Construction Facilities and Temporary Controls, the following shall be provided:

1. Provide for the safety and good condition of materials and equipment until Substantial Completion. Protect materials and equipment from damage.

2. Protect installed Work.

3. Replacements: In case of damage, immediately provide repairs and/or replacements as required.

4. Protect covering for bearings, open connections to tanks, pipe coils, pumps, compressors and similar equipment.

5. Interior of ductwork shall be maintained free of dirt, grit, dust, loose insulation, and other foreign materials.

6. Air handling equipment shall not be operated until building is cleaned and air filters are installed.

7. Fixtures, piping, finished brass or bronze, and equipment shall have grease, adhesive, labels, and foreign materials removed. Chromium, nickel plate, polished bronze or brass Work shall be polished. Glass shall be cleaned inside and out.

8. Before initial start-up and again before Substantial Completion, piping shall be drained and flushed to completely remove grease and foreign matter. Pressure regulating assemblies, traps, strainers, boilers, flush valves, and similar items shall be thoroughly cleaned. Tag system with an information tag listing responsible party and date of element, before initial start-up and again before Substantial Completion. Compressed air, oil, and gas piping shall be blown out with oil-free compressed air or inert gas. Refrigerant piping shall be cleaned as specified.

END OF SECTION

SECTION 23 05 48

HVAC SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Reduction or elimination of excessive noise or vibration within building due to operation of equipment, machinery, piping, and ductwork as specified.

1. Vibration isolators.

2. Seismic restraint devices.

3. Acoustic housing.

5. Lining and enclosing ductwork.

6. Sound attenuation boots at supply, return, exhaust and transfer air inlets, outlets and openings.

8. Flexible ducts, conduits and piping.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 01 45 25: Testing, Adjusting, and Balancing for HVAC.

3. Section 23 05 00: Common Work Results for HVAC.

6. Section 23 30 00: Air Distribution.

7. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

1.02 GENERAL REQUIREMENTS

A. Provide vibration isolators to eliminate or reduce the transmission of vibration noise to any part of building and mitigate vibration frequency and load imposed by equipment. Vibration isolators, base frames, inertia bases and seismic restraints shall be of sufficient size, flexibility and load distribution configuration to assure that deflection, stability and seismic restraint requirements are met without permitting excessive movement when starting. For typical units, no fewer than four isolators shall be provided. Isolators shall be provided to deflect uniformly under operating gravity and equipment thrust loadings to within plus or minus 10 percent of specified deflection values.

B. Static deflections specified are based on the anticipated equipment characteristics. In the event the equipment proposed by the Contractor has characteristics other than those indicated, particularly the rated rpm, the static deflection shall be re-evaluated and the proper mountings and other devices shall be provided.

C. Where fabricated vibration isolator units are indicated, furnish manufacturer's standard catalog products with printed loading ratings or certified submittals

D. Seismic Requirements:

1. Refer to Seismic Restraint Manual: Guidelines for Mechanical Systems, published by SMACNA, for minimum seismic restraints required on mechanical components design and construction details.

2. Provide seismic restraints for mechanical equipment or components specified. Where equipment is specified with proprietary names, design for seismic restraints is for first proprietary name listed.

3. Provide restraints, bracing and anchorage as required for the mechanical equipment, electrical equipment and components specified in the Contract Documents. Restraints, bracing and anchorage shall be installed to resist the total design earthquake or wind loads in any direction in accordance with CBC and SMACNA guidelines.

4. Provide restraints, bracing, and anchorage for the mechanical equipment and components.

5. For ductwork and other mechanical equipment restraints, comply with SMACNA Seismic Restraint Manual: Guidelines for Seismic Mechanical.

1.03 SUBMITTALS

A. Provide in accordance with Division 01.

1. Catalog cuts and data sheets on specific vibration isolators, seismic restraints, and anchors demonstrating compliance with the Specifications.

2. Shop Drawings for each piece of equipment including dimensions, structural member size, support point, vibration, and seismic restraints.

3. Written approval of frame design to be furnished by the equipment manufacturer.

4. Drawings indicating methods for suspension, support, seismic restraints, guides, etc., for piping, ductwork, etcetera.

5. Drawings indicating methods for isolation of pipes, ducts etcetera, piercing slabs, beams, etcetera.

B. Vibration Test Reports: At completion of installation, submit the following documents. Submission of these documents must be complete before final acceptance of vibration isolation systems is given. Assistance from the vibration isolation equipment Manufacturer may be required.

1. Complete tabulation showing for each vibration isolator:

a. Actual static deflection measured at the project.

b. Specified minimum static deflection.

2. Report certifying:

a. Each piece of operative rotating mechanical equipment does not exceed the specified vibration displacement level.

b. Each piece of isolated equipment or equipment component (ducts, pipes, conduit, etcetera) is not short-circuited by any means.

c. Requirements of Part 2 are satisfied for equipment.

1.04 QUALITY ASSURANCE

A. Standards and Codes: Comply with applicable codes and standards having jurisdiction including, but not limited to:

1. NFPA, Pamphlet 13.

2. ASHRAE Handbook: HVAC Systems and Equipment.

3. SMACNA Seismic Restraint Manual: Guidelines for Mechanical Systems.

4. California Building Code.

5. VISCMA

a. Installing Seismic Restraints for Mechanical Equipment.

b. Installing Seismic Restraints for Duct and Pipe.

B. Qualifications of Manufacturer and Installers: Comply with provisions as set forth in Section 23 0500: Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish and install vibration dampers, sound isolation pads, flexible connections and similar equipment required to prevent sound of water flowing in pipes, vibration of motors, and motor operated equipment from being transmitted to building structure; and, in case of fans, from being transmitted along ducts. Piping shall be isolated from vibrating equipment by furnishing required flexible connectors.

B. Pumps and similar motor operated equipment shall be installed on anti-vibration units.

C. Fans, except curb-mounted roof-type exhaust fans and wall mounted propeller fans, shall be installed with anti-vibration units, whether indicated on Drawings or not. Fans built into air handling units may be furnished with independent anti-vibration mountings or whole unit may be installed on an external vibration isolation system.

D. Other equipment shall be installed on anti-vibration bases, pads, or hangers, unless specifically noted otherwise on Drawings. Package units, furnished with built in anti- vibration bases, do not require unit bases unless otherwise specified.

1. Unless specified otherwise, anti-vibration bases shall be Mason Industries, M.W. Sausse & Co., the VMC Group, or equal, of the Model Number specified or indicated on the drawings. Furnished base including sub-base, shall be manufactured by same company with fan and integral motor base. Seismic restraints may be incorporated into bases or furnished separately.

2. Inertia anti-vibration bases shall conform to requirements indicated.

3. Unless noted otherwise, furnished anti-vibration bases, including supporting units for inertia bases, shall be of the spring type.

4. Selection of bases or supporting units shall be in accordance with manufacturer's recommendations based on following installed minimum effective isolation efficiencies (where not provided with each piece of equipment):

a.	Centrifugal fans, packaged fan and coil units and cooling towers, less than 800 RPM	80 percent
b.	Centrifugal fans over 800 RPM	90 percent
c.	Centrifugal pumps	95 percent
d.	Reciprocating compressors	95 percent

E. Flexible duct connections shall be provided at inlet and outlets of each fan or HVAC unit, except curb-mounted roof exhaust fans whether indicated on the drawings or not.

F. Flexible pipe or conduit connections shall be provided at piping and conduit connections to HVAC units, pumps, compressors and other moving (reciprocating or rotating) mechanical or electrical equipment provided under this Section whether indicated on the drawings or not.

G. Flexible connections for Freon piping shall be seamless flexible metal hoses of type and length recommended by manufacturer and suitable for system operating pressure.

H. Flexible connections for all other piping shall be flexible metal hose or spool type with flanged ends, unless otherwise specified. Metal hose shall be covered with protective braiding in areas where physical abrasion may occur, or for personnel safety.

I. Spool types shall be similar to American Rubber Co., Mercer Rubber Co., PROCO Products, Inc., or equal, and hose types shall be similar to DME, Inc., U.S. Flex, Pennflex, Anaconda Flexpipe, Keflex, or equal with any required modifications to meet specified requirements. Flanges shall be furnished with steel retaining rings. Units installed on discharge side of pumps shall be furnished for a suitable working pressure of not less than 100 psig, and those on suction side for working pressures of 50 psig or 30 inches Hg vacuum.

K. Spool type units shall be furnished with control units comprised of a minimum of two tie-rods and anchor plates or internal guide sleeves to prevent excessive elongation or misalignment. Rubber washers shall be provided under bolt heads and rubber grommets in bolt holes to prevent any metal to metal contact between bolts and flanges.

L. Where hose type units are furnished, restraining anchors or braces shall be provided if excessive or undesirable pipe movement occurs when system is operated.

2.02 GENERAL PROPERTIES OF VIBRATION ISOLATORS.

A. Shall be provided with markings so that, after adjustment, when carrying their load, deflection under load can be verified; thus determining that load is within proper range of device and that correct degree of vibration isolation is being provided according to the design.

B. Isolators to operate in direct proportion to their load versus deflection curve. Load versus deflection curves shall be furnished by manufacturer and must be linear over a deflection range of 50 percent above design deflection.

C. Wave motion through isolator shall be reduced to following extent: Isolation above resonant frequency shall follow theoretical prediction based upon an un-dampened single degree of freedom system with a minimum isolation of 50 decibels above 150 cycles per second.

D. Vibration isolator spring diameters shall be no less than their deflected height. Furnish spring with a 50 percent overload safety factor.

E. Unless otherwise indicated, equipment installed on vibration bases shall provide a minimum operating clearance of one inch between structural steel base and floor or support base. Provide flexible connectors in piping and flexible conduit in power wiring to minimize transmission of vibration.

F. Isolators and springs exposed to weather shall be hot-dipped galvanized or powder coated after fabrication and before installation. Hot-dipped zinc coating shall be not less than two ounces per square foot by weight complying with ASTM A123. In addition, provide limit stops to resist wind velocity.

G. Where indicated, provide structural steel bases with height saving brackets, and minimum of three points of support. Isolators shall be furnished with a method for leveling.

H. Design isolators and seismic restraints for positive anchorage against uplift and overturning.

I. Provide and install, under this Section of the Specifications, structural steel required to properly support equipment and steel required to support horizontal thrust arrestors.

2.03 ISOLATOR TYPES

A. Type A: Steel Spring Isolators: Un-housed steel spring isolators, laterally stable and unrestrained. Design springs so that ratio of horizontal to vertical spring (stiffness) constant is between 0.9 and 1.3. Natural frequency of isolator must be 1/3 to 1/4 of driving frequency that is to be controlled. Isolators to provide a minimum additional travel to solid equal to 50 percent of rated deflection. Isolators shall be furnished with built-in leveling bolts complete with sound isolation pads type B. Static deflection as specified.

B. Type B: Sound Isolation Pad: Provide under each spring isolator a sound isolation pad, utilizing high quality durable neoprene pad material, loaded to 40 psi. Build sound pad up to 2 layers of 1/4 inch thick neoprene material; separate layers with a 16 gage galvanized sheet metal plate. Top layer shall provide a hardness of 40 durometers and the bottom layer shall be 40 durometers. Cold bond sound pads together and to isolator baseplate.

C. Type C: Neoprene-in-Shear Isolators: Isolator shall be neoprene-in-shear type as recommended by manufacturer. Isolator shall provide a static deflection under rated load at 1/4 inch.

2.04 EQUIPMENT FRAMES

A. Provide mounting frames and brackets to carry load of equipment without causing mechanical distortion or stress to the equipment.

B. Type A Frame: Wide flange members, rigidized structural steel frame with brackets. Maximum allowable deflection at any point on load frame relative to unloaded frame shall be 0.005 inch. Members to be constructed of wide flange beams, with a depth of not less than 1/10 of length of span between isolators. Frame shall be M.W. Sausse & Co. type RMSB-W, as basis of design, or Mason Industries, Caldyn, or equal.

C. Type B Frame: Channel members, rigidized structural steel frame with brackets. Frame to be constructed of channel steel with section depth equal to 1/10th length of longest structural member. Frame shall be M.W. Sausse & Co. type RMSB-C, as basis of design, or Mason Industries, Caldyn, or equal.

D. Type C Frame: Steel gusset or bracket welded or bolted directly to machine frame in order to accommodate isolator. Frame shall be M.W. Sausse & Co. type RMSG, as basis of design, or Mason Industries, Caldyn, or equal.

E. Type D Frame: Fabricated of rectangular channel steel forms for floating foundations to be filled with concrete on the Project site. Channel depth to be a minimum of 1/12th of longest dimension, but in no case less than 6 inches. Form shall include 1/2 inch reinforcing bars installed each way in a layer 1 ½ inches above bottom and drilled steel members with sleeves mounted below holes to receive equipment anchor bolts. Weight of concrete and frame shall be two times or more than the weight of the unit it supports. Frame shall be M.W. Sausse & Co. type RMSBI, as basis of design, or Mason Industries, Caldyn, or equal.

2.05 MATERIALS AND CONSTRUCTION

Flexible Ducts: As indicated in Section 23 07 00: HVAC Insulation.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Provide isolators, flexible pipe connectors, flexible electrical conduit and flexible duct connectors at all moving mechanical system components to prevent transmission of vibration noise to any part of building whether indicated on the drawings or not.

B. Install isolators to suit imposed load and the vibration frequency to be absorbed. Isolator units shall furnish adequate strength and flexibility to exhibit proper resiliency under machine load and impact without permitting excessive movement when starting.

C. Where commercial vibration isolator and seismic restraint units are specified, furnish manufacturer's standard catalog products with printed loading ratings, or provide substantiating calculations.

D. Install vibration isolators and seismic restraints in accordance with manufacturer's printed installation instructions.

E. Where equipment is belt driven and motor is not installed on equipment, install motor and driven equipment on unitized support, and install entire support isolators. Unitized support to be provided with adjustable slide rails sized for motor weight and frequency. Support shall be Mason Industries type WF, M.W. Sausse & Co., type RMSF, Caldyn, or equal.

F. Do not install any equipment, piping, conduit, ductwork, etc., that makes rigid contact with building or its structural members, unless reviewed by the Architect.

1. Coordinate Work with other trades to avoid rigid contact with building.

2. Correct, before installation, any conflict with other Work that would result in solid contact to equipment or piping due to inadequate space.

3. Obtain inspection from the Project Inspector for concealed Work before enclosure.

4. Notify manufacturer before installation of vibration isolation devices so that manufacturer may instruct and demonstrate technique for proper installation.

G. The furnishing or installation of vibration isolators must not cause any change of position or alignment of equipment, ductwork, or piping, resulting in stresses in piping or ductwork, connections, or misalignment of shafts or bearings. Equipment, piping, and ductwork shall be maintained in a rigid position during installation. Load shall not be transferred to isolator until installation is complete and under full operational load.

H. Suspended Fans and Air Conditioning Unit Fan Coils and Unit Ventilators: Suspend each integral unit from overhead structure on steel spring and elastomer hanger isolators. Support deflection under rated load of 3/8 inch. Provide spring static deflection as follows:

Fan RPM	**Min. Deflection**
200 – 400	3 inches
400 – 700	2 inches
Above 700	1 inches

M. Pipe Isolation: Where indicated and as required, furnish and support each pipe from an isolator. Isolator for the first five support locations away from vibrating equipment shall have the same deflection as the equipment isolators. After that, isolators shall be a neoprene-in-shear type of size as recommended by manufacturer; except where indicated on Drawings, pipe hanger rod shall be furnished with a steel spring isolator and elastomeric element, with lower rod capable of 30 degrees total misalignment without contact on spring housing.

N. Seismic Restraints: Floor or pad mounted equipment that do not require vibration isolators, shall be bolted to floor or other support. Floor mounted equipment with vibration isolators shall be provided with lateral and vertical restraining devices on all sides of base to restrict displacement of equipment. On all sides of suspended equipment, provide bracing for rigid supports and provide aircraft cable restraints for resiliently supported equipment.

O. Ductwork, duct acoustical lining, manual volume dampers and flexible ducts: Do not reduce length of duct runs, duct acoustical lining, manual volume dampers and flexible ducts for economy.

P. Installation of flexible ducts at air inlets and outlets: Do not attach flexible ducts directly to air inlets and outlets unless a straight, smooth and uniform air flow can be achieved with sufficient space to make an elbow with a radius of at least three times the diameter of the duct. If sufficient space is not available to make such an elbow, provide a rigid elbow or a lined plenum.

Q. Placement of Air Devices: Do not relocate air devices without the Architect's approval.

3.02 EXAMINATION

A. Arrange for the services of a certified representative of isolation manufacturer to visit the Project site for inspecting installation of devices. In the event the isolators do not meet specified requirements perform necessary revisions. Submit a written report to the Architect, signed by above representative, indicating all devices are properly installed and are operating as specified or required by isolation manufacturer.

END OF SECTION

SECTION 23 05 53

HVAC IDENTIFICATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Marking and identification required on mechanical piping systems, ducts, controls, valves, apparatus, etcetera.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 23 09 00: HVAC Instrumentation and Controls.

4. Section 23 30 00: Air Distribution.

6. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

1.02 SUBMITTALS

A. Submit in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. Submit product data and installation instructions for each item specified.

C. Submit Samples of materials.

1.03 QUALITY ASSURANCE

A. Comply with provisions of:

1. Section 23 0500: Common Work Results for HVAC.

2. ANSI/ASME A13.1: Scheme for the Identification of Piping Systems.

3. APWA: Uniform Color Code.

Or

4. IAPMO: Uniform Plumbing Code (UPC).

PART 2 – PRODUCTS

2.01 MATERIALS

A. General: Piping systems, controls, valves, apparatus, etc., except those that are installed in inaccessible locations in partitions, walls, and floors, shall be permanently identified.

2.02 VALVES

A. Furnish prepared chart or diagram for each piping system, indicating by identifying letter or model number of each valve in the system, its location, and function.

B. Install charts in aluminum frame with clear glass front and secure on wall where designated by the Project Inspector.

C. Bind copies of each chart in operating instructions manual.

D. Provide each valve with a brass, aluminum, or plastic disc, not less than 1-1/4 inches diameter bearing engraved numbers corresponding to those indicated on chart. Fasten discs to valve with No. 14 brass wire.

E. Provide an additional tag for safety valves and other valves that could be hazardous to safety and health of occupants. Distinguish these tags from regular valve tags by color (such as yellow with black letters, and marked "Danger"); submit Sample tag to the Architect for review.

2.03 INSTRUMENTS AND CONTROLS

A. Identify panel-mounted instruments and controls with engraved bakelite nameplates permanently affixed to panel boards.

B. Identify alarm indicating devices and alarm reset devices by nameplates.

2.04 EQUIPMENT

A. Identify each major piece of equipment with engraved bakelite nameplates permanently affixed to the equipment, indicating the room numbers it services, Equipment identification designation shall be the same to its designation indicated on the “As-Built Drawings”. Room numbers in the nameplates shall correspond to the final room numbers.

2.05 IDENTIFICATION OF AIR CONDITIONING EQUIPMENT

A. Provide identification markers to locate air conditioning equipment above T-bar ceilings. Install 3/4 inch to one inch diameter colored self-adhesive dots to T-bar ceiling grid indicating point of access. The following identification markers shall be recorded on the project record documents:

1. Fire Damper and Combination Fire/Smoke Fire Damper: Red.

2. Manual Volume Dampers, Relief Dampers, Motorized Volume Dampers: Blue.

a. Supply air: Full dot.

b. Return air: Half dot.

3. Fan coil unit: Green.

4. Filter Location if separate from fan coil: Yellow.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Correct detrimental conditions prior to commencing the Work of this Section. Install markers and identification tags as specified with materials and installation procedures recommended by manufacturer.

B. Place tracer wire on top of non-metal utility lines allowing some slack. Do not wrap tracer wire around pipe. Fasten tracer wire in place at approximately 10 feet on centers with non-metal ties.

C. Install underground detectable pipe marking tape continuously buried 8 to 10 inches above the buried utility pipe. Wrap tape on pipe risers up to a height of 12 inches above grade.

3.02 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Condensate drain piping from air conditioning equipment.
2. Refrigerant piping.
3. Supply and return air ducts for heating and cooling systems air ducts.

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 23 05 00: Common Work Results for HVAC.
3. Section 23 05 13: Basic HVAC Materials and Methods.
4. Section 23 05 53: HVAC Identification.
5. Section 23 30 00: Air Distribution.
6. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

1.02 REFERENCES

A. American Society for Testing and Materials International (ASTM):

1. ASTM C167 - Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
2. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board.
3. ASTM C302 - Standard Test Method for Density and Dimensions of Preformed Pipe-Covering-Type Thermal Insulation.
4. ASTM C411 - Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
5. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
6. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
7. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

8. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.

9. ASTM D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

10. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

11. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

12. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

13. ASTM G22 - Standard Practice for Determining Resistance of Plastics to Bacteria.

B. Underwriters Laboratories Inc.:

1. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors.

2. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems .

2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

3. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Submit in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

1. Complete material list of items to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required demonstrating compliance with the specified requirements.

3. Shop Drawings, catalog cuts and manufacturer's data indicating insulation, jacketing, adhesives, and coating. Insulating materials shall be certified by manufacturer to comply with the California quality standards for insulating materials.

4. Display sample cutaway sections.

5. Manufacturer's recommended method of installation procedures, which will become part of this Section.

1.04 QUALITY ASSURANCE

A. Qualifications of Manufacturer and Installer, Materials, Fabrication, Execution, and Standard of Quality: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC and Section 23 0513: Basic HVAC Materials and Methods.

B. Test Ratings:

1. Comply with provisions stated under Section 23 0500 and 23 0513 with emphasis on ASTM E84, NFPA 255, or UL 723. ASTM C167, ASTM C302, UL label or listing of satisfactory test results from the National Institute of Standards and Technology, or a satisfactory certified test report from an acceptable testing laboratory. Approval by the State Fire Marshal is required.

2. Furnish labels, legibly printed with the name of the manufacturer or listings indicate that fire hazard ratings do not exceed those specified for materials proposed for installation. Flame spread index of not more than 25 and smoke developed rating not exceeding 50.

3. Tests shall be performed on each item individually when insulation, vapor barrier covering, wrapping materials, or adhesives are installed separately at the Project site.

4. Test insulation, vapor barrier covering, wrapping materials and adhesives as an assembly when they are factory composite systems.

C. Regulatory Requirements: Insulation furnished and installed under this Section shall conform to the requirements of the California Building Code Parts 4, Mechanical Code, Part 5, Plumbing Code and Part 6, Energy Code.

D. All chemically based products such as sealers, primers, fillers, adhesives, etc. shall meet the California air quality regulations.

1.05 PRODUCT HANDLING

A. Protection, Replacement, Delivery and Storage: Comply with provisions stated under Sections 23 0500: Common Work Results for HVAC and 23 0513: Basic HVAC Materials and Methods.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General:

1. Piping insulating material shall be fire resistant, non-corrosive, shall not break, settle, sag, pack or disintegrate under vibration, nor absorb more than 1 percent moisture by weight.

2. Piping insulating material shall be furnished with thickness indicated in Table 1, unless otherwise noted on the drawings, and shall furnish thermal resistance in the range of R-4.0 to 4.6 in accordance with inch at 75 degrees F. For any other value of R, insulation thickness shall be calculated accordingly and submitted for review.

3. Asbestos in any quantity in insulating material is not permitted.

4. Provide insulation materials, adhesives, coatings, sealants, fitting covers, and other accessories with a fire hazard rating not to exceed 25 for flame spread, 25 for fuel contributed and 50 for smoke developed, except for materials listed as follows:

   a. Nylon anchors for installing insulation to ducts or equipment.

   b. Treated wood blocks.

5. Flame-proofing treatments subject to moisture damage are not permitted.

TABLE 1 - MINIMUM PIPING INSULATION THICKNESS (1)

Insulation Thickness Required (in inches)
Space Heating Systems (Steam, Steam Condensate and Hot Water)

Piping System Type	**Temp. Range (degrees F)**	**Run-outs up to 2** (2)	**1 and less**	**1.25 to 2**	**2.5 to 4**	**5 to 6**	**8 and larger**
Hi Pres Temp	Above 350	1.5	2.5	2.5	3.0	3.5	3.5
Med Pres Temp	251 to 305	1.5	2.0	2.5	2.5	3.5	3.5
Low Pres Temp	201 to 250	1.0	1.5	1.5	2.0	2.0	3.5
Hot Water	Up to 200	0.5	1.5	1.5	1.5	1.5	1.5
Steam Cond.	-	0.5	1.0	1.0	1.0	1.5	1.5
Service Water Heating Systems (recirculating, piping supply and return)							
Hot Water	Up to 180	0.5	1.0	1.0	1.5	1.5	1.5
Space Cooling Systems (Chilled water, Brine and Refrigerant)							
Chilled Water	40-60	0.5	0.5	0.75	1.0	1.0	1.0
Refrigerant/Brine	Below 40	1.0	1.0	1.5	1.5	1.5	1.5
Condensate Drain	½-inch Minimum insulation thickness.	0.5	0.5	0.5	0.5	0.5	0.5
From Air Conditioning Equipment:	Insulate condensate drain lines within building, in room, inside walls and above ceilings.	0.5	0.5	0.5	0.5	0.5	0.5

NOTES:

(1) For Underground HVAC Piping refer to section 23 2016 Underground HVAC Piping.

(2) For piping exposed to ambient temperatures, increase thickness by 0.5 inch.

(3) Run-outs to individual terminal units, not exceeding 12 feet in length.

B. Lagging Adhesives: Shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E84. Insulation finished with canvas shall be provided with laps adhered in accordance to manufacturer's recommendation. A finish coat of same material shall be applied to entire outer surface of lagging cloth at coverage specified by manufacturer.

C. Canvas Jackets: Furnish 6 ounce in accordance with square foot minimum, 48 by 48 thread count canvas jacketing.

D. Insulation Jackets:

1. Exterior insulation exposed to weather shall be weatherproofed with Childers aluminum jacketing as basis of design, or Pabco, RPR, or equal. Jacketing shall be manufactured from 1100, 3105 or 5010 aluminum alloy with 3/16-inch corrugations. Smooth or embossed jackets may be permitted in special situations to match an existing installation. Jacketing shall be furnished with an integrally bonded moisture barrier over entire surface in contact with insulation. A minimum thickness of 0.016 aluminum jacketing is to be provided on ducts and piping. A minimum thickness of 0.020 shall be provided on tanks, equipment, and heat exchangers.

2. Insulated elbows, of 90 degrees and 45 degrees, with a nominal iron pipe size of ½-inch to 8-inch shall be provided with Childers aluminum Ell-Jacs insulation covers as basis of design, or Pabco, RPR, or equal, manufactured from 1100 aluminum alloy of 0.024-inch thickness. Insulated elbows with a nominal pipe size of 10 inches to 18 inches shall be provided with Childers 4-piece aluminum Ell-Jacs as basis of design, or Pabco, RPR, or equal.

3. Tees, Flanges, and Valve Insulation in Conjunction with Aluminum Jacketing: Furnish Childers Aluminum Special Fabrications Insulation Covers as manufactured by Childers Products Company, Pabco, RPR, or equal.

E. Adhesives: Adhesives shall be water based, UL Classified, meet the requirements of NFPA 90A and NFPA 90B, have been tested according to relevant ASTM requirements, and be acceptable to the State Fire Marshal. Name, type and method of installation shall be submitted for review.

F. Valve and Fitting Cover: When installed in conjunction with PVC jacketing, furnish Zeston 25/50 rated polyvinyl chloride fitting covers as manufactured by Johns Manville, Knauf Insulation, Speedline, or equal.

2.02 COOLING PIPING SYSTEM INSULATION

A. General: Refrigerant piping.

B. Materials:

1. Classes of Insulation:

a. Class A: Expanded polystyrene pipe insulation, self-extinguishing type, either molded or extruded; Dow Chemical Co. STYROFOAM, ITW Insulation Systems XPS PIB, Foam-Control EPS, or equal.

b. Class B: Glass fiber molded pipe insulation ASTM C547. Pipe insulation shall be one piece, preformed, and provide a minimum R factor of 4 at 75 degrees F mean temperature. Insulation shall be faced with all-purpose fire-retardant vapor barrier jacket. Pipe insulation shall be Johns Manville Micro-Lok, CertainTeed Snap-On, Owens Corning FIBERGLAS SSL II-ASJ, or equal.

c. Class C: Expanded (foamed) urethane (polyurethane) or polyisocyanurate pipe insulation of self-extinguishing type molded or fabricated, Dyplast Products, LLC ISO-C1/2.0, ITW Trymer, Specialty Products & Insulation Co. Polyisocyanurate Pipe Insulation, Armacell Armalok, or equal.

d. Class D: Foamed plastic pipe insulation, self-extinguishing type, ASTM C534 Type 1 - tubular. Pipe insulation shall be one-piece preformed, flexible tubing type and provide a maximum K factor of 0.28 at 75 degrees F mean temperature. Pipe insulation shall be Armacell Armaflex, Aeroflex Aerocel, Rubatex INSUL-TUBE 180, or equal.

2. Locations and Class of Insulation Required: For thickness required, refer to Table 1 of this Section.

TABLE 3 – SERVICE, LOCATION AND CLASS OF INSULATION REQUIRED

SERVICE	LOCATION	CLASS OF INSULATION
Condensate drains from air conditioning equipment	Indoors at all locations including above ceilings and between stud walls	D
Refrigerant suction Liquid line as required	All locations except underground	D
All other piping, except underground	All locations except underground	A, B, C

3. Adhesives:

a. Polystyrene adhesives: Synthetic rubber and resin adhesives specifically designed to adhere extruded and expanded rigid polystyrene and urethane insulation to themselves and to other porous and non-porous substrates.

b. Vapor barrier laps and penetrations: Furnish protective coating and lagging adhesive on butt joints of foil-faced vapor barriers, and where pins and staples puncture facings.

2.03 DUCTWORK AND PLENUM INSULATION

A. General: Insulate ductwork and plenums with not less than the amount of insulation tabulated in Table 4, unless noted otherwise on the drawings. Insulation may be omitted under the following conditions:

1. Exposed return air ductwork in conditioned space.

2. Return air ductwork between wall studs inside an interior wall.

TABLE 4 - INSULATION OF DUCTS AND PLENUM

Duct Location	Insulation Type
Exterior locations other than Health Units and Clinics	L-2
In walls, within floor/ ceiling spaces	F-1 or L-1 See note 3
Hot and cold plenums	F-2, DW-1 or L-2 See note 3
Attics, Garages, and Crawl Spaces, within unconditioned space or in basement	F-3 or L-2 See note 3

B. Insulation Types:

1. F-1: 1½-inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

2. F-2: 2-inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

3. F-3: 3-inch blanket fiberglass, factory-laminated with all-service jacket vapor barrier.

4. L-1: 1½-inch Internal duct lining.

5. L-2: 2-inch Internal duct lining.

C. Notes:

1. Minimum insulation provided shall be as required by the current California Mechanical Code Title 24 for the most restrictive condition.

2. Refer to the materials indicated in this section for external insulation & Internal Lining.

3. External insulation shall be replaced with internal duct lining (of equivalent thermal resistance value unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

4. Provide internal duct lining (1 ½-inch unless noted otherwise) where indicated on the drawings or specified elsewhere for sound attenuation.

5. All exterior insulated ductworks shall be water proofed at joints, seams and duct penetrations.

D. Materials:

1. Fire-Resistive Insulation Materials and Coatings: Submit State Fire Marshal pre-approved materials only.

2. Adhesives: See Paragraph 2.01.E for applicable products.

3. External Insulation: Provide glass fiber blankets that are factory-laminated with Foil Reinforced Kraft (FRK) vapor barrier facing; Johns Manville Microlite, Owens-Corning SOFTR Duct Wrap, Knauf Insulation Friendly Feel Duct Wrap, or equal. Provide a minimum installed R value as required by the CEC Building Energy Efficiency Standards; but not less than scheduled on Table 5:

TABLE 5

INSULATION OF DUCTS AND PLENUM INSTALLED

THERMAL RESISTANCE "R" VALUES

Type	Labeled Thickness (in inches)	Installed R Value ($hr.ft^2.°F/Btu$)
F-1	1 ½	4.2
F-2	2	5.6
F-3	3	8.3
DW-1	1	4.2
DW-2	2	5.6
L1	1 ½	6.0
L2	2	8.0

4. Internal Lining: Internal Lining shall be of the type that inhibits the growth of mold, mildew and fungi and shall not contain harmful VOC's or contain glass fiber. Approved Material:

   a. Polyester Duct Liner:

      1) Polyester duct liner shall be an engineered nonwoven, thermally bonded Polyester with a smooth and durable FSK facing.

      2) Polyester duct liner must be able to withstand a constant internal temperature up to 250°F must be compliant with Greenguard Environmental Institute and contain zero VOCs per ASTM D5116. Liner must comply with all applicable standards including ASTM E84, ASTM C411, ASTM C518, ASTM G21, NFPA 90A and 90B, and UL 181.

      3) Approved Manufacturer: Ductmate Industries "PolyArmor" duct liner or approved equal.

   b. Elastomeric duct liner:

      1) Closed-cell, sponge- or expanded-rubber materials. Elastomeric liner must be able to withstand a constant internal temperature up to 300°F and must comply with all applicable standards including ASTM E84, ASTM E96, ASTM C209, ASTM C534 - Type II sheet materials, ASTM C411, ASTM C518, ASTM G21, ASTM G22, NFPA 90A and 90B, and UL 181.

2) Approved Manufacturer: Armacell LLC “AP Armaflex FS” duct liner or approved equal.

c. Duct liner must be attached per manufacturer’s requirements using a non-flammable, low VOC water-based adhesive. When applicable, apply a non-flammable, low VOC water-based lagging adhesive to the exposed leading edge of the insulation. Install fasteners per SMACNA HVAC Duct Liner installation instructions.

d. Duct liner must be installed per SMACNA Manual, “HVAC Duct Construction Standards, Metal and Flexible,” Third Edition unless otherwise specified.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Except as specified herein, install material in accordance with recommendations of manufacturer. Do not install insulation materials until tests specified in other sections are completed. Remove foreign material such as rust, scale, or dirt. Surfaces shall be clean and dry. Maintain insulation clean and dry at all times.

B. On cold surfaces where a vapor barrier must be provided and maintained, insulation shall be installed with a continuous, unbroken moisture and vapor seal. Hangers, supports, anchors, or other projections that are fastened to cold surfaces shall be insulated and vapor sealed to prevent condensation.

C. Surface finishes shall be extended in such a manner as to protect raw edges, ends, and surfaces of insulation.

D. Pipe or duct insulation shall be continuous through walls, ceiling or floor openings, or sleeves; except where fire-stop or fire-safing materials are required.

E. Metal shields shall be installed between hangers or supports and the piping insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Inserts shall be of equal thickness to adjacent insulation and shall be vapor sealed accordingly.

F. Insulation shall not be installed in the following locations unless otherwise noted:

1. On vacuum return lines less than 50 feet long.

2. On unions, flanged connections or valve handles.

3. Over edges of any manhole, clean-out hole, clean-out plug, access door or opening to a fire damper, so as to restrict opening or identification of access.

4. Over any label or stamp indicating make, approval, rating, inspection, or similar data, unless provision is made for identification and access to label or stamp.

3.02 INSTALLATION OF COOLING PIPING SYSTEM INSULATION

A. General: Refrigerant piping and condensate drain lines, after having been tested, shall be cleaned and insulated.

B. Application: Insulation on refrigerant suction lines and liquid lines, if indicated, and air conditioner interior drain lines shall be jacketed with fire-resistant vapor barrier of laminated aluminum foil consisting of 2 plies with glass-yarn reinforcing. Jacket joints shall be lapped and sealed with an approved adhesive. Insulation shall be secured with aluminum bands not less than 0.005-inch thick by ¾-inches wide, spaced not over 12-inch on centers, or as recommended by manufacturer.

1. Longitudinal Seams: Butt hinged sections of covering tightly together and seal down jacket flap with adhesive, or with factory-applied, self-sealing lap with pressure-sensitive sealer protected with release paper.

2. End Joints: Wrap joint with a 3-inch wide (minimum) self-sealing tape.

3. Fittings and Valves: Fittings and valves shall be covered with same material of same thickness as pipe insulation, sealed with an approved, vapor-sealing tape or compound and covered with Johns Manville Zeston polyvinyl-chloride cover, Knauf Insulation Proto PVC Fitting Cover, Speedline Polyco Smoke Safe, or equal.

4. Pipe hangers shall be insulated or attached to pipe by an insulating insert, butted between adjoining insulation sections.

C. Additional Jackets:

1. Exposed Indoor Insulation: Cover with 26 gage galvanized sheet metal jacket to 8 feet above floors, except in mechanical equipment rooms and accessible pipe tunnels.

2. Exposed Outdoor Insulation: In addition to canvas or fiberglass cloth cover, provide 0.016-inch thick aluminum jacket with 1-inch wide aluminum bands and seals. Install appropriate jackets on valves and fittings.

3.03 INSTALLATION OF DUCTWORK AND PLENUM INSULATION

A. External Covering:

1. Before installing duct insulation, sheet metal ducts shall be clean, dry, and tightly sealed at joints and seams, inspected pressure tested, and accepted by Inspector.

2. Duct exterior insulation shall be firmly wrapped around ductwork with joints lapped a minimum of 2-inch. Insulation shall be securely fastened with 18 gage copper-lined steel wire, or 16 gage soft-annealed galvanized wire spaced approximately 12-inch on centers and at loose ends, presenting a neat and workmanlike appearance. Where duct width is such that wiring will not fasten insulation firmly against duct an adhesive shall be furnished to fasten insulation to duct with wiring being installed at ends of insulation segment.

3. Insulation on ductwork transporting conditioned air, both supply and return, and outside air intake ducts when pre-conditioned, shall be furnished with a factory-applied, fire-resistant vapor barrier.

4. Exposed Ducts or Plenum:

a. Install insulation to ducts or plenum furnished with butt joints, without voids and with adhesive over entire surface of duct. Cover insulation with canvas jacket, fastened tightly to insulation with lagging adhesive. Install 2 finish coats of undiluted adhesive.

b. When installing jacket, finished covering shall be even and level, without humps, with constant diameters on round ducts maintained.

B. Interior insulation - lining:

1. Dimensions of ducts indicated are net inside dimensions and must include thickness of duct liners to obtain the required duct size.

2. Install insulation in square turns, where required, to cover interior surfaces before duct turns are installed.

3. Install lining material during fabrication of duct with sealed face only exposed to air stream.

4. Interior insulation in ducts or plenums shall not have exposed edges. Edges open to entering or leaving air streams shall be covered, secured in place and sealed with approved duct liner edge sealers.

5. Insulation shall be fastened to sheet metal with an approved fire-retardant adhesive, with minimum 90 percent coverage and edges firmly adhered.

6. Mechanical fasteners shall supplement the adhesive on top sections of ducts more than 12-inch wide and on sides of ducts more than 24-inch high and shall be spaced on 16-inch centers maximum. Fastener posts shall be cut off approximately ¼-inch from metal disc.

3.04 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 23 30 00

AIR DISTRIBUTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Ductwork and appurtenances required for a complete air transmission and distribution system for the heating, ventilating, and air conditioning systems indicated on Drawings and as specified.

B. Related Requirements:

1. Division 01: General Requirements.

2. Section 09 90 00: Painting and Coating.

3. Section 23 05 00: Common Work Results for HVAC.

4. Section 23 05 13: Basic HVAC Materials and Methods.

5. Section 23 05 48: HVAC Sound, Vibration and Seismic Control.

6. Section 23 07 00: HVAC Insulation.

7. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

1.02 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 05 00: Common Work Results for HVAC.

B. Manufacturer's Data:

1. Complete list of items to be furnished and installed under this Section. Material lists that do not require performance data shall include manufacturer names, types and model numbers.

2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements.

3. Literature shall include descriptions of equipment, types, models, sizes, capacity tables or curves marked to indicate performance characteristics, electrical requirements, options selected, space requirements, including allowances for servicing, and other data. Data shall include name and address of nearest service and maintenance organization that regularly stocks repair parts. Listings of items that function as parts of an integrated system shall be furnished at one time.

4. Submit complete acoustical test reports showing that proposed products have been tested in accordance with latest editions of relevant ASHRAE and AHRI Standards (ANSI/ASHRAE Standard 70 for air inlets and outlets; ANSI/ASHRAE Standard 130 and AHRI 880 for terminal units) and will be suitable for operation in Project spaces with

specified maximum noise criteria (NC) requirements. The results of all testing shall be certified by an independent testing agency and submitted to the ARCHITECT for approval. The submittal shall include a complete description of the test conditions, methods and procedures.

5. Submittals shall include a tabulation of proposed products, identification of Project spaces where proposed products are to be installed, maximum allowable NC for all Project spaces, and product NC (at specific design air volume) for all Project spaces.

6. Shop Drawings: Shop Drawings indicating methods of installation of equipment and materials, sizes and gages of ducts, and details of supports. Items to be covered shall include but not be limited to following:

   a. Layout of ductwork and equipment drawn to scale to establish that equipment will fit into allotted spaces with clearance for installation and maintenance. Indicate proposed details for attachment, anchoring to, and hanging from structural framing of building. Indicate vibration isolation units, foundations, supports, and openings for passage of pipes and ducts.

   b. Drawings indicating locations and sizes of sleeves and prepared openings for pipes and ducts.

   c. Typical details of supports for equipment and ductwork.

1.03 QUALITY ASSURANCE

A. Installer's and Manufacturer's Qualifications: Comply with provisions stated under Section 23 0500: Common Work Results for HVAC.

B. Sound power level measurements and Manufacturers' NC value calculations shall be conducted in complete accordance with the latest version of ANSI/ASHRAE Standards 70 and 130 and AHRI 880.

1.04 DELIVERY, STORAGE AND HANDLING

A. Comply with provisions stated in Section 23 0500: Common Work Results for HVAC.

B. Ensure ducts are clean and free of dirt, dust, moisture, oils and other contaminants that can lead to poor air quality. Cover openings of ductwork with a self-adhering protective film. Film shall not leave a residue on metal after removal, and shall be highly resistant to tears and punctures.

1.05 COORDINATION

A. Coordinate activities in accordance with provisions of Section 23 0500: Common Work Results for HVAC.

PART 2 – PRODUCTS

2.01 GENERAL

A. Unless otherwise noted, provisions, including amendments thereto, of the latest edition of the HVAC Duct Construction Standards of Sheet Metal and Air Conditioning Contractor’s National

Association (SMACNA) and the California Mechanical Code (CMC), are hereby made part of this Section.

B. Rectangular, round and flat oval ducts shall be manufactured and installed in accordance with requirements of the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA.

C. Sheet metal ducts shall be fabricated from galvanized steel, aluminum or stainless steel.

D. Galvanized steel ducts shall be fabricated of galvanized steel sheet, lock forming grade, conforming to ASTM A653 and A924.

E. Galvanized steel ducts gage thickness and permissible joints and seams of ductwork shall conform to requirements of the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC unless noted otherwise on the drawings. The more stringent requirements shall prevail.

F. Button punch snap-lock seams, using Lockformer or equal, shall be permitted only in concealed areas using 20 and 22 gage galvanized steel ducts with screws added at the ends. Button punch snap-lock is not permitted for aluminum or duct lighter than 22 gage.

G. Ducts shall be reinforced in accordance with the latest edition of the SMACNA HVAC Duct Construction Standards: Cross-broken Duct: Duct sizes 19 inches wide and larger which have more than 10 square feet of unbraced panel shall be beaded or cross-broken. This requirement is applicable to 20 gage or less thickness and 3 inches w.g. or less pressure. For details, refer to SMACNA manual.

H. Round and Oval Galvanized Steel and Aluminum Ducts:

1. Round Spiral Ducts and Fittings: Fabricated from galvanized sheet steel shall be machine-formed spiral pipe with sealed spiral locking joints. Fittings shall be furnished with continuous corrosion-resistant welds. Provide gages of ducts and fittings recommended by manufacturer.

2. Details of seams and transverse joints for round duct and fittings shall conform to SMACNA standards.

3. Flat oval ducts shall be provided as indicated on the Drawings. Reference standard details in SMACNA manual.

4. Minimum duct wall thickness, and permissible joints and seams of ductwork for flat oval duct construction shall conform to requirements in the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA and the CMC. The more stringent requirements shall prevail.

5. 5. These provisions apply for ducts furnished for indoor comfort heating, ventilating and air conditioning service only.

I. Flexible Ducts

1. Flexible duct shall be non-metallic, insulated for conditioned air supply and return. The flexible ducts shall be factory fabricated with exterior reinforced laminated vapor barrier, 1 ½-inch thick fiber glass insulation (K = 0.25 at 75 degrees F), encapsulated zinc-coated spring steel wire helix and impervious, smooth, non-perforated interior vinyl liner and factory fabricated steel connection collars. For the composite assembly,

including insulation and vapor barrier, comply with NFPA Standard 90A or 90B and tested in accordance with UL Standard, UL 181. Non-insulated metallic ducts shall be provided for exhaust only.

2. Methods of installations, standards for joining and attaching, and supporting flexible duct shall conform to applicable provisions of SMACNA manual.

3. Specifications herein shall not supersede installation requirements by flexible duct manufacturer if those are more stringent.

J. Aluminum Ducts:

1. Material for aluminum duct shall be of 3003-H14 alloy aluminum sheets, with such designation embossed or stenciled on each sheet. Minimum tensile strength shall be 19,000 psi.

2. Aluminum duct thickness and permissible joint and seams shall conform to requirements of the latest edition of the HVAC Duct Construction Standards-Metal and Flexible of SMACNA, and CMC.

3. Aluminum ductwork shall be furnished to transport moisture-laden air from shower rooms, shower drying rooms, dishwashers and discharge ducts from evaporative condenser and cooling towers.

4. Unless otherwise noted, follow SMACNA Duct Construction Details for steel construction standards as indicated for unreinforced duct, reinforced duct, or cross-broken duct.

5. Button punch snap-lock seams on aluminum ducts are not permitted.

K. Stainless Steel Duct:

1. Materials for stainless steel duct shall be stainless steel conforming to ASTM A167 and A480.

2. Stainless steel ducts shall be provided as required and indicated on the Drawings.

3. Fume hood exhaust shall be stainless steel Type 304.

4. Kitchen exhaust duct system shall be stainless steel Type 304.

5. Stainless steel ducts shall be constructed with welded joints except for connections to equipment which shall be flanged joints with gaskets.

6. Entire stainless steel duct systems shall comply with current CMC requirements for product conveying ducts except where the requirements of this Section are more stringent.

L. Fittings and Other Construction Details: Details of fittings such as elbows, turning vanes, branch take-off and connections, duct access doors, connections for grilles, registers and ceiling diffusers, flexible connector at fan, etcetera, shall conform to applicable provisions of this Section or SMACNA manual.

M. Duct Seam and Joint Sealant: Provide sealant for metal ducts at duct joints which are defined as transverse joints between duct sections including girth joints, branch and sub-branch

intersections, duct collar tap-ins, fitting subsections, louver and air terminal connections, access doors and frames, and abutments to building structure. Also provide the same at duct seams which are defined as longitudinal joint between duct sections. Spiral lock seams in factory fabricated round or oval ducts are excluded.

1. Sealant for low-pressure ducts shall be: Design Polymerics DP1010 or DP1020, Childers CP-145A/CP-146 Chil-Flex, Foster's 32-19 Duct-Fas, Miracle-Kingco Glenkote Seal-Flex, Ductmate Industries PROseal or FIBERseal, or equal.

2. Provide sealing material for medium-pressure ducts as described in the SMACNA manual for those pressures.

3. Sealant materials shall comply with the flame spread and smoke developed rating of current CMC when tested in accordance with ASTM E84.

4. Sealant for exposed to weather ducts shall pass the Weather Resistance Test per ASTM G154 at 2000 hours QUV.

N. Restrictions:

1. Zinc-coated steel duct shall not be installed for ductwork transporting moisture-laden air. Flexible duct may only be furnished where specifically indicated on Drawings. Aluminum ducts shall not be installed for internal pressures above 2 inches of water.

2. Fiberglass duct is not permitted as a substitute for sheet metal duct.

2.02 DAMPERS

A. Manually Operated Volume Control Dampers:

1. VD-1, Rectangular: Multi-blade type, opposed blade operation, 16 gage galvanized steel blades; center pivoted on 3/8 inch diameter steel trunnions; interlocking edges; dampers shall be in own angle frame, full duct size as indicated on Drawings; frame of minimum 16 gage steel channel construction. Provide with damper operator and axles positively locked to blade. Ruskin MD35, Pottorff MD-42, Greenheck MBD-15 or equal.

2. VD-2, Round: Frame shall be constructed of not less than 20 gage galvanized steel, blades of not less than 20 gage galvanized steel channel construction with factory neoprene seals, ½ inch diameter axle shafts and locking hand quadrant. Ruskin MDRS25, Greenheck MBDR-50, or equal.

3. VD-3, Oval: Frame shall be constructed of not less than 14 gage galvanized steel channels with factory blade seals of not less than 12 gage galvanized steel with not less than ½ inch diameter axle shafts. Provide Ruskin standard construction for frame, blade and axle size, thickness and material variation. Provide adjustable locking hand quadrant. Ruskin CDO25, or equal.

B. Motorized Volume Control Dampers:

1. MVD-1, Rectangular: Multi-blade type opposed blade operation, 16 gage minimum steel channel frame construction; 16 gage galvanized steel blades center pivoted on ½ inch diameter steel trunnions. Interlocking edges. Dampers shall be in own angle frame. Full duct size as indicated on the Drawings. Provide with matching two position

motorized actuator with linkages, 24VAC by Belimo, Honeywell, Invensys, or equal. Ruskin CD35, Pottorff CD-42, Greenheck VCD Series, or equal.

2. MVD-2, Round: Butterfly type constructed with minimum 20 gage galvanized steel frame with steel angle reinforcement on above 20-inch diameter. Blade shall be 14 gage minimum thickness. Neoprene seal to ensure air tightness in closed position. Furnish with matching two position motorized actuator with linkage 24 VAC by Belimo, Honeywell, Invensys, or equal. Ruskin CDRS25, American Warming and Ventilating (AMV) VC-25, Air Balance, Inc. AC530, or equal.

3. Electronic Damper Actuators: Belimo, Honeywell, Invensys, or equal.

   a. Sized for torque required for damper seal at load conditions.

   b. Coupling: V-bolt dual nut clamp with a V-shaped toothed cradle. Aluminum clamps or set screws are not acceptable.

   c. Overload Protection: Microprocessor or an electronic based motor controller providing burnout protection if stalled before full rotation is reached. Actuator shall be electronically cut off at full open to eliminate noise generation with the holding noise level to be inaudible.

   d. Power Requirements: As indicated on Drawings.

   e. Actuator Timing: Shall meet 15 seconds.

   f. Temperature Rating: Actuator shall have a UL 555S listing by damper manufacturer for 350 F.

   g. Auxiliary Switches: Provide for signaling, fan control, and position indications.

C. Automatic Fire Dampers:

1. FD, Fire Dampers: Shall conform to requirements of and be listed by State of California Fire Marshal and NFPA 90A. Dampers shall provide airflow resistance not to exceed 0.05 inch water gage static pressure at 900 fpm or 0.25 inch water gage at 2,000 fpm. Dampers shall be installed in required steel sleeve at each penetration of a rated partition.

   a. Vertical-mounted fire dampers: Fire damper shall be curtain type with blades removed from the air stream to allow for maximum free area. Dampers will be provided in factory sleeves as tested and listed by manufacturer. Dampers shall be rated for 1 ½ hours for installation in one or 2-hour partitions. Provide UL listed fusible links of adequate size and temperature rating. Dampers will be installed according to the manufacturer's recommended installation instructions provided with units. Provide suitable access for inspection and servicing of each damper. Pottorff VFD-10/VFD-10D Series, Ruskin IBD/DIBD Series, Greenheck FD/DFD Series, or equal.

   b. Ceiling fire dampers: Ceiling fire dampers shall be butterfly type with ceramic material to minimize heat radiation. Dampers shall be rated for one hour and shall be furnished as a part of an integral sleeve ceiling box that will accept air distribution, have a UL listed and pre-mounted hanger tabs. Dampers shall be installed according to the manufacturers recommended installation instructions. Pottorff CFD-15 Series, Ruskin CFD Series, Greenheck CRD-1 Series/CRD-2, or equal.

c. Combination fire and smoke dampers: Combination fire and smoke dampers shall be louver bladed type. Units shall be tested and listed under UL 555 and UL 555S. Rating 1 ½ hours for installation in one or 2-hour partitions. The seals shall be non-degradable steel to steel. Leakage shall not exceed 15 cfm/sq. ft. at one inch w.g. and shall be tested at 850 degrees F. Dampers shall be capable of being remotely controlled and reset for pressurization and smoke evacuation. Fire-releasing device shall be UL 33 listed melting fusible links. Dampers shall be provided in sleeves with pre-mounted non-stall motor actuators and dual-position indicators for remote annunciation, if required. The complete assembly shall be factory cycled and tested prior to shipment. Provide suitable access for inspection and servicing of each damper. Pottorff FSD-141 with non-stall motor, Ruskin FSD37 or FSD60 with electric fuse link Model EFL 200, with electric non-stall motor, Greenheck FSD Series, with non-stall motor, or equal.

2. Electronic Damper Actuators: Refer to Sub-paragraph 2.04.B.3.

D. Relief Dampers: Parallel multi-blade, counter balanced type with adjustable counter weights. Constructed of 20 gage galvanized sheet steel or extruded aluminum with solid stops all around. Bearings shall be dust proof, ball bearings. Damper shall open on a positive pressure of 0.01 inch within space and close to a backdraft. Interlocking edges shall prevent dust infiltration when closed. Air Balance, Inc., Pottorff, Ruskin, Metal Form Manufacturing Co. Inc., or equal.

E. Duct Access Panels: Provide factory fabricated access panels in ducts where required for servicing fire or smoke dampers, and at other locations as specified in this Section. Units shall consist of removable panel, gasketed and pressure sealed by controlled spring tension locks. Construct unit, including interior parts, of same material as duct. Units shall be constructed to be suitable for installation in systems of up to 5 inches water gage static pressure.

2.03 AIR DISTRIBUTION DEVICES

A. General:

1. Grilles, registers, diffusers and appurtenances shall conform to requirements specified herein and shall be of type and sizes as specified and indicated on Drawings. Performance shall be in accordance with ANSI/ASHRAE Standard 70 including airflow velocity, pressure, temperature, and sound measurements.

2. Sponge neoprene, rubber, vinyl or felt border gaskets shall be provided for surface-mounted registers, grilles or diffusers.

3. The noise generating characteristics of all specified grilles, registers, and diffusers shall be tested to, and comply with, all requirements of this specification. Representative samples shall be subjected to tests in accordance with applicable standards and procedures in order to demonstrate such compliance. A special test for this project is not required if the manufacturer has previous certified test results that can be made applicable to this project. Maximum Sound Levels of diffusers, grilles and registers shall be as follows:

Administrative office area:	NC 30
Classrooms:	NC 20
Libraries and other noise sensitive areas:	NC 25
Gymnasiums, cafeterias, lockers areas:	NC 30

4. Provide suitable frame types to match the ceiling types as specified or indicated on the Architectural Drawings.

5. Ceiling diffusers shall be provided with equalizing grids.

6. Ceiling mounted grilles, registers and diffusers shall be provided with a factory applied, baked enamel, dull finish, bone white to match acoustical ceiling tile.

7. Grilles or registers mounted on painted walls or other surfaces shall be furnished with a baked prime coat and finish painted in accordance with Section 09 9000: Painting and Coating.

8. Do not provide opposed blade dampers at diffusers and registers to balance the airflow, as they tend to create noise. Provide a manual volume damper at each branch take-off and also at branch duct to each diffuser and register upstream of the flexible duct connections. Air throw patterns shall be as indicated on the drawings.

9. Diffusers, registers and grilles indicated or scheduled on the drawings to comply with special requirements shall take precedence over the standard items specified.

B. Ceiling Diffusers - Round, Square, Rectangular:

1. CD-1 For non-classroom areas of less than 10 feet ceiling height only. Units shall be square or rectangular modular core type as indicated on the drawings. Anemostat QC Series, Krueger Model 1240, Price SMCD Series, or equal.

2. CD-2 For typical classrooms. Units shall be square plaque type. Anemostat PG Series, Krueger Model PLQ, Price SPD Series, or equal. The horizontal air discharge pattern shall be 360-degree radial type with factory installed blank-offs for three way, two way corner, two way opposite, or one way discharge pattern.

3. CD-3 For non-classroom areas of higher than 10 feet ceiling height. Units shall be square or rectangular louver faced type. Anemostat D Series, Krueger Model SH, Price SMD/AMD Series, or equal.

4. CD-4: Units shall be round, adjustable pattern, and surface-mounted type. Anemostat C-27, Krueger RM Series, Price RCDE Series, or equal.

5. CD-5: Units shall be adjustable linear slot type. Anemostat SLAD Series, Krueger Model 1900, Price AS Series, or equal.

C. Grilles - Return, Exhaust, Ceiling, Square, Rectangular:

1. GR-1 Acoustical Tile on Plaster Ceiling: Return and exhaust grilles shall be single deflection type with horizontal fixed face bars set at straight or 45 degree angle, ½ inch spacing and flush and flanged for surface mounting. Anemostat S3HD Series, Kruger Model S80/S85, Price 500/600 Series, or equal.

2. GR-2 Prefabricated Acoustical Tile Ceiling with Inverted Exposed T-Bars: Return and exhaust grilles shall be with single deflection horizontal fixed face bars, set at straight or 45 degree angle, ½ inch spacing and flush, lay-in panel type with nominal overall dimension of 24-inch by 24-inch. Anemostat Type SAC3L Series, Krueger Model S80/S85, Price 500/600 Series, or equal.

D. Registers, Supply, Return, Wall:

1. WR-1: Sidewall supply register shall be double deflecting type with loose key-operated opposed blade volume control. Anemostat S2 Series, Krueger Model 80/880, Price 500/600 Series, or equal.

2. WR-2: Sidewall return register shall be single deflecting type with horizontal fixed face bars set at 45 degree angle flush and flanged for surface mounting and complete with loose key-operated opposed blade volume control. Anemostat S3 Series, Krueger Model S80/S85, Price 500/600 Series, or equal.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 DUCTWORK

A. Construct ductwork according to details of fabrication and methods of support, as indicated in the SMACNA manuals and CMC, unless specified or indicated otherwise in this Section or on Drawings. In event of conflict, the most stringent requirement shall be provided.

B. Unless otherwise required, construct ducts to conform accurately to dimensions indicated and to be straight and smooth on inside, with joints neatly finished.

C. Duct dimensions indicated are net inside dimensions.

D. Where aluminum is welded, provide a minimum thickness of 16 gage, and use gas inert tungsten process of welding.

E. Anchor ducts to building structural slab, framing and roof decking and detail method of anchoring and fastening if not indicated on Drawings. Supports shall be seismically constructed as required by the latest edition of the SMACNA guidelines.

F. Construct and install ducts to be completely free from vibration under operating conditions.

G. Indicate on layout drawing, required for suspended ductwork, location of supports, loads imposed on each fastening or anchor, typical details for anchorage, and details for special anchorage for supports attached to metal roof decking.

H. Attach supports only to building structural framing members and concrete slabs.

I. Where supports are required between structural framing members, detail and install suitable intermediate metal framing.

J. Ducts transporting air-conditioned or heated supply air shall be insulated in accordance with requirements of Section 23 0700: HVAC Insulation.

1. Ducts exposed to weather shall be prefabricated double wall type from HVAC equipment through building envelope.

K. Ferrous angles and structural members and joining collars specified for construction and support of ductwork and plenums shall be primed with one heavy coat of required asphaltic aluminum paint before installation or fabrication. Metal surfaces shall be thoroughly cleaned before installation of paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls are not required to be primed or painted.

L. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

3.03 DUCT CONSTRUCTION

A. Minimum ductwork gages, joints, reinforcing, and bracing of ductwork shall conform to SMACNA and CMC. The most stringent standards shall prevail. Additional bracing shall be provided to prevent objectionable panel vibration.

B. Button punch snap-lock seams, using Lock-former or equal, shall be permitted only in non-accessible areas using 20 and 22 gage galvanized steel ducts with screws added at the ends. Button punch snap-lock is not permitted for aluminum or duct lighter than 22 gage.

C. Provide longitudinal seams of the grooved snap lock, or Pittsburg and standing, sealed spiral or continuously welded.

D. Ferrous angles and structural members and joining collars specified for the construction and support of ductwork and plenums shall be primed with one heavy coat of asphalt aluminum paint before installation or fabrication. The metal surface shall be thoroughly cleaned before application of the paint. Galvanizing may be provided instead of painting. Installed duct hanger rods concealed in furred ceilings and walls is not required to be primed or painted.

E. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

F. S-type or drive-slip type girths or longitudinal seams shall not be furnished for ductwork installed outdoors or mounted on roofs.

G. Broken places in galvanized coating shall be acid washed and then completely soldered over or painted with galvanizing paint.

3.04 DUCT ELBOWS AND TURNING VANES

A. Duct elbows, including supply, exhaust, and return, shall be provided with a centerline radius of 1.5 times duct width parallel to radius whenever possible; centerline radius shall not be less than width of duct parallel to radius.

B. Where space does not permit above radius, or where square elbows are indicated on Drawings, turning vanes shall be installed whether indicated on Drawings or not.

C. Turning vanes shall conform to SMACNA and CMC.

3.05 DUCT JOINTS AND SEAMS

A. Conditioned air supply ducts shall be furnished with joints and seams sealed, welded for air tightness, except spiral seam factory machine formed duct components. Spiral seam is exempted. Joints between slip-fit components may be assembled with all seams and joint connections fastened with screws.

B. Other ducts shall be furnished with joints and seams sealed by using sealant, taping, soldering, or welding. Ducts for grease hood exhaust shall be furnished with grease-tight welding or brazing on external surface for joints and seams. Fiberglass ducts shall be provided with a thermally activated closure system, Johns Manville Fortifiber Therm-Lock with Automatic Bond Indicator dots, or equal.

C. S-slip or drive-slip type girths or longitudinal seams are not permitted on exterior or exposed rooftop mounted ductwork.

D. Caulking, taping, or other joint or seam treatment shall be provided in accordance with recognized standards.

E. Seams around fan, coil housing and plenums shall be sealed with gaskets or sealing compound to provide an airtight assembly.

F. Stainless steel ductwork connected to range hoods and fume hoods shall be provided with grease-tight, gas tight welded seams, and shall be constructed and installed so that grease or other material cannot become pocketed in any portion thereof, and system shall slope downward toward hood not less than 1/4 inch per lineal foot. Gasketed flanged joints with sealing compound shall be used only at fan and fume hood connections.

G. Alternative duct connectors such as Ductmate Industries, Mez Industries, or equal may be used if the following conditions are met:

1. One of the specifically listed connectors is submitted and approved by the ARCHITECT and OAR.

2. The correct size connector, application, and gage of material conform to SMACNA Standards.

3. The connector is installed per manufacturer’s specifications.

3.06 DUCT TRANSITION

A. Slopes in sides of transition pieces shall be no greater than 1 to 5. Abrupt changes or offsets in duct system are not permitted, except when reviewed by the ARCHITECT.

3.07 DUCT TEST HOLES

A. Holes in ducts and plenums shall be provided for pilot or static tubes for obtaining air measurements to balance or check air systems. Holes shall be covered with neoprene gasketed sheet metal cover or plugged with a fitted neoprene plug chained to duct.

3.08 FLEXIBLE CONNECTIONS

A. At points where sheet metal connections are installed to fans or air handling units, or where ducts of dissimilar metals are connected, a flexible connection of commercial grade, Duro Dyne Durolon, Ventfabrics Ventglas, Ductmate Industries Proflex, or equal, non-combustible material shall be installed and securely fastened by zinc-coated steel clinch-type bands or a flange type connection. Inlet and outlet openings shall be axially in-line, maximum deviation of centerline shall be less than 5 percent of diameter or shortest dimension of a rectangular inlet of fan or air handling unit, with system at rest. Duct end of connection shall be seismically restrained if more than 4 feet from last support.

3.09 AIR TERMINAL DEVICES

A. General: Install supply devices after ducts, plenums, and casings have been cleaned and blown free of small particles, as specified. Devices shall be aligned to be parallel to ceiling construction or walls and ceiling surfaces, and shall be pulled tightly to compress gaskets and to fit neatly against surfaces.

B. Diffusers: Support surface mounted ceiling diffusers from angles or channels resting on and fastened to ceiling construction. Do not support from ducts. Install lay-in diffusers on T-bar ceilings with hanger wires from each corner and not supported by ceiling structure. Provide sheet metal adaptor box above each diffuser to allow space for volume controller with round collars for connection to round ducts where indicated on Drawings. Fasten duct-mounted diffusers to duct collars.

C. Registers and Grilles:

1. Install wall supply registers at least 6 inches below ceiling, unless otherwise indicated. Locate return and exhaust registers 6 inches below ceiling unless otherwise indicated.

2. Support ceiling diffuser type inlets, registers, and grilles as required above for ceiling diffusers.

3. Fasten wall mounted and duct mounted registers and grilles to flanges of duct collars.

3.10 DAMPERS

A. Manually operated dampers, gravity dampers, fire dampers, and motor operated dampers shall be furnished and installed as specified and indicated. Upon completion of installation, dampers shall be checked, lubricated, and adjusted so that they operate freely, without binding. Dampers shall be of standard commercial manufacture, complete with damper frame. Where painting is required, they shall be shop finished unless otherwise noted.

1. Provide and install manual volume dampers per SMACNA standards to allow balancing per AABC, NEBB or TABB Procedures and Standards whether indicated on the drawings or not.

2. Balancing dampers shall be installed in main supply ducts from fan discharge plenums, where two or more ducts are connected to each plenum, although such balancing dampers may not be indicated. Each zone shall be provided with a manual volume damper. Sheet metal screws shall be installed through handles and into ducts to lock damper in place after test and balance.

3. Each supply, return, and exhaust branch shall be provided with manual volume dampers.

4. Do not provide opposed blade dampers at air inlets and outlets.

5. Each supply, return, and exhaust inlet or outlet shall be provided with a manual volume damper. This damper shall be a minimum of 5 feet upstream of the air outlet and inlets. An acoustic flexible duct should be provided between the outlet and inlet and the damper for concealed ducts.

6. Dampers installed in accessible locations shall be provided with locking and indicating quadrants. Ventfabrics Ventlok, Duro Dyne, Young Regulator Co., or equal.

7. Dampers installed in ductwork in furred ceiling spaces or in roof spaces with less than 30 inches of clearance below beams, joists, or other construction, and where access panels are not provided shall be furnished with damper rods extended below ceiling and terminated with a concealed damper regulation. Ventfabrics Ventlok, Young Regulator Co., Duro Dyne, or equal.

8. Dampers not identified as splitter, extractor, or butterfly dampers shall be of multi-louver type arranged for opposed blade operation. Damper shall be same dimension as adjoining duct and be tight closing. Blades shall not be greater than 9 inches. Dampers shall be not less than 18 gage steel.

9. Motor operated dampers shall be furnished by temperature control manufacturer as part of temperature control equipment and shall conform to requirements of Section 23 0900: HVAC Instrumentation and Controls.

10. Dampers shall be provided with accessible operating mechanisms. Where operators are exposed in finished portions of building, operators shall be chromium-plated with exposed edges rounded. Splitter dampers are not permitted unless specified and reviewed by the ARCHITECT.

11. Dampers shall not be installed in combustion air ducts.

12. Access panels shall be installed for access at each damper's operating mechanism.

3.11 FIRE AND SMOKE DAMPERS

A. Fire dampers or combination fire and smoke dampers shall be installed and accessible at duct penetrations of rated walls and partitions and as required by State Fire Marshal and NFPA 90A, 92A, 92B, and 101.

B. Fire dampers shall be sized, and adjoining duct enlarged, to assure full size air passage of connecting ductwork.

C. Install smoke dampers as indicated on Drawings and as required in ducts penetrating smoke isolation separations.

D. Fire dampers or combination fire and smoke dampers shall be electrically actuated, power open-fail close type, UL 555 and UL 555S classified for 1-1/2 hours.

E. Provide a service disconnect switch for each and every combination smoke and fire damper.

3.12 DETECTORS

A. Smoke detectors shall be installed in accordance with requirements of the California Mechanical Code.

B. Smoke detectors shall be installed in systems of over 2000 CFM capacity to detect presence of smoke and automatically shut down air handling units or fans unless it has been verified with the electrical installer that Exception 1 to CMC 609.0: Automatic Shutoffs, regarding automatic shutdown of systems with total coverage smoke detection systems is applied.

C. Smoke detectors shall be installed in supply system downstream of filters.

3.13 BACKDRAFT DAMPERS

A. Backdraft dampers shall be installed at locations indicated in accordance with the State of California Building Energy Efficiency Standards, Title 24, CCR.

3.14 DUCT SLEEVES AND PREPARED OPENINGS

A. Furnish duct sleeves for 15-inch diameter ducts or less passing through floors, walls, ceilings, or roof and install during construction of the floor, wall, ceiling, or roof. Install round ducts larger than 15 inches diameter and square and rectangular ducts passing through floors, walls, ceilings or roof through prepared openings. Provide duct sleeves and prepared openings for duct mains and duct branches.

B. Provide one inch clearance between duct and sleeve or between insulation and sleeves for insulated ducts, except at grilles, registers and diffusers.

C. Provide prepared openings for round ducts larger than 15 inches in diameter and for square and rectangular ducts with one inch clearance between duct and openings or between insulation and opening for insulated ducts, except at grilles, registers and diffusers.

D. Provide closure collar of galvanized sheet metal not less than 4 inches wide unless otherwise indicated on Drawings on each side of walls or floors where sleeves or prepared openings are provided except where grilles or diffusers are installed. Install collar tight against surface. Fit sharp edges of collar installed around insulated duct to preclude tearing or puncturing insulation covering vapor barrier. Fabricate collars from round ducts in steel. Provide not less than 4 nails to attach collar where openings are 12 inches in diameter or less and not less than 8 nails where openings are 20 inches in diameter or less.

E. Pack space between sleeve or opening and duct or duct insulation with commercial grade packing yarn.

3.15 FLEXIBLE DUCT RUNOUTS

A. Runouts from branches, risers or mains to air terminal units and outlets may be pre-insulated, factory fabricated flexible ducts complying with NFPA 90A. Flexible ductwork shall not exceed 7 feet in length. When required to suspend flexible ducts, furnish hangers of type recommended by manufacturers of pre-insulated flexible duct and install at intervals recommended. Method of attachment to other components of air distribution system for a vapor-tight joint shall be in accordance with printed instructions of flexible duct manufacturer. Bend radius shall be 1-1/2 times diameter of duct, measured from centerline. Bends greater than 90-degree angle are not permitted. Non-metallic flexible duct shall be permitted only in T-bar suspended ceilings.

3.16 DUCT HANGERS AND SUPPORTS

A. Exposed or easily accessible ductwork: All exposed ducts shall be supported by all-thread Rod as a single hanger and or a trapeze support for rectangular duct work in accordance with requirements of the latest edition of the HVAC Duct Construction Standards – Metal and Flexible of SMACNA.

B. Non-accessible ductwork: Non-exposed and hidden from sight during regular school operations ductwork, rigid round, rectangular, and flat oval metal ducts, shall be installed with support systems conforming to SMACNA Standards.

C. Where ducts are installed one above the other, they shall be individually supported on a trapeze of steel angles with 3/8 inch supporting steel rods securely fastened to overhead construction. A minimum distance of 3 inches shall be maintained between ducts wherever possible, but in no event shall distance be less than 2 inches. Minimum sizes of steel angles shall be 1 ½-inch by 1 ½-inch by 1/8 inch for duct sizes through 60 inches in greatest dimension, 2-inch by 2-inch by 1/8 inch for duct sizes 61 inches through 84 inches, 2-inch by 2-inch by 3/16 inch for duct sizes 85 inches through 96 inches, and 2-inch by 2-inch by 1/4 inch for duct sizes over 97 inches.

D. Ducts six square feet area and greater and or minimum 28” round or greater shall be seismically restrained. Refer to Section 23 0548: HVAC Sound, Vibration and Seismic Control.

E. Hangers shall not be supported by, or fastened to, non-structural members including blocking. Toggle or Molly type bolts are not permitted.

F. Vertical ducts shall be supported with suitable angles on each side of each duct located at each floor and at intervals not to exceed 8 feet. Angles shall be sized and installed according to SMACNA Standards for required span so that they will be rigid, without bending or sagging.

G. Roof-mounted ductwork shall be installed a minimum 12 inches above roof and shall be supported by galvanized welded pipe, one on each side, fastened to roof structure, flashed and sealed to roof membrane. Install supports at each turn, unit connections, and each penetration, and space at maximum 6 feet off-center in general. Pitch pockets are not allowed.

3.17 ACCESS PLATES AND DOORS

A. Access plates and doors shall be furnished and installed where stops, valves, fire dampers, fusible links, coils, damper operating mechanism, control equipment, lubrication fittings, air filters, air handling equipment and similar items normally requiring adjustment or servicing are installed in concealed spaces.

B. Access plates and doors shall be located to permit convenient access to equipment sized to permit removal of equipment for servicing. Access plates shall be no less than 12-inch by 12-inch in clear opening. Proper servicing of equipment requires adequate access for maintenance personnel. Access doors shall not be less than 24-inches by 24-inch, unless otherwise detailed. Two or more valves shall not be located in same access area unless sufficient clearance is provided for operation, servicing and removal of each valve.

C. Openings in ducts or plenums whose longer dimension does not exceed 12 inches may be covered by a plate of same material as duct, gasketed and fastened to duct or plenum with sheet metal screws.

D. Access plates in floors shall not be less than 8-inch by 8-inch and shall be carborundum surface brass with cast brass frames anchored into concrete. Access plates in tile walls shall be chromium plated brass and polished. Serrated plates furnished as part of a clean-out assembly are permitted in floors instead of a separate plate.

E. Access plates and doors in walls and ceilings of finished rooms and in locations normally accessible to students shall be furnished with continuous piano hinges, unless otherwise specified, and a special flush type spring-loaded latch requiring an Allen wrench to operate. Access devices shall be installed after plastering in plaster ground openings.

F. Access panels or doors penetrating one-hour fire resistive ceilings shall meet code requirements for such openings.

G. Access panels shall be fire-rated; Milcor, or equal. Access doors shall be as required for installation in openings penetrating one-hour fire resistive ceilings. Access doors shall be furnished with a flush, key-operated cylinder lock, furnished with two keys each, instead of Allen headlock for non-rated ceilings.

H. Access panels that are part of an integrated ceiling are specified in Section 09 8433: Cementitious Wood Fiber Acoustical Units. Identification markers shall be affixed to adjacent supports, under this portion of Work, to indicate location and type of mechanical device to be serviced.

I. Access panels installed in ducts or plenums located in heater or equipment rooms containing gas-fired equipment shall be furnished with heavy-duty spring closing hinges and refrigerator door type catches unless otherwise required. When these panels are intended for maintenance personnel access, catches shall be operable from both interior and exterior.

J. Other access panels, except those specified above, shall be furnished with suitable hinges and one or more sash fasteners.

K. Panels located in ducts and plenums shall be installed with gaskets made of synthetic rubber, felt, or similar material to provide an airtight installation. Panels shall be constructed and reinforced to prevent vibration.

L. Label the words "FIRE DAMPERS" on panels over fire dampers and words "DO NOT OPEN - HEATER IS OPERATING" on panels located in heater or equipment rooms. Letters shall be approximately 3 inches high, if space is available.

M. Furnish a key to operate latch access plates, one for each access plate, but not to exceed five keys for any one Project.

N. Access plates and panels shall be furnished with manufacturer's name or trade mark and model number cast or stamped thereon, or upon a label permanently affixed thereon.

O. Provide duct through roof flashing as detailed in the SMACNA standards or as indicated on Drawings.

P. Refer to SMACNA for access plate and door construction.

3.18 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose off the Project site.

3.19 PROTECTION

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION

SECTION 23 80 00

HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Air conditioning and air handling equipment including but not limited to:

1. Split System Heat Pump Units.
2. Single Packaged Air Conditioning Units.
3. VRF Heat Pump and Fan Coil Units

B. Related Requirements:

1. Division 01: General Requirements.
2. Section 07 60 00: Flashing and Sheet Metal.
3. Section 23 05 00: Common Work Results for HVAC.
4. Section 23 05 48: HVAC Sound, Vibration and Seismic Control.
5. Section 23 30 00: Air Distribution.

1.2 DESIGN REQUIREMENTS

A. The work of this Section is based on HVAC equipment units indicated as Basis of Design in Part 2 of this Section. Products from the different HVAC equipment manufacturers listed are never identical, although equivalent in capacity, performance and quality. In the cases where dimensions, weight, configuration and utility requirements differ from the products used as a basis of design, the Contractor, at no additional cost to the Owner, shall coordinate and submit, for Architect review, revisions to the design.

1.3 SUBMITTALS

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. For products listed that are not the basis of design, submit the following in addition to above requirements:

1. Title 24 Calculations: Replace HVAC unit values in calculation files provided by the Architect and submit for review.

1.4 QUALITY ASSURANCE

A. Provide submittals in accordance with Section 23 0500: Common Work Results for HVAC.

1.4 PROJECT RECORD DOCUMENTS

A. Provide Owner instructions on equipment operation and maintenance procedures, as indicated in Section 23 0500: Common Work Results for HVAC.

1.5 WARRANTY

A. Compressors shall be provided with manufacturer's five year warranty, replacement only.

B. Manufacturer shall warrant parts, except heat exchangers, for a period of five years.

C. Heat exchangers shall be provided with manufacturer’s ten year warranty, replacement only.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Capacities of air conditioning equipment indicated on Drawings are net capacities actually required. Standard catalog ratings shall be adjusted to actual Project site environmental conditions.

2.2 VRF HEAT PUMP AND FAN COIL UNITS

A. Manufacturer: Daikin, Mitsubishi, Carrier, Trane, York, Lennox, American Standard Heating & Air Conditioning, or equal.

1. Basis of Design: Carrier

B. HP and matching indoor fan coil units and condenser unit: Furnish VRF heat pump, split type, air-cooled, roof or ground installation with ducted connections or free blow. Units shall be air-cooled heat pump/direct expansion fan coil combinations. Heat pump outdoor section shall be factory assembled and furnished with direct-drive condenser fans with horizontal or vertical air discharge, scroll type compressor, refrigerant coil, fan motors, pre-wired control panel. Unit shall also be provided with a fully piped refrigerant circuit, fully charged with an environmentally friendly refrigerant that is not scheduled for phase out. Provide additional refrigerant for extended lines. Indoor fan coil units shall be furnished with horizontal discharge and will include evaporator coil, fan and motor, condensate pan with drain, thermal expansion valve, pre-wired control panel and remote thermostat control. Nominal unit cooling, heating capacities, electrical characteristics, and operating conditions shall be as indicated on Drawings.

C. Quality Assurance:

1. Cooling capacity rated in accordance with current AHRI Standard 210/240 and 270. Units shall be listed in AHRI.

2. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, and with NEC.

3. Units shall be constructed in accordance with UL standards and shall carry UL label of approval. Units shall have CSA approval.

4. Units shall be listed in CEC directory.

5. Unit cabinet shall be capable of withstanding ASTM B117 500 hour salt spray test.

6. Unit shall provide an EER/SEER/COP complying with CCR, Title 24, Building Energy Efficiency Standards and per the drawings.

D. Evaporator and condenser coils: Evaporator and condenser coils shall be copper with mechanically bonded, smooth aluminum plate fins. Tube joints shall be brazed with copper or silver alloy. Coils shall be pressure-tested at the factory. Protective metal guard for inlet and outlet of outdoor coil.

E. Fans:

1. Condenser Fan and Motors: Condenser fan shall be ECM type motor direct driven, propeller type arranged for horizontal or vertical discharge. Condenser fan motors shall be furnished with inherent protection, and shall be permanently lubricated type, resiliently mounted for quiet operation. Each fan shall be furnished with a safety guard.

2. Evaporator fan section shall be furnished with ECM type motor centrifugal, forward curved, double width, double inlet fan or fans installed on a solid shaft. Fan shall be statically and dynamically balanced and shall rotate on permanently lubricated bearings.

F. Unit Cabinets:

1. Cabinets shall be fabricated of galvanized steel, bonderized and finished with baked enamel.

2. Cabinet interior shall be insulated with minimum one inch thick foil face fiberglass.

3. Outdoor unit compartment shall be isolated and have an acoustic lining to assure quiet operation.

G. Compressor: Compressor shall be two stage or variable speed type hermetic scroll.

1. VRF Compressor shall be furnished with access valves and it shall be installed on rubber isolators to reduce sound vibration.

2. Furnish with high and low-pressure protection.

3. Each heat pump shall be furnished with factory installed suction accumulator. Field installed accumulators are not permitted.

4. It shall be furnished with high and low-pressure protection, brass external vapor supply line service valves, vapor return line service valves with service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader-type fittings with brass caps, filter drier, pressure relief, liquid line solenoid valves, thermostatic expansion valves, and a holding charge of refrigerant.

H. Refrigeration Components: Refrigerant circuit components shall include brass external liquid line service valve with service gage port connections, suction line service valve with service gage connection port, service gage port connections on compressor suction and discharge lines

with Schrader type fittings with brass caps, accumulator, bi-flow filter drier, pressure relief, reversing valve, heating mode metering device, and a holding charge of refrigerant.

I. Controls and Safeties:

1. Compressor motor assembly shall be protected with high and low-pressure switches, internal overloads, internal thermostat, internal relief valve, and anti-recycle relay, or time cycle device to prevent rapid cycling of compressor after any off cycle.

2. Control panel shall be pre-wired in unit casing.

3. The control circuit shall incorporate a safety circuit to render refrigerant system (compressor and outdoor air motor) inoperative should there be a loss of airflow or refrigerant.

4. Units shall also be furnished with automatic condenser-fan motor protection, high condensing temperature protection, compressor motor current and temperature overload protection, high pressure relief and condenser fan failure protection.

J. Low Ambient Operation: Head pressure control shall be provided for operation at outside air temperature below 45 degrees F.

K. Safeties:

1. High condensing temperature protection.

2. Compressor motor current and temperature overload protection.

3. High pressure relief.

4. Outdoor fan failure protection.

L. Filters:

1. Filters shall be 1-inch standard size high capacity replaceable media type, MERV 13, or equal, installed in an external 1-inch rack filter section and complete with an access door.

2. An-line filter-drier shall be furnished with equipment and installed at Project site.

M. Provide programmable digital thermostat with following features:

1. 7-day time clock.

2. Heat, cool, automatic changeover.

3. Occupied / Unoccupied modes.

4. Dry contact switch for input from an external device such as a central time clock, occupancy sensor, or a telephone activated device.

5. Robertshaw, Honeywell, Johnson Controls, Carrier, Schneider Electric, Viconics, or equal with built-in occupancy sensor.

N. Start-up: Factory test each unit before shipment to Project site. Performance test shall include full refrigeration start-up, fan and controls start-up. Each unit shall be provided with its own report with its own serial number. Non-tested units are not permitted to be delivered to Project site. Provide full start-up of units to include full refrigeration and provide a written report.

O. Parts Availability: Submit proof in writing that majority (minimum 80 percent) of replacements parts are commonly available and not proprietary. Also, submit proof in writing that a local parts sales and service facility exists, where replacement parts will be warehoused in quantity. Guarantee timely availability for parts that are proprietary.

2.3 ROOF MOUNTED CENTRIFUGAL EXHAUST FANS

A. RMCEF-1:

1. Manufacturer:

CARNES	GREENHECK	LOREN COOK	PENNBARRY	TWIN CITY & BLOWER	OR EQUAL
VBBB Series	SWB Series	CPS	Dynamo	BCV	

2. Provide single width, single inlet, backward inclined steel wheel, belt driven centrifugal vent sets of sizes, capacities and configurations indicated on drawings, complete with accessories for installation of fans. Also, provide accessories for proper operation and balancing of fans in accordance with design intent and sequence of operation.

3. Certification: Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear AMCA Certified Ratings Seal for Sound, Air Performance and be manufactured with Type C spark resistant construction.

4. Housing: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The scroll wrapper shall be a minimum 14 gage steel with scroll drain and scroll side panels shall be a minimum 12 gage steel. The entire fan housing shall have continuously welded seams for leak proof operation. A performance cut-off shall be furnished to prevent re-circulation of air in fan housing. The fan housing shall be field rotatable to any one of eight discharge positions and shall have a minimum 1 ½-inch outlet discharge flange. Bearing support shall be minimum 10 gage welded steel. Side access inspection ports shall be provided with quick release latches for access to motor compartment without removing weather cover. Lifting lugs shall be provided for ease of installation. Unit shall bear an engraved aluminum nameplate.

5. Finish: Steel fan components shall be an electrostatically applied, baked epoxy powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2.5 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method. Interior and exterior parts of the fan exposed to the air being moved shall be coated with minimum 15 mils of baked epoxy.

6. Wheel: Wheel shall be steel centrifugal backward inclined, non-overloading flat blade type. Blades shall be continuously welded to backplate and deep spun inlet shroud. Wheel hub shall be keyed and securely attached to fan shaft. Wheel inlet shall overlap a one piece aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204, Balance Quality and Vibration Levels for Fans.

7. Motor: Motor shall be heavy-duty, explosion proof type with permanently lubricated sealed ball bearings and furnished at specified voltage, phase, and enclosure.

8. Bearing: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy duty re-greasable anti friction ball or roller type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

9. Shaft: Blower shaft shall be AISI C1045/SAE 1045 hot rolled steel and accurately turned, ground, and polished. Shafting shall be sized for a critical speed of at least 143 percent of maximum RPM.

10. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to wheel and motor shafts. Drives shall be sized for 150 percent of installed motor horsepower. The variable pitch motor drive must be factory set to specified fan RPM.

2.4 INLINE FANS

A. ILF-1:

1. Manufacturer:

LOREN COOK	OR EQUAL
SQN-B or SQN-D	

2. Fan shall be duct mounted, belt driven centrifugal square inline.

3. Certification: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.

4. Housing: The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gasketing. Pivoting motor plate shall utilize threaded L-bolt design for positive belt tensioning. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.

5. Finish: Steel fan components shall be coated with polyester powder coating to exceed 1,000 hour salt spray test under ASTM B117 test method.

6. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-05, Balance Quality and Vibration Levels for Fans.

7. Motor: Motor shall be NEMA design B with class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure.

8. Shaft: Blower shaft shall be AISI C1045/SAE 1045, or 1040 hot rolled and accurately turned, ground, and polished. Shafting shall be sized for a critical speed of at least 143 percent of maximum RPM.

9. Bearings: Bearings shall be designed and tested specifically for use in air handling applications. Construction shall be heavy-duty regreasable ball or roller type in a cast iron pillow block housing and selected for a minimum L50 life in excess of 200,000 hours at maximum cataloged operating speed.

10. Drive: Fans shall be direct drive or belt driven as indicated on drawings.

11. Belts and Drives: Belts shall be oil and heat resistant, static conducting. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.

2.6 FILTERS

A. Air filters shall be of pleated, high capacity, disposable type of efficiencies indicated on drawings. Each filter shall consist of a non-woven cotton fabric media, media support grid, and enclosing frame. Filter shall be UL 900 listed, Class 2.

B. Filter media shall provide an average efficiency as specified on drawings per ASHRAE Standard 52.2.

C. Initial resistance of air filters shall not exceed following limits for each efficiency level at face velocities indicated. Lower resistance requirements, if indicated on drawings shall have precedence.

30 percent (MERV 8)	0.27 inch water gage at 500 feet per minute
75 percent (MERV 11)	0.28 inch water gage at 500 feet per minute
85 percent (MERV 13)	0.30 inch water gage at 500 feet per minute
95 percent (MERV 14)	0.38 inch water gage at 500 feet per minute

D. Use standard size Filter Medias only.

E. Media support shall be a welded wire grid or a rigid frame with an effective open area of not less than 96 percent.

1. Media support shall be bonded to filter media to eliminate possibility of media oscillation and media pull-away.

2. Media support grid shall be formed in such a manner that it effectively forms a radial pleat design, providing total use of filter media.

F. Enclosing frame shall be bonded to air entering and air exit side of each pleat, to ensure pleat stability. Inside periphery of enclosing frame shall be bonded to filter pack, thus eliminating possibility of air bypass.

G. Holding frames shall be factory fabricated of 16 gage galvanized steel, or equivalent and shall be furnished with gaskets and spring type positive sealing fasteners. Fasteners shall be capable of being attached or removed without use of tools.

H. Manufacturers: Camfil Farr, Koch, or AAF.

2.7 LOUVERS, AIR CONDITIONING (use in conjunction with relief damper)

A. Standard steel louvers shall be furnished complete with frames, blades, finish and construction details per Drawings and manufacturer's recommendations.

B. Louvers shall be furnished with horizontal blades, 2 inches deep for air through wall installation in conjunction with gravity relief damper for backdraft protection that will open at 0.01 inch wc room static pressure as indicated on Drawings. Blades shall be 16-gage steel, spaced at 1 7/8-inch at 30 degrees angle, and with baked epoxy coating. Panel size shall be as indicated but not less than 24 inches width by 18 inches in height.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine areas under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 EQUIPMENT FOUNDATIONS

A. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Equipment foundations shall be of sufficient size and weight, and of proper design to preclude shifting of equipment under operating conditions, or under abnormal conditions imposed upon equipment.

B. Provide foundations (housekeeping pads, level platforms or curbs) for mechanical equipment whether indicated on drawings or not. Foundations shall meet requirements of equipment manufacturer and, when required by Architect, obtain from equipment manufacturer, approval of foundation design and construction, for equipment to be installed. Equipment vibration shall be maintained within design limits, and shall be dampened and isolated. Isolators shall be bolted to a structural member so as to be readily removable.

3.3 EQUIPMENT DESIGN AND INSTALLATION

A. Uniformity: Unless otherwise specified, equipment of same type or classification shall be product of same manufacturer.

B. Application: Only provide equipment as reviewed by Architect.

C. Equipment Installation: Equipment installation shall be in strict accordance with these Specifications, and installation instructions of manufacturers. Equipment installed on concrete

foundations shall be grouted before piping is installed. Piping shall be installed in such a manner as not to place a strain on equipment. Flanged joints shall be adequately extended before installation. Piping shall be graded, anchored, guided and supported, without low pockets.

1. Install equipment in a neat and skillful manner, properly aligned, leveled, and adjusted for satisfactory operation.

2. Install so connecting and disconnecting of piping and accessories can be readily accomplished, parts are readily accessible for inspection, service and repair. Space shall be provided to readily remove filters, coils, compressors and fan wheels. Access doors shall be hinged with cam lock door handles.

3. Provide flexible connections for duct, pipe and conduit connections at moving equipment.

3.4 ROOF-TOP EQUIPMENT MOUNTING

A. Downflow Packaged Units: Install unit on a prefabricated mounting frame or curb secured directly to roof. Follow manufacturers recommended installation manuals. Submit Shop Drawings for review by Architect.

B. Horizontal Flow Packaged Units: Install unit on platform or prefabricated mounting frame or curb secured directly to roof designed to suit roof conditions and requirements of provided unit. Submit Shop Drawings for review by Architect.

3.5 NOISE AND VIBRATION

A. Operation of Equipment: Mechanical equipment and piping systems shall operate without exceeding specified noise and/or vibration levels.

B. Corrective Measures: If specified noise and/or vibration levels are exceeded, provide necessary changes to reduce noise and/or vibration levels to within specified levels.

3.6 FIELD TESTS AND INSPECTION

A. General: Perform field inspections, field tests, and trial operations as specified in Section 23 05 00: Common Work Results for HVAC. Provide labor, equipment and incidentals required for testing. The Project Inspector will witness field tests and trial operations as specified in Section 23 05 00: Common Work Results for HVAC.

B. Equipment and Material: Equipment and material certified as being successfully tested by manufacturer, in accordance with referenced Specifications and standards, will not require re-testing before installation. Equipment and materials not tested at place of manufacture will be tested before or after installation, as applicable or necessary, to determine compliance with reference Specifications and standards.

C. Start-Up and Operational Test: System shall be started up and initially operated with components operating. During this test, various strainers or filters shall be periodically cleaned until no further accumulation of foreign material occurs. Adjust safety and automatic control instruments as required to provide proper operation and control sequence. Refer to Section 23 05 00: Common Work Results for HVAC.

D. Extent of Field Tests: After installation and before completion, Work of this Section shall be subjected to required field tests, including those specified here and in Section 23 0500: Common Work Results for HVAC.

E. Operation and Maintenance Data: Provide required operation and maintenance data as specified in Section 23 0500: Common Work Results for HVAC.

3.7 REFRIGERANT PIPING

A. Unless otherwise indicated, main liquid and suction lines from condensing unit to evaporator coil shall be of sizes specified by manufacturer.

B. Refrigeration piping shall be refrigeration grade copper tubing, type L hard-drawn. In instances where refrigeration lines are installed in an inaccessible location and must be snaked through conduit or a trench, that portion of tubing required to complete connections through conduit or trench may be soft drawn. Maintain entire system clean and dry during installation. Pipe shall be sealed until installed.

C. Refrigeration piping, both hard and soft-drawn, shall be straight and free from kinks, restrictions and horizontal runs shall be sloped towards compressor one inch to 10 feet wherever possible. Vapor line oil traps shall be installed on bottom of vertical risers and inverted oil trap shall be installed on top of vertical risers.

D. Joints shall be installed with Sil-Fos 15, Silvaloy 15, or equal.

E. Flare nuts required on suction lines shall be of short forged or frost-proof type. Other fittings shall be standard sweat-soldered type. Ells and return bends shall be long radius type. Install leak lock material.

F. Refrigeration Piping: Joints shall be silver brazed and leak tested. Field fabricated lines shall be thoroughly flushed and cleaned before connection. Bleed nitrogen through lines during silver brazing, and cap and seal lines when not completed and connected to equipment.

G. Sleeve penetrations of floors, walls and ceiling to allow for free motion of piping. Provide 24 gage galvanized iron pipe and chrome-plated escutcheon plates. Pack annular space between pipe and sleeve with incombustible material such as fiberglass and seal each end with mastic to provide a waterproof seal.

H. Install insulated couplings at points of connection between dissimilar metals for cathodic protection. Insulate copper tubing from ferrous materials and hangers with 2-inch thickness of 3-inch wide strip, 10 mil polyvinyl tape wrapped around pipe.

I. Support piping by iron hangers and supports. Hydra-Zorb cushion clamps, LSP Products Group Acousto Clamp, or equal, on non-insulated piping, and Klo-Shure coupling clamp on insulated piping, or equal.

J. Provide saddles to protect pipe insulation.

K. Provide connections of copper, copper plated steel, steel, and brass pipe and tubing with Harris Products Group Safety-Silv 56, Lucas-Milhoupt, Inc., or equal, complying with ANSI/AWS A5.8 and NSF 51.

L. Insulate refrigerant suction lines.

M. On split heat pump systems, insulate both vapor and liquid lines. For insulation materials, refer to Section 23 07 00: HVAC Insulation.

3.8 CLEANUP

A. Remove rubbish, debris and waste materials and legally dispose of off Project site.

3.9 PROTECTION

A. Protect Work of this Section until Substantial Completion.

END OF SECTION

SECTION 26 00 00

ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to, but not limited to Division 25, 26, 27, &28 in addition to Division 1 -General requirements.

1.2 CODES AND FEES

A. Unless specifically noted to the contrary, the Contractor shall furnish all equipment, materials, labor, and install and test in accordance with the FBC.

B. The Contractor shall comply with applicable building and construction codes as stated in Section 01 41 00.

1.3 STANDARDS

A. All materials shall be new, free of defects, and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency.

B. Where no labeling or listing service is available for certain types of equipment submit test data to the Engineer proving that equipment meets or exceeds available standards.

1.4 UTILITY COMPANY FEES, CHARGES, COSTS

A. It is the contractor's responsibility to contact the appropriate Utility Company to determine if any fees, charges, or costs will be due, as required by the Utility Company for temporary power in/Out installations, hook-ups, etc.

1. This fee, charge, or cost and all the usage charges for the temporary power shall be included in this contractor's bid price.

B. The contractor shall pay all costs, charges, or fees due to the contractor’s use of School District owned electrical service.

1.5 QUALITY ASSURANCE

A. A person with a current LA County Journeyman Electricians Certificate of Competency shall be on site and supervise all electrical work.

1. A copy of the certification shall be available in the General Contractors site office.

B. Coordinate with other trades to provide adequate working clearance about equipment.

C. Materials, where applicable, shall bear the label of an approved testing agency, such as:

1. ETL (Electrical Testing Laboratories)

2. UL (Underwriters Laboratories, Inc.)

3. FM (Factory Mutual)

D. Protect all materials subject to corrosion.

1.6 RELATED WORK

A. Continuity of Service:

1. Do not interrupt or change service or circuits without authorization from the Engineer and the Owner. Obtain written authorization before starting work.

B. Demolition:

1. Deliver all equipment removed and turned over to the Owner at a place and time mutually agreed upon location.

2. Maintain all materials turned over to the Owner or reused and installed in the condition equal to that existing before work began.

a. Repair or replace damaged materials or equipment at no additional cost to the Owner.

C. Outdoor equipment not secured to wall surface shall be mounted on steel channel or iron supports.

1.7 TEMPORARY WIRING

A. New Construction: Install according to NEC.

B. Remodel:

1. Coordination of conductors and routing of temporary wiring in or on existing buildings and approved is by the Department of Facility and Construction Management.

2. Remove temporary wiring upon completion of project.

3. Install according to NEC.

C. Grounding: Bond the equipment grounding conductors to available electrodes at each building.

1.8 EQUIPMENT

A. Equipment of a similar nature shall be identical and of the same manufacturer.

B. Equipment shall be set level.

1. Where grouped, mount at the same height, properly align, bolt together in sections, and fastened in place.

2. Tighten screws, bolts, nuts, lamps, fittings, or other fastening devices.

3. Install all covers, plates, fittings, and accessories.

PART 2 PRODUCTS

2.1 Not Used

PART 3 EXECUTION

3.1 Not Used

END OF SECTION

SECTION 26 05 00

ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SCOPE

A. The work shall include the furnishings of systems as defined in Section 26 08 00 "Work Included".

B. Drawings for the work are diagrammatic, intended to convey the Scope of the Work and to indicate the general arrangement and locations of the work.

1. Because of the scale of the drawings, certain basic items such as conduit fittings, access panels, sleeves, pull, and junction boxes may not be shown.
2. Where such items are required by Code or by other sections, such items shall be included.

1.2 RELATED DOCUMENTS

A. The other Contract Documents complement the requirements of this Section.

B. The General Requirements apply to the work of this Section.

1.3 TEMPORARY POWER

A. Furnish, install, and maintain temporary power used by all trades during construction.

1. See Section 16 00 00 for in/out" fees
2. The entire system shall be grounded and bonded to building steel prior to energizing temporary power, follow NEC for any other conditions.
3. Payment for monthly power consumption shall be the responsibility of the General Contractor.
4. Provide overcurrent protection for all circuits.
5. Use thermal magnetic breakers or cartridges fuses only for overcurrent protection.
6. All receptacles shall be GFI protected.

B. The Building Department and Utilities Department Manager shall review and approve any connection to the existing LE School District owned electrical service on existing facilities.

1. Contractor is responsible for all cost of temporary power.

1.4 SUPERVISION OF THE WORK

A. Provide field supervisor for electrical work, who has had a minimum of 4-year previous successful experience on projects of comparable sizes and complexity.

B. The supervisor shall be providing on the job site supervision at all times during the performance of any work under this Division or if the work under this Division is affected.

C. Supervisor shall have a valid LA County Electrical Journeyman Certificate of Competency with a copy on file at the General Contractors site office.

D. Submit a resume of the Foreman's experience to Engineer before starting work.

1.5 DELIVERY AND STORAGE

A. Handle, store and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of NFPA 70B, Appendix-I, titled "Equipment Storage and Maintenance during Construction".
   1. Replace damaged or defective items with new items.

1.6 ELECTRICAL CONNECTIONS

A. Tighten all connections to the torque values pert hat device manufacturer's instructions.
B. If manufacturer does not provide the values, tighten to pound-inch or pound-foot values in UL Standard 486B, a summary is in Section 110-14 of the NEC Handbook.

1.7 ACTIVE SERVICES

A. Protect all existing active services; water, gas, sewer, electric, when encountered, against damage.
B. Do not prevent or disturb operation of active services, which are to remain.
C. If contractor encounters active services, which require relocation, make request to authorities with jurisdiction for determination of procedures.
D. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the utility or Municipality having jurisdiction and Electrical Demolition Drawings.
E. The Contractor at his expense shall immediately restore any damaged active services to its original condition, and with properly licensed and trained people.
F. Inform the District Representative immediately of any damage.
G. Contractor shall use lock out/tag out procedures when active services; gas, water, sewer, electric, mechanical, ands life systems have been interrupted.
   1. Tag shall have company name, acting supervisor’s contact phone number and date of interruption.
   2. This applies to work in all buildings as well as portable installations and relocatable buildings.

1.8 TESTS

A. System Functional Performance Testing is part of the Commissioning Process.
   1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
   2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirement.
   3. Approved test results shall be available for the Electrical Inspector at the time of inspection.
B. Prior to beginning work, all electrical equipment and systems shall be operated in the presence of representatives of the Contractor and Representatives of the School District, in order to establish that all systems are in proper working order at the start of the project.
   1. Upon completion of the above test, the Contractor shall submit a detailed listing indicating any items noted which are not in operational condition.
   2. All parties present at the test shall sign the listing.

3. Commencement of work prior to the above shall constitute acceptance of all systems by the Contractor in as operational system.
4. The Contractor shall have all electrical systems back in working order at the end of the project.

C. After work is completed, perform a load balance test for each panel board to demonstrate that with full lighting and mechanical load, the balance between phases is within 15%.
   1. Correct any unbalance beyond this limit, maintaining proper phase relation to neutral at all times.
   2. The Contractor shall reproduce as many copies of load-balance report sheet, located at end of this Section, as required and submit to Engineer prior to request for final inspection.

D. Test all grounding electrodes to demonstrate that the ground resistance does not exceed 25 ohms. (See Section 26 05 26 for report requirements.)

E. Perform such test as required by authorities having jurisdiction over the site.
   1. The Engineer of Record shall witness all required tests, unless approved by the School District.
   2. The Contractor shall record and submit typewritten results to the Engineer for approval.

F. Provide a copy of the test results approved by the Engineer at the time of the equipment inspection by the Building Department and the Commissioning Agent.

1.9 DEMONSTRATIONS

A. Training of the Owner’s operation and maintenance personnel is required in cooperation with the Owner's Representative.

B. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.

C. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.

D. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.

1.10 IDENTIFICATION

A. Contractor shall provide identification for wiring systems and equipment in accordance with Section 26 05 33.

B. Power shall have conductors color banded, per 26 05 13 "Wire and Cable" in each junction and pull box.

1.11 NAMEPLATES

A. The following items shall be equipped with nameplates:

1. All motor starters, pushbutton stations, control panels, time switches, disconnect switches, Panelboards, contactors or relays in separate enclosures, power receptacles where the nominal voltage between any pair or contacts is greater than 150V, all switches controlling outlets or equipment where the outlets are not located within sight of the controlling switch, high voltage boxes and cabinets.
2. Special electrical systems shall be identified at terminal cabinets and equipment racks.

B. Power panels and switchgear without doors, shall have circuit breakers and switches identified by engraved plastic tags affixed to cabinet adjacent to device.

C. Nameplates shall adequately describe the function of the particular equipment involved.

1. Nameplates detailed on the drawings, inscription and size of letters shall be as shown on the approved shop drawings.
2. Nameplates for panel board and switchboards shall include the panel designation, voltage, and phase of the supply.
3. For example, "panel PA 120/208V 3-phase 4-wire".
4. The name of the machine on the nameplates for a particular machine shall be the same as the one used on all motor starters, disconnect and P.B. station nameplates for that machine.

D. Nameplates shall be laminated phenolic plastic, black front and back with white core, with lettering engraved through the outer covering.

1. Attach with plated self-tapping screws or small brass screws.
2. Nameplates to identify emergency devices shall be red laminate.

E. Panelboards shall have typewritten circuit directories installed inside the doors under transparent plastic covers that identify components and corresponding room numbers.

1.12 SUBMITTALS

A. Method of preparing and procedure for submitting Shop Drawings and submittal data shall comply with Division 1.

B. Submittal data for electrical equipment shall consist of Shop Drawings and/or catalog cuts showing technical data necessary to evaluate the material or equipment, to include dimensions, wiring diagrams, performance curves, ratings, control sequence, and other descriptive data necessary to describe fully the item proposed and its operating characteristics.

C. Any submittal data in following electrical sections, peculiar to that section, is in addition to submittal requirements of this section.

D. Where more than one item or option is on a single submittal sheet, clearly indicate which one you are proposing for the project.

1.13 CONCRETE WORK

1. Where cutting sidewalks to route conduit concealed into buildings, this Contractor is responsible for all repair work to return concrete sidewalks to original conditions.
2. Furnish and install reinforced concrete pads for transformers, switchgear, generators, and motor control centers, of size as shown on the drawings or required.
    a. Unless otherwise noted pads shall be 4" high and shall exceed dimensions of equipment being set on them, including future sections, by 4" on all sides, except when equipment is flush against a wall, then the side or sides against the wall shall be flush with the equipment.
    b. Chamfer top edges ½".
    c. Trowel all surfaces smooth.
    d. Reinforce pads with 6" X 6" X 6/6 welded wire fabric.
3. This contractor shall furnish all equipment anchor bolts and shall be responsible for their proper installation and accurate location.

PART 2 PRODUCTS

2.1 Not Used

PART 3 EXECUTION

3.1 Not Used

END OF SECTION

SECTION 26 05 13

ELECTRICAL WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable

B. Wiring connectors and connections

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electric Code/California Electrical Code (NEC/CEC).

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years of experience.

1.4 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Wire and cable routing shown on Drawings is approximate unless dimensioned.

1. Route wire and cable as required to meet the Project Conditions.

C. Where wire and cable routing are not on plans, and only the destination only is on the plans, determine exact routing and lengths required.

1.5 SUBMITTALS

A. Provide in accordance with Division 01.

B. List of Materials: Submit a complete list of proposed materials.

C. Shop Drawings: Provide detailed and dimensioned Shop Drawings indicating kind, weight and thickness of materials insulation type, resistivity, conductivity, impedance and conductance. Drawings shall contain sufficient information to assemble and install equipment at the Project site without further instructions.

1.6 QUALITY ASSURANCE

A. Provide in accordance with Division 01.

B. Wiring installation shall be performed under the supervision of state certified electricians. Contractor or Installer’s electricians shall be certified in accordance with Labor Code sections 3099, and 3099.2 and section 209.0 of the California Code of Regulations.

C. Contractor shall have adequate experience installing systems of similar size and complexity.

1. Qualifications of Installer: Minimum five years of experience installing products and systems of similar scope and complexity.
2. Installer shall have completed at least five projects of equivalent scope and complexity.
3. Contractor shall have completed and commissioned a minimum of five service agreements that provide similar support services to those needed for this project.

4. System startup and testing shall be performed under direct observation of the project Inspector and OAR.

1.7 QUALITY ASSURANCE

A. Provide a one-year labor warranty.

B. Provide material warranty of no less than 10 years.

C. Warranty period begins at substantial completion or project acceptance for beneficial occupancy.

D. CONTRACTOR shall warranty all products and materials. Multiple warranty sources are not acceptable.

PART 2 PRODUCTS

2.1 WIRES AND CABLES

A. Description

1. Single conductor insulated wire.
2. Type MC cable.
   a. Interlocked construction
   b. Connectors shall be steel or malleable iron with steel locknuts, do not use push-in or snap-in connectors.

B. Conductor

1. Copper: Feeder sizes 100 amps and smaller
2. Copper: Branch circuits
3. Copper: Equipment grounding conductors and grounding electrode conductors
4. Copper: Feeder sizes larger than 100 amps

C. Insulation Voltage Rating

1. Single conductor wire - 600 volt
2. Type MC cable – 600 volt

D. Insulation

1. Single conductor wire - NFPA 70 Type THHN/THWN insulated with polyvinyl chloride and covered with a protective sheath of nylon, rated 600volts. Wires may be operated at a maximum continuous conductor temperature in dry locations of 90 degrees Centigrade and 75 degrees Centigrade in wet locations.
2. Wire and cables shall be listed by a nationally recognized testing lab for the environmental conditions they are installed and in accordance with Article 310 of the NEC/CEC.

E. Temporary wiring according to NEC/CEC. open conductors are permitted.

2.2 WIRING CONNECTORS

A. Solderless Pressure Connectors

1. Ilsco

2. Or approved equal.

B. Spring Wire Connectors
   1. Ideal
   2. Scotchloc
   3. Holub
   4. Or approved equal.

C. Compression Connectors
   1. Panduit
   2. Burndy
   3. 3M
   4. Or approved equal.

D. Insulate Multi Cable Connector Blocks
   1. Polaris products molded for precise fit and supplied with removable access plugs over hex screws.

E. Do not use insulation piercing or push-in type connectors.

F. Do not use split-bolt type connectors.

G. Do not use silicon filled twist on wire connectors in wet locations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable is complete before installation of work under this section.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Use stranded conductors for control circuits.

C. Use conductor no smaller than 12 AWG for power and lighting circuits.

D. Use conductor no smaller than 16 AWG to supply a single fixture.

E. Use conductor no smaller than 14 AWG for control circuits.

F. Pull all conductors into raceway at same time.

G. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

H. Protect exposed cable from damage.

I. Use suitable cable fittings and connectors.

J. Neatly train the wiring inside boxes, equipment, and panel boards.

K. Clean conductor surfaces before installing lugs and connectors.

L. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

M. Use sealed weatherproofing kits for underground splices.

N. Provide 8" of free conductor at outlet, switch, and junction boxes.

1. Conductors not spliced or terminate at the box, shall require only 6” loop inside each box.

O. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 8 AWG and smaller.

P. Splices and joints made in conductors #6 AWG and larger shall be with copper compatible sleeves using indent method or "Ilsco" or equal insulated power distribution block.

Q. Maximum size wire: 600 MCM.

R. Conductors and cables, regardless of voltage, shall be installed in a complete raceway system, except:

1. Underground irrigation zone control wires of 24 volts or less.
2. Temporary wiring
3. Open wiring as permitted by 27 60 00.

S. Adjust conductor size to compensate for a maximum of 3% voltage drop for branch circuits and maximum of 2% voltage drop for feeders.

T. Use minimum size #10 AWG conductors for all 20 amps, 120-volts branch circuits longer than 200 feet and use minimum size #10 AWG conductors for all 20 amps, 277-volts branch circuits longer than 300 feet.

U. When flexible conduit is used, use stranded wire in the raceway.

V. Type MC cable may only be used as a fixture whip from a single fixture to a junction box - maximum length of 6-feet.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 26 05 33.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provision of Section 01 45 00 and 26 05 00.

B. Inspect wire and cable for physical damage and proper connection.

1. Damaged conductors will be replaced at no cost to the district.

C. Tighten all connections to the manufacturer's recommended values.

1. Engineer shall witness the torque values and submit a written report of the measurements and statement that they are correct to the Owner's representative.
2. Provide copy of the approved report at time of equipment inspection by the Commissioning Agent.

D. Verify continuity of each branch circuit conductor.

E. Conductors for circuits of 100 amps or larger shall be tested with a megger.

1. The Engineer of Record or designated representative shall review all megger test results.

2. The Engineer of Record or designated representative shall witness a minimum of 10 % of the test.
3. Submit all Engineer approved megger test to the Building Department.
4. Provide copy of the approved report at time of equipment inspection by the Commissioning Agent.

F. Test all service conductors with a megger.
1. The Engineer of Record or designated representative shall witness all service conductor meggering.
2. The Contractor shall record the results and the Engineer of Record shall approve.
3. The Building Department requires a copy of the approved report before they authorize the utility company to turn on the power.

G. Megger report shall at a minimum include the following for the Commissioning Agent
1. Test date.
2. Manufacture and model number of test equipment.
3. Provide documentation of the last re-calibration of test equipment.
4. Weather conditions including humidity at time of test.
5. Sign-in sheet of witnesses.
6. Verification the test voltage was 1000 volts for at least one minute.
7. The results shall be in numerical value.
8. Provide circuit description, including circuit id, wire size, and length.
   a. Indicate service conductor in description.
9. Configuration shall include A-B, A-C, B-C, A-N, B-N, C-N, A-G, B-G, C-G, and N-G, where applicable.
10. Check the test equipment at the start and end of each test session with the test lead open test and a short test.
    a. Provide copy of the confirmation of passing the open and short tests.

3.6 COLOR CODES

A. General Wiring:
1. For phase and neutral conductors 6 gage or larger, permanent plastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.
2. Color code conductor insulation as follows:

SYSTEM VOLTAGE		
Conductor	208Y/120	480Y/277

Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Natural Gray

Neutrals shall be colored-distinguished if circuits of two voltage systems are used in the same raceway.

3. Where two voltage systems are combined in an enclosure; CONTRACTOR shall apply a permanent color code label where the circuits originate.

END OF SECTION

SECTION 26 05 19
EQUIPMENT WIRING SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Electrical connections to equipment specified under other Sections or furnished by School District.

1.2 REFERENCES

A. FS W C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet

B. NEMA WD 1 - General Requirements for Wiring Devices

C. NEMA WD 5 - Specific Purpose Wiring Devices

PART 2 PRODUCTS

2.1 CORDS AND CAPS

A. Straight-blade Attachment Plug: NEMA WD 1

B. Locking-blade Attachment Plug: NEMA WD 5

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.

E. Cord Size: Suitable for connected load of equipment and rating of branch circuit over current protection.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough in.

B. Verify location, size, and type of connections.

C. Coordinate details of equipment connections with supplier and installer.

3.3 INSTALLATION

A. Use wire and cable with insulation listed by a nationally recognized testing lab for the installation’s environmental conditions.

B. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

C. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

D. Make wiring connections in control panel or in wiring compartment of prewired equipment in accordance with manufacturer's instructions.
   1. Provide interconnecting wiring where indicated.

E. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated.
   1. Connect with conduit and wiring as indicated.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Work included: Labor, materials, and equipment necessary to complete the installation required for the item specified under the Division, including but not limited to:

1. Power system grounding.
2. Electrical equipment and raceway grounding and bonding.

1.2 REFERENCES

A. Comply with the latest edition of the following applicable Specifications and standards except as otherwise indicated or specified:

1. Underwriters Laboratories, Inc. (UL):

UL 467	Grounding and Bonding Equipment.

2. Institute of Electrical and Electronics Engineer Inc. (IEEE)

IEEE No. 142	Recommended Practice for Grounding of Industrial and And Commercial Power Systems.
IEEE No. 81	Guide for Measuring Earth Resistivity, Ground Impedance And Earth Surface Potentials of a Ground System.

1.3 SYSTEM DESCRIPTION

A. Ground the electrical service system neutral at service entrance equipment to metallic water service and to all available grounding electrodes.

B. Ground each separately-derived system neutral to nearest effectively grounded metallic water pipe or nearest effectively grounded building structural steel member.

C. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways, receptacle and switch ground connectors, and plumbing systems.

D. Metallic or semi-conducting shields and lead sheaths of cables operating above 1000 volts shall be permanently and effectively grounded at each splice and termination.

E. Within every building, the main switchboard or panelboard shall be bonded to the cold-water line. Metallic piping systems such as gas, fire sprinkler, or other systems shall be bonded to the cold-water line.

F. Neutral of service conductors shall be grounded as follows:

1. Neutral shall be solidly grounded at only one point within the Project site for that particular service. The preferable location of grounding point shall be at the service switchboard, or main switch.
2. Equipment and conduit grounding conductors shall be bonded to that grounding point.
3. If other buildings or structures on the Project site are served from a switchboard or panelboard in another building, power supply is classified as a feeder and not as a service.
4. Equipment grounding conductor shall be installed from switchboard to each individual building. At the building, grounding conductor shall be bonded with power equipment enclosures, metal frames of building, etc., to “made” electrode for that building.
5. Feeder neutrals shall be bonded at service entrance point only; neutrals of separately derived systems shall be bonded at the source only.

G. Resistance:

1. Resistance from the main switchboard ground bus through the ground electrode to earth shall not exceed 5 OHMS unless otherwise noted.
2. Equipment and conduit grounding conductors shall be bonded to that grounding point. Resistance from the farthest panelboard, switchboard, etc. ground bus through the ground electrode to earth shall not exceed 20 OHMS.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.
B. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
C. Indicate location of system grounding electrode connections, and routing of grounding electrode conductor.
D. Submit Manufacturer's installation instructions.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Products furnished by the following Manufacturers shall be acceptable if in compliance with all features specified herein and indicated in the Drawings.
   1. Ground Rods:
      a. Erico “DADWELD” Products Inc.
      b. Weaver

   2. Ground Wells:
      a. Christy Concrete Products, Inc.
      b. Forni Corp.

   3. Ground Bushings, Connectors, Jumpers and Bus:
      a. O-Z/Gedney.
      b. Thomas & Betts Corp.

2.2 GROUND CONDUCTORS

A. Refer to Specification Section 260519: Building Wire and Cable for conductor specifications.
B. General purpose insulated:
   1. UL approved and code sized copper conductor, with dual rated THHN/THWN insulation, color identified green.
   2. Where continuous color-coded conductors are not commercially available, provide a minimum 4" long color band with green, non-aging, plastic tape in accordance with NEC/CEC.

C. Bonding pigtails: Insulated copper conductor, identified green, sized per code and provide with termination screw or lug. Provide solid conductors for #10 AWG or smaller and stranded conductors for #8 AWG or larger.

2.3 DRIVEN (GROUND) RODS

A. Copper clad steel, minimum 3/4-inch diameter by 10 feet long, unless otherwise noted.

2.4 GROUND WELL BOXES FOR GROUND RODS

A. Precast concrete box nominal 9" throat diameter x 14" deep with light duty concrete cover for non-traffic areas or steel plate for traffic areas. Cover shall be embossed or engraved with "GROUND ROD".

2.5 INSULATED GROUNDING BUSHINGS

A. Plated malleable iron or steel body with 150-degree Centigrade molded plastic insulating throat and lay-in grounding lug.

PART 3 EXECUTION

3.1 APPLICATION

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
   1. Bury at least at least 24 inches below grade.
   2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPERATELY DERIVED SYSTEM

A. Equipment Comply with IEEE C2 grounding requirements.

B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof non-shrink grout.

C. Pad-Mounted Transformers and Switches: Install two ground rods and a ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.4 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeder and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70.

1. Feeders and branch circuits.
2. Receptacles circuits.
3. Single- phase motor and appliance branch circuits.
4. Three- phase motor and appliance branch circuits.
5. Flexible raceway runs.
6. Metal- clad cable runs.

C. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

3.5 INSTALLATION

A. Provide a separate, insulated equipment-grounding conductor in feeder, branch circuit, or grounded control circuit conduit(s).
   1. This bonding conductor shall be continuous through the raceway system from main switch ground bus to panelboard ground bus and to each outlet, switch, device, box, or equipment using terminal bars, screws, lugs, expressly designed for that purpose.
   2. Do not use raceways and metal enclosures for ground path.

B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp.

C. Supplementary Grounding Electrode:

   1. Use driven ground rod in main service equipment area.
   2. Use effectively grounded metal frame of the building.
   3. Use minimum of 20' bare copper wire embedded in concrete foundation.

D. Use minimum 6-AWG un-spliced copper conductors for communications service grounding conductor from the grounding collector plate in the nearest electrical room.

E. Exothermic weld (Cadweld) or approved equal all ground wire to ground rod connections.

F. Separate buildings or buildings connected by a breezeway shall have main feeder(s) grounding conductor(s) connected to all of the available grounding electrodes of that structure.

G. Ground the equipment grounding conductor for temporary wiring to the available electrodes, metal piping, and metal components of a building when run inside a building.

H. Install a ground rod at all freestanding exterior electric scoreboards and electric signs.

I. Parallel grounding rods shall be bonded together with listed fittings and grounding conductors in galvanized rigid steel conduit, buried not less than 12 inches below finish grade.

J. Ground rods shall be separated from one another by not less than ten feet.

3.6 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Measure ground-rod resistance when not connected to electrode conductor, using approved ground testing equipment.
   1. Resistance shall not exceed the specified values in this Specification.
   2. Extend the rod as deep as necessary to meet the minimum resistance.
   3. The Electrical Engineer and Owner shall observe the test.

C. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements.
   1. Refer to Section 01 91 00, Commissioning, for further details.

D. Contractor shall provide ground rod resistance report to the Commissioning Agent, with the following information:
   1. Date of test
   2. Manufacture and model number of the test equipment.
   3. Documentation of the last re-calibration of the test equipment
   4. Weather conditions, including the humidity during the test
   5. Sign-in sheet of witnesses to the test.
   6. The results in a numerical value
   7. Location of the rod(s) tested.

3.7 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.8 CLEAN UP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Conduit and equipment support

B. Fastening hardware

1.2 COORDINATION

A. Coordinate size, shape, and location of concrete pads with Section 03 30 00.

1.3 QUALITY ASSURANCE

A. The support systems shall be adequate for weight of equipment and conduit including any wiring they carry.

PART 2 PRODUCTS

2.1 MATERIAL

A. Support Channel: Galvanized steel

B. Hardware: Corrosion resistant

PART 3 EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps, spring steel clips.

B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in metal studs; and wood screws in wood construction.

C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

D. Do not use powder-actuated anchors.

E. Do not drill structural steel members.

F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance.

1. Use hexagon head bolts with spring lock washers under all nuts.

G. Install freestanding electrical equipment on a housekeeping pad, minimum 4" thick, and 4" overhang.

H. Install surface mounted cabinets and panel boards with minimum of four anchors.

1. Provide steel channel supports to stand cabinet ¾" off wall.

I. Bridge studs top and bottom with channels to support flush-mounted cabinets and panel boards in stud walls.

END OF SECTION

SECTION 26 05 33
ELECTRICAL SYSTEM RACEWAY AND BOXES

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Metal conduit
- B. Flexible metal conduit
- C. Liquid tight flexible conduit
- D. Electrical metallic tubing
- E. Non-metallic conduit
- F. Fittings and conduit bodies
- G. Outlet boxes
- H. Floor boxes
- I. Pull and junction boxes
- J. Surface Metal Raceways
- K. Aluminum conduit

1.2 REFERENCES
- A. NEMA ANSI C80.1 – Electrical Rigid Steel Conduit
- B. NEMA ANSI C80.3 – Steel Electrical Metallic Tubing
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
- D. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports
- E. NFPA 70 - National Electrical Code
- F. NECA "Standard of Installation"
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- H. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel conduit and intermediate metal conduit
- I. NEMA TC 3 – Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

1.3 SUBMITTALS
- A. Submit under provisions of Section 01 33 00.

1.4 PROJECT RECORD DOCUMENTS
- A. Submit under provisions of Section 01 77 00.
- B. Accurately record actual routing of all empty conduits including exterior underground installations and provide written record for the project.
- C. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, protect, and handle Products to site under provisions of Section 01 60 00.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.6 PROJECT CONDITIONS
- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing shown on Drawings is in approximate locations unless dimensioned.
  1. Route as required to complete wiring system.
- D. Verify locations of floor boxes and outlets prior to rough-in.
- E. Electrical boxes shown on Drawings are in approximate locations unless dimensioned.

1. Install at location required for box to serve intended purpose.
2. The Owner may change the location of a box as much as 6', at no extra cost to the Owner.

PART 2 PRODUCTS

2.1 CONDUIT REQUIREMENTS

A. Minimum Size: ½" unless otherwise specified, ¾" for home runs and feeders.

B. Underground Installations:
   1. Use rigid galvanized steel conduit (RGS), plastic coated conduit, or thick wall nonmetallic conduit.
   2. Minimum Size is ¾" for home runs and feeders.
   3. Install conduits outside building line at a minimum of 30" below finished grade (except for conduits for Electrical Utility Company's cables.)
   4. Terminate PVC conduits with bell ends or connectors and bushings.
   5. Cover underground PVC conduits larger than 2" outside of building footprint with 3" thick by trench width, 2,500 psi Concrete.
   6. In areas with muck, either de-muck the area or support the conduit from structure or slabs as indicated by the engineer.
   7. Seal underground utility conduits.
   8. All conduit 90 degree bends for conduits larger than 2" shall be rigid galvanized steel conduit.
   9. Install conduits from Electrical Utility Company's connection point to the building service entrance equipment at a min depth of 36" and covered with 3" thick by trench width 2,500-psi concrete.
   10. Underground conduit installation using "directional bore" method shall be allowed with conduits installed at 36" below grade:
      a. Directional bore method not allowed for conduits from Electrical Utility Company's connection point to the building service entrance equipment.
      b. Concrete cover for conduits installed using directional bore, at least 42" below grade, is not required.
      c. Identification tape for conduits installed using directional bore is not required.

C. Outdoor and Wet Locations, Above Grade:
   1. Use rigid steel conduit (RGC).
   2. PVC schedule 80 may extend from underground to maximum of 10'-0" above finished grade on vertical conduit runs only.
   3. The maximum length of liquid-tight flexible nonmetallic or metallic conduit is 6'.
   4. Use EMT minimum 6'-0" above grade

D. In Slab Not on Grade:
   1. Use rigid steel conduit, electrical metallic tubing, and thick wall nonmetallic conduit.
   2. Maximum Size Conduit in Slab is ¾".

E. Outdoor damp Locations:
   1. Use rigid steel conduit, electrical metallic tubing.
   2. PVC schedule 80 may extend from underground to maximum of 10'-0" above finished grade on vertical conduit runs only.

F. Dry Locations: Concealed:
   1. Use rigid steel conduit, electrical metallic tubing.
   2. PVC conduit may extend from underground to the first box in interior stud wall, masonry or concrete poured wall.
   3. PVC conduit may extend from underground through the slab in tilt wall if it changes to EMT or rigid within 2" above tilt wall.

G. Dry Locations: Exposed:
   1. Use rigid steel conduit, electrical metallic tubing.

2. PVC conduit may stub-up under floor-mounted switchgear, floor mounted motor control center, and floor mounted transformer.
3. PVC conduit schedule 80 may extend from underground to maximum of 10'-0" above finished floor on vertical conduit runs only within electrical, communication and mechanical rooms and terminate in approved fittings.
4. PVC conduit may sleeve a grounding electrode conductor or bonding jumper.
5. Installer may use surface metal raceway in remodel or renovation projects only where concealed conduit is not possible or practical.
    a. Prior approval required by the Building Department.
    b. Use Wiremold 700 series as minimum, or approved equal.

H. Corrosive Areas: PVC externally coated galvanized or thick wall non-metallic conduit.
I. Subject to Physical Damage: PVC externally coated galvanized or rigid steel conduit.
J. Flexible conduit: ⅜" steel, maximum 6' long for a single fixture from a junction box, for type MC cable, see section 26 05 13.
K. Use steel flexible conduit or liquid tight conduit ½" minimum 6' long maximum, to connect equipment where subject to vibration or frequent changing.

2.2 METAL CONDUIT
A. Rigid Galvanized Steel Conduit: Use material meeting ANSI C80.1.
B. Fittings and Conduit Bodies: Use materials meeting ANSI/NEMA FB 1 material to match conduit and steel fittings.
    1. Do not use push-in or snap-in connectors or couplings.

2.3 PVC COATED METAL CONDUIT
A. Description: NEMA RN 1, rigid galvanized steel conduit with external PVC coating, 20-mil thick.
B. Fittings/Conduit Bodies: ANSI/NEMA FB1 steel fittings with external PVC coating to match conduit.
    1. Do not use push-in or snap-in connectors or couplings.

2.4 FLEXIBLE METAL CONDUIT
A. Description, interlocked construction
B. Fittings: ANSI/NEMA FB 1, connectors and/or couplings shall be steel or malleable iron.
    1. Do not use push-in or snap-in connectors or couplings.

2.5 LIQUID TIGHT FLEXIBLE CONDUIT
A. Description, interlocked construction with PVC jacket
B. Fittings: ANSI/NEMA FB 1, connectors and/or couplings shall be steel or malleable iron.
    1. Do not use push-in or snap-in connectors or couplings.
    2. Use two-piece fittings.

2.6 ELECTRICAL METALLIC TUBING (EMT)
A. Description: ANSI C80.3 galvanized tubing.
B. Fittings/Conduit Bodies: ANSI/NEMA FB 1 steel compression or setscrew type.
    1. Do not use push-in or snap-in connectors or couplings.

2.7 NONMETALLIC CONDUIT
A. Description: NEMA TC 2 Schedule 40 PVC or Schedule 80 PVC.
    1. Do not use ENT.
B. Fittings and Conduit Bodies: NEMA TC 3
    1. Do not use push-in or snap-in connectors or couplings.

2.8 OUTLET BOXES
A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel, 4" x 4" x 1.5" deep, minimum.
B. Cast Boxes
    1. NEMA FB 1 Type FD cast iron.
    2. Provide gasketed cover by box manufacturer.

3. Provide threaded hubs.

C. May use PVC single gang boxes on aluminum covered walkway posts where conduit and boxes are covered by aluminum cap on post.

2.9 FLOOR BOXES

A. Floor Boxes: NOT ALLOWED

2.10 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1 galvanized steel.
   1. Minimum Size Box is 4" x 4" x 1.5" deep.
B. Surface-Mounted Cast Metal Box, NEMA 250, Type 4; flat-flanged, surface-mounted junction box:
   1. Material: Galvanized cast iron
   2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
C. Fiberglass Hand holes:
   1. Use minimum size die-molded fiberglass handholds.
      a. Brooks 1419 series, or approved equal for handholds with conduit sizes 1½" or smaller.
      b. Brooks 1324 series, or approved equal for handholds with conduit sizes 2" or larger.
   2. Cover: Bolt down fiberglass weatherproof cover with ⅜" stainless steel bolts and is traffic rated.
D. May use PVC single gang boxes on aluminum covered walkway posts where conduit and boxes are covered by aluminum cap on post.

PART 3 EXECUTION

3.1 INSTALLATION - CONDUIT

A. Install conduit in accordance with NECA "Standard of Installation."
B. Install nonmetallic conduit in accordance with manufacturer's instructions.
C. Arrange supports to prevent misalignment during wiring installation.
D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
E. Support all multiple parallel runs of suspended conduits by steel channel and straps.
F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
G. Do not support conduit with perforated pipe straps, and remove any wire used for temporary supports.
H. Steel tie wire may support conduit within interior partitions only.
I. Arrange conduit to maintain a minimum of 6'-6" of headroom and present neat appearance.
J. Route exposed conduit parallel and perpendicular to walls.
   1. Exposed conduit below 10' above floor in student areas, shall have a two-hole strap spaced a maximum of 5' oc.
K. Do not route conduits on floors in areas used for access to any equipment.
L. Route the conduit in and under slab from point-to-point.
M. Use liquid tight flexible metal or liquid tight flexible nonmetallic conduit for connection to all motors 3/4 horsepower or larger.
N. Maintain adequate clearance between conduit and piping.
O. Maintain 12" clearance between conduit and surfaces with temperatures exceeding 104°F.
P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
Q. Bring conduit to shoulder of fittings; fasten securely.
R. Join nonmetallic conduit using cement as recommended by manufacturer.
   1. Wipe nonmetallic conduit dry and clean before joining.
   2. Apply full even coat of cement to entire area inserted in fitting.
   3. Allow joint to cure for 20 minutes, minimum.
S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and cast metal boxes.

T. Use conduit bodies to make sharp changes in direction, as around beams.
   1. Use hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 1½" size.
U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.
W. Provide a 200-lb. test pull string in each empty conduit except sleeves and nipples.
X. Cap spare and unused conduits by approved means.
Y. Ground and bond the conduit under the provisions of Section 26 05 26.
Z. Identify conduit under provisions of Section 26 05 53.
AA. New Construction: Conceal all conduits run in finished areas.
BB. May install exposed conduits on existing block walls.
   1. Exposed conduits in classrooms, offices, corridors or other normally occupied spaces shall be surface raceways.
CC. Do not install conduits on roof surfaces.
DD. Do not use "all-thread" conduit nipples.
EE. Provide two-1" spare conduits from recessed panel boards and 1” spare conduit from surface panel boards into the closest suspended acoustical ceiling outside the room where panel is located.
FF. Do not use disconnect switches, magnetic starters, contactors, control cabinets, and panel boards as raceways.
GG. Flexible metal conduit and liquid tight flexible metal conduit shall not penetrate walls or ceilings.
HH. Complete electrical raceway installation before starting the installation of conductors.
II. Patch around conduits that penetrate wall, ceiling, or floor.
JJ. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07 84 00.
KK. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
   1. Coordinate location with roofing installation.
LL. If using an existing raceway for new work, it must meet current codes and DMS requirements, or made to meet the requirements.
MM. All locknuts are to be steel or malleable iron.
NN. Aluminum conduit is allowed only in locations where conduit will have direct contact with aluminum walkway covers and aluminum canopies.
OO. Add pull boxes, as necessary, to eliminate conduit runs from exceeding 400' in length for systems and 750’ in length for power.
PP. Support conduit in or on aluminum walkways with stainless steel bolts or screws.
QQ. Caulk the penetrations of walkway roofs with silicone caulking.
RR. May use surface metal raceway in remodel or renovation projects, only where concealed conduit is not possible:
   a. Prior approval required by the Building Department.
   b. Use Wiremold 700 series as minimum, or approved equal.

3.2 INSTALLATION - BOXES

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
B. Install electrical boxes to maintain a 6'-6" headroom and to present neat mechanical appearance.
C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
D. Inaccessible Ceiling Areas: Install junction boxes no more than 24" from ceiling access panel or from removable recessed luminary with box opening facing access panel or luminary.

E. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of Section 07 84 00.
F. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
G. Use flush mounting outlet boxes in finished areas.
H. Do not install flush mounting boxes back-to-back in walls; provide minimum 6" separation.
   1. Provide minimum 24" separation in acoustic rated and fire rated walls.
I. Secure flush mounting box to interior wall and partition studs.
   1. Accurately position to allow for surface finish thickness.
J. Use stamped steel bridges or steel studs to fasten flush mounting outlet box between studs.
K. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
L. Do not support boxes with wires.
M. Support boxes from building structure or structural member.
N. Use gang box when mounting more than one device together, do not use sectional box.
O. Use gang box with plaster ring for single device outlets.
P. Use cast outlet box in exterior locations exposed to the weather and wet locations.
Q. Use cast iron floor boxes or nonmetallic floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
R. Set floor boxes level.
S. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12" in any dimension.
   1. Interior Dry Locations: Use hinged enclosure under provisions of Section 26 27 16.
   2. Other Locations: Use surface-mounted cast metal box.
T. Do not use floor boxes for feed through wiring except to another floor box.
U. Cast boxes at the end of a run shall have one additional conduit into slab for support.
V. Add pull boxes, as necessary, to eliminate conduit runs from exceeding 400' in length for systems and 750’ in length for power.
W. Locate handholds, in grassy areas.
X. Use a maximum of one extension ring on a box.
Y. Lay-in type ceiling area: Install junction boxes no more than four feet above the ceiling grid.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for casework furnished under Section 06 41 00.
B. Coordinate locations and sizes of required access doors with Section 08 31 00.
C. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only.
   1. Coordinate masonry cutting to achieve neat opening.
D. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
E. Position outlet boxes to locate luminaries as shown on reflected ceiling plan.

3.4 ADJUSTING

A. Adjust floor box flush with finish flooring material.
B. Adjust flush-mounting boxes to make front flush with finished wall material.
   1. Installer may use plastic Add-a-depth rings for recessed boxes if the box is within ½” of the surface.
C. Install knockout closure in unused box opening.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 SESSION INCLUDES
- A. Nameplates
- B. Wire and conduit markers
- C. Box color coding
- D. Power junction boxes
- E. Panel directories
- F. Conduit

1.2 SUBMITTALS
- A. Submit shop drawings under provisions of Section 01 33 00.
- B. Include schedule for nameplates.

PART 2 PRODUCTS

2.1 MATERIALS
- A. Nameplates: Engraved three-layer laminated plastic, white letters on a colored background.
  1. Background color shall match box color coding schedule, see section 26 05 33 3.4A
- B. Underground-Type Plastic Line Marker:
  1. Manufacturer's standard permanent bright-colored continuous-printed plastic tape intended for direct-burial service not less than 6" wide x 4 mils thick.
  2. Provide tape with printing which most accurately indicates the type of the buried conduit.
- C. Wire and Cable Markers: Provide cloth markers, split sleeve, or tubing type.

PART 3 EXECUTION

3.1 INSTALLATION
- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using screws, rivets, or adhesive.
  1. Secure nameplate to outside face of recessed panel board doors in finished locations.
- D. Do not use embossed tape for any application.
- E. Provide underground-type plastic line marker above exterior underground conduits.
  1. Bury 6" to 8" below finish grade.
  2. Provide line markers on each side of trench if wider than 16".

3.2 WIRE IDENTIFICATION
- A. Wire Color Coding:
  1. 120/208-volt system, "A" phase - black, "B" phase -red, "C" phase - blue, neutral - white, and ground green.
  2. 277/480-volt system, "A" phase - brown, "B" phase - purple, "C" phase - yellow, neutral - gray, and ground - green.
- B. Maintain A, B, C, phase relation left to right or top to bottom when viewed from front.
  1. Maintain color-coding including switch legs and travelers throughout entire project.
- C. Conductors' #10 and smaller shall have a continuous outer factory finish, meeting the requirements of 26 05 53-3.2a.
  1. Neutrals and equipment-grounding conductors' #6 or smaller shall have a continuous outer factory finish (NEC 200.6 and 250.119.).

3.3 NAMEPLATE ENGRAVING SCHEDULE (EXAMPLE)

A. Provide nameplates of minimum letter height as scheduled below.
B. Panelboards, Switchboards, and Motor Control Centers: ½" identify equipment designation, and ¼" identify voltage rating.
C. Individual Circuit Breakers, Switches, and Motor Starters, Switchboards, and Motor Control Centers: ⅜" identify circuit and load served, including location.
D. Safety Switches, Enclosed Switches, and Motor Starters: ¼" identify panel load served, and room number if not obvious.
E. Transformers: ⅜" identify equipment designation, ¼" identify primary and secondary voltages.
F. Electrical Cabinets and Enclosures: ⅜" identify equipment designation.
G. System Terminal Cabinets: ⅜" identify equipment designation.
H. Electrical equipment located above suspended or hard ceilings: ⅛", identify circuit number on grid or hard ceiling.
I. In exposed finished painted areas, occupied by students, identify junction box with ½" diameter self-adhesive colored dot (same as in 26 05 53-3.4 A) instead of painting.
J. For junction boxes above suspended ceilings, install ½" diameter self-adhesive colored dot (same as in 26 05 53-3.4 A) on ceiling "T" bar below each junction box to show location.

3.4 POWER JUNCTION BOX IDENTIFICATION

A. Permanently identify power junction box covers with circuit and panel board number on the outside.
B. In exposed finished student occupied areas, place circuit and panel board number on inside of cover.

3.5 PANEL DIRECTORY

A. Each panel directory shall be typewritten, indicate specific and clear area of control, using official school district room numbers, and protected by a plastic covering.
B. Each panel directory shall include the conductor color code.
C. Each panel directory shall indicate the voltage and phase of the feeder, ID of the feeder, and location of the feeder disconnect.

3.6 Arc Fault Hazard Warning

A. Each switchboard, panel board, industrial control panel, meter socket, and motor control center shall be marked to warn of the potential electric arc flash hazards to comply with NFPA 70E and ANSI Z535.41998.

END OF SECTION

SECTION 26 08 00
WORK INCLUDED

PART 1 GENERAL

1.1 DESCRIPTION OF SYSTEMS

A. The work required under this Division shall include all materials, labor, and auxiliaries required to install, start up, and test a complete and properly operating electrical system.

1. The electrical systems required under this Division consists basically of, but is not limited to, the following:
   a. The main switchboard and distribution panels.
   b. Complete distribution system for power including feeders, branch circuits, convenience outlets, and connections to motors and other power loads.
   c. A complete electric service ground system and special grounds as required or noted.
   d. Connecting motors and manual control, unless otherwise specified.
   e. Complete system of electrical distribution including receptacles, non-linear panels, and transformers.
   f. Complete power distribution system for HVAC equipment including wiring, conduits, and disconnect switches.
   g. Furnishing and installing all necessary access panels.
   h. Concrete work for pad mounted equipment, or encased raceways.
   i. Painting of special equipment
   j. Temporary power
   k. Coordination and verification of power service requirement prior to bid.
      i) Bid to include all work required.
   l. Contractor shall check site and existing conditions thoroughly before bidding.
      i) Inform the Engineer of Record of discrepancies or questions noted.
   m. On existing buildings being remodeled or renovated, existing disconnected conductors no longer being used shall be removed and associated existing conduits located above ceilings and within walls shall be removed, existing conduits located underground shall be capped and abandoned.

1.2 COMMISSIONING

A. Commissioning of a system or systems specified in this section is part of the construction process.

B. Documentation and testing of these systems, as well as training of the Owner’s operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.

C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.

E. Refer to Section 01 91 00 - Commissioning, for detailed commissioning requirements.

END OF SECTION

SECTION 26 22 10
DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Two winding transformers
- B. Two-winding transformers rated for nonlinear loads
- C. Shielded Transformers

1.2 REFERENCES
- A. NEMA ST 1 - Specialty Transformers
- B. NEMA ST 20 - Dry Type Transformers for General Applications
- C. NFPA 70 - National Electrical Code

1.3 SUBMITTALS FOR REVIEW
- A. Section 01 33 00 - Submittals Procedures for submittals.
- B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
- C. Test Reports: Indicate the loss data efficiency at 25, 50, 75, and 100 % rated load and indicate the sound level.
- D. Submit manufacturer's installation instructions.
  1. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements.
  2. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.4 DELIVERY, STORAGE, AND HANDLING
- A. Section 01 60 00 - Material Equipment and approved equals, transport, handle, store, and protect products.
- B. Store in a clean, dry space
  1. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions.
  1. Life only with lugs provided for that purpose.
  2. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS
- A. Manufacturers:
  1. Square D
  2. Cutler Hammer
  3. General Electric
  4. Substitutions: Under provisions of Section 01 60 00
- B. NEMA ST 20 factory-assembled air-cooled dry type transformers, shown on the drawings
- C. Primary Voltage: 480 volts, 3 phase
- D. Secondary Voltage: 208/120 volts, 3 phase
- E. Insulation system and average winding temperature rise for rated KVA as follows:
  1. 1-15 KVA: Class 185 with 115°C rise
  2. 16-500 KVA: Class 220 with 80°C rise
  3. Transformers shall not depend on mechanical ventilation to maintain required temperatures due to heat rise (transformers with integral fans are not allowed.)
- F. Case temperature: Do not exceed 35°C rise above ambient at warmest point at full load.
- G. Winding Taps:
  1. Transformers less than 15 KVA: Two-5% below rated voltage, full capacity taps on primary winding.

2. Transformers 15 KVA and Larger: NEMA ST 20.

H. Sound Levels: Maximum sound levels are as follows:
1. 1-5 KVA: 40 dB
2. 6-25 KVA: 45 dB
3. 26-150 KVA: 50 dB
4. 151-225 KVA: 55 dB
5. 226-300 KVA: 55 dB
6. 301-500 KVA: 60 dB

I. Basic Impulse Level for 10 kV for transformers shall be less than 300 KVA, 30 kV for transformers 300 KVA and larger.

J. Ground core and coil assembly to enclosure by means of a visible flexible copper-grounding strap.

K. Mounting:
1. 1-15 KVA: Provide unit suitable for wall mounting.
2. 16-75 KVA: Provide unit suitable for wall, floor, or trapeze mounting.
3. Larger than 75 KVA: Suitable for floor or trapeze mounting.

L. Coil Conductor: Continuous windings with terminations brazed or welded.

M. Enclosure: Use a NEMA ST 20 Type 1 or Type 3R ventilated or non-ventilated.

N. Isolate core and coil from enclosure using vibration-absorbing mounts.

O. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

P. Transformers shall meet the energy efficiency standards requirements of NEMA Standard TP-1.

2.2 TWO-WINDING TRANSFORMERS RATED FOR NONLINEAR LOADS

A. Manufacturers:
1. Square D
2. Cutler Hammer
3. General Electric
4. Substitutions: Under provisions of Section 01 60 00

B. Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers, ratings as shown on the drawings, designed to supply a 100% nonlinear load as noted on the drawings.

C. Primary Voltage: 480 volts, 3 phase

D. Secondary Voltage: 208Y/120 volts, 3 phase

E. Core Flux Density: Below saturation at 10% primary over voltage

F. Insulation and temperature rise:
1. Provide a class 220 insulation system with 80°C average winding temperature rise.
2. Transformers shall not depend on mechanical ventilation to maintain required temperatures due to heat rise (transformers with integral fans are not allowed.)

G. Case temperature: Do not exceed 35°C rise above ambient at its warmest point at full load.

H. Winding Taps:
1. Transformers less than 15 KVA: Two 5% below rated voltage, full capacity taps on primary winding.
2. Transformers 15 KVA and Larger: NEMA ST 20.

I. Sound Levels: NEMA ST 20, Maximum sound levels are as follows:
1. 1-5 KVA: 40 dB
2. 6-25 KVA: 45 dB
3. 26-150 KVA: 50 dB
4. 151-225 KVA: 55 dB
5. 226-300 KVA: 55 dB
6. 301-500 KVA: 60 dB

J. Basic Impulse Level for 10 kV for transformers shall be less than 300 KVA, 30 kV for transformers 300 KVA and larger.

K. Ground core and coil assembly to enclosure by means of a visible flexible copper-grounding strap.

L. Mounting:

1. 1-15 KVA: Suitable for wall mounting
2. 16-75 KVA: Suitable for wall, floor, or trapeze mounting
3. Larger than 75 KVA: Suitable for floor or trapeze mounting

M. Coil Conductor:
1. Continuous windings with terminations brazed or welded.
2. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies.
3. Size the secondary neutral conductor at twice the secondary phase conductor ampacity.

N. Electrostatic Shield: Use copper between primary and secondary windings.

O. Enclosure:
1. Use a NEMA ST 20 Type 1 or Type 3R ventilated or non-ventilated.
2. Provide lifting eyes or brackets.

P. Isolate core and coil from enclosure using vibration-absorbing mounts.

Q. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

R. Transformers shall meet the energy efficiency standards requirements of NEMA Standard TP-1.

2.3 SHIELDED TRANSFORMERS

A. Manufacturers:
1. Square D
2. Cutler Hammer
3. General Electric
4. Substitutions: Under provisions of Section 01 60 00

B. Description: Use NEMA ST 20 factory-assembled air-cooled dry type transformers, with ratings as shown on the drawings.

C. Primary Voltage: 480 volts, 3 phase.

D. Secondary Voltage: 208Y/120 volts, 3 phase.

E. Insulation system and average winding temperature rise for rated KVA as follows:
1. 10-15 KVA: Class 185 with 115°C rise
2. 16-500 KVA: Class 220 with 150°C rise
3. Transformers shall not depend on mechanical ventilation to maintain required temperatures due to heat rise (transformers with integral fans are not allowed.)

F. Case temperature: Do not exceed 50°C rise above ambient at warmest point at full load.

G. Winding Taps:
1. Transformers less than 15 KVA: Two 5% below rated voltage, full capacity taps on primary winding.
2. Transformers 15 KVA and Larger: NEMA ST 20.

H. Sound Levels: NEMA ST 20 Maximum sound levels are as follows:
1. 1-5 KVA: 40 dB.
2. 6-25 KVA: 45 dB.
3. 26-150 KVA: 50 dB.
4. 151-225 KVA: 55 dB.
5. 226-300 KVA: 55 dB.
6. 301-500 KVA: 60 dB.

I. Basic Impulse Level for a 10 KV for transformers shall be less than 300 KVA, 30 kV for transformers 300 KVA and larger.

J. Ground core and coil assembly to enclosure with visible flexible cooper grounding strap.

K. Winding Shield: Electrostatic, with separate insulated grounding connection.

L. Mounting:
1. 1-15 KVA: Suitable for wall mounting
2. 16-75 KVA: Suitable for wall, floor, or trapeze mounting
3. Larger than 75 KVA: Suitable for floor or trapeze mounting

M. Coil Conductors: Continuous windings with terminations brazed or welded.

N. Enclosure:

1. Use a NEMA ST 20 Type 1 or Type 3R ventilated or non-ventilated.
2. Provide lifting eyes or brackets.

O. Isolate core and coil from enclosure using vibration-absorbing mounts.
P. Nameplate: Include transformer connection data.
Q. Transformers shall meet the energy efficiency standards requirements of NEMA Standard TP-1.

2.4 ALTERNATIVE SYSTEM

A. Transformers combined with integrated power distribution system containing switchboard, panel boards, transformers, transient voltage-surge suppression devices (TVSS), and other electrical equipment will be acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set transformer plumb and level.
B. Use flexible conduit, under the provisions of Section 26 05 33, 2' minimum length, for connections to transformer case.
   1. Make conduit connections to side panel of enclosure.
C. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.
D. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.
E. Mount trapeze-mounted transformers as indicated.
F. Provide grounding and bonding in accordance with Section 26 05 26.

3.2 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.
B. Measure primary and secondary voltages and make appropriate tap adjustments.
C. Provide disconnecting means, for the primary, adjacent to power transformer.
D. Provide power transformers with a grounding bar attached to the enclosure for all grounding conductors.

END OF SECTION

SECTION 26 23 10
DISCONNECT SWITCHES

PART 1 GENERAL

1.1 WORK INCLUDED
- A. Disconnect switches
- B. Fuses
- C. Enclosures

1.2 REFERENCES
- A. UL 248-12- Class R Fuses
- B. NEMA KS 1 – Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

1.3 SUBMITTALS
- A. Submit product data under provisions of Section 01 33 00.
- B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES
- A. Square D
- B. General Electric
- C. Cutler Hammer
- D. Siemens/ITE

2.2 DISCONNECT SWITCHES
- A. Fusible Switch Assemblies: Provide NEMA KS-1 Type HD quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position.
  1. Handle lockable in OFF position, Fuse Clips
  2. Designed to accommodate only Class R-fuses
  3. Provide with fuse rejection clip
- B. Non-fusible Switch Assemblies:
  1. Provide NEMA KS-1 Type HD quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position.
  2. Handle lockable in OFF position.
- C. Enclosures shall be NEMA KS-1 as indicated on Drawings.
- D. Provide ground bar kit for equipment grounding conductors.
- E. Provide neutral bar kit where neutral(s) are present in disconnect switch.

2.3 ACCEPTABLE MANUFACTURERS - FUSES
- A. Gould Shawmut
- B. Bussmann
- C. Reliance Fuse
- D. Substitutions: Under provisions of Section 01 60 00
- E. Little Fuse

2.4 FUSES
- A. Fuses 600 Amperes and Lower, use Class RK1 or RK5 and keep dual element, current limiting, and time delay one-time fuse, of 250 or 600 volts.
- B. Interrupting Rating shall be minimum 200,000 rms amperes.

PART 3 EXECUTION

3.1 INSTALLATION
- A. Install disconnect switches were indicated on Drawings.
- B. Install fuses in fusible disconnect switches.

END OF SECTION

SECTION 26 24 16
PANEL BOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Service and distribution panel boards

1.2 REFERENCES
- A. FS W-C -375 - Circuit Breakers, Molded Case, Branch Circuit and Service
- B. FS W-P -115 – Panel, Power Distribution
- C. UL 489 - Molded Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
- D. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches
- E. NEMA PB 1 - Panelboards
- F. NEMA PB 1.1 – General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or less
- G. NEMA PB 2.2 - Application Guide for Ground-Fault Protective (GFP) Devices for Equipment

1.3 SUBMITTALS
- A. Submit shop drawings for equipment and component devices under provisions of Section 01 33 00.
- B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.4 COMMISSIONING
- A. Commissioning of a system or systems specified in this section is part of the construction process.
- B. Documentation and testing of these systems, as well as training of the Owner’s operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- E. Refer to Section 01 91 00 - Commissioning, for detailed commissioning requirements.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURES - PANELBOARDS
- A. Square D
- B. General Electric
- C. Cutler Hammer
- D. Siemens/ITE

2.2 DISTRIBUTION PANELBOARDS
- A. Panel boards: Use a NEMA PB 1 circuit breaker type fusible switch type.
- B. Enclosure: NEMA PB 1 type as required to meet conditions of installation unless indicated on the Drawings.
- C. Provide flush lock in hinged door(s).
  1. Covers finished in manufacturer's standard enamel color.
- D. Provide panel boards with copper bus, ratings as scheduled on Drawings.
  1. Provide copper ground bus in all panel boards.
- E. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 208-volt panel boards; 14,000 amperes rms symmetrical for 480-volt panel boards, or as shown on Drawings.
- F. Fusible Switch Assemblies:
  1. NEMA KS 1 quick-make quick-break load interrupter enclosed knife switch with externally operable handle.
  2. Provide interlock to prevent opening front cover with switch in ON position.
  3. Handle lockable in OFF position.
  4. Fuse Clips: Designed to accommodate Class R fuses, type as specified.
- G. Molded Case Circuit Breakers: Provide UL 489 circuit breakers with integral thermal and instantaneous magnetic trip in each pole.
  1. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

H. Molded Case Circuit Breakers with Current Limiters: Provide UL 489, circuit breakers with replaceable current limiting elements, in add provide an integral thermal and instantaneous magnetic trip in each pole.
I. Current Limiting Molded Case Circuit Breakers; UL 489; provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinate with automatically resetting current limiting elements in each pole.
   1. Interrupting rating of 100,000 symmetrical amperes, let-through current, and energy level less than permitted for same size Class RK-5 fuse.
J. Breakers to have bolted bus connections

2.3 BRANCH CIRCUIT PANELBOARDS

A. Appliance Branch Circuit Panel boards, provide NEMA PB1 circuit breaker type.
B. Enclosure: Use a NEMA PB 1 Type 1 or Type 3R.
C. Provide applicable cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike.
   1. Finish in manufacturer's standard enamel.
D. Provide panel boards with copper bus, ratings as scheduled on Drawings.
   1. Provide copper ground bus in all panel boards.
E. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 208-volt panel boards; 14,000 amperes rms symmetrical for 480-volt panel boards, or as shown on Drawings.
F. Molded Case Circuit Breakers: UL 489 bolt on type thermal magnetic trip circuit breakers, with common trip handle for all poles.
G. Current Limiting Molded Case Circuit Breakers:
   1. UL 489; provide bolt-on type circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole.
   2. Interrupting rating of 100,000 symmetrical amperes let-through current and energy level less than permitted for same size Class RK-5 fuse.
H. Do not use tandem circuit breakers.
I. Use full width, breakers.
J. Breakers for kitchen equipment shall have permanent padlock breaker locks.
K. Provide a neutral conductor to every panel board.

2.4 ALTERNATIVE SYSTEM

A. Panelboards combined with integrated power distribution system containing switchboard, panelboards, transformers, transient voltage surge-suppression devices (TVSS), and other electrical equipment will be acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install panel boards plumb and flush with wall finishes where recessed, in conformance with NEMA PB 2.1.
B. Height: 6' maximum
C. Provide filler plates for unused spaces in panel boards.
D. Provide typed circuit directory for each branch-circuit panel board.
   1. Revise directory to reflect circuiting changes required to balance phase loads.
E. Provide two - 1" spare conduits from recessed and one - 1" spare conduit from surface panel boards into the closest suspended acoustical ceiling outside the room where the panel is located.
F. Install surface-mounted panel boards with minimum of four anchors or per drawing detail.
   1. Provide steel channel supports to stand panel boards ¾" off wall.
G. Bridge studs top and bottom with channels to support flush-mounted panel boards in stud walls.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panel board feeder.
   1. Should the difference at any panel board between phases exceed 15%, rearrange circuits in the panel board to balance the phase loads within 15%.
   2. Take care to maintain proper phasing for multi-wire branch circuits.
B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding.
   1. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. System Functional Performance Testing is part of the Commissioning Process.
   1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
   2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirements.
B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.
C. Perform the Functional performance testing of Panelboards as part of the Electrical System Functional Performance testing.

3.4 DEMONSTRATION AND TRAINING

A. Training of the Owner’s operation and maintenance personnel is required in cooperation with the Owner's Representative.
   1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
   2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
   3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements
B. Provide demonstration and training for all types of panelboards installed in this project.

END OF SECTION

SECTION 26 27 16
ELECTRICAL CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Hinged cover enclosures
- B. Cabinets
- C. Terminal blocks and accessories

1.2 REFERENCES
- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- B. NEMA ICS 1 - Industrial Control and Systems: General Requirements
- C. NEMA ICS 4 – Application Guideline for Terminal Blocks
- D. NEMA ICS 6 - Enclosures

1.3 SUBMITTALS
- A. Submit product data under provisions of Section 01 33 00.
- B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing and construction diagram as described in NEMA ICS 1.

PART 2 PRODUCTS

2.1 HINGED COVER ENCLOSURES
- A. Construction: Use NEMA 250 steel types as required to meet conditions of installation unless indicated on the Drawings.
- B. Finish: Use manufacturer's standard enamel finish.
- C. Covers: Continuous hinge, held closed by flush latch operable by key.
- D. Panel for Mounting Terminal Blocks or Electrical Components: 14-gage steel, enamel finish.

2.2 CABINETS
- A. Cabinet Boxes: Provide galvanized steel with removable end walls.
  1. Provide ¾" thick plywood backboard (exterior fir, type A/C, 7 ply) painted gray on all sides, for mounting terminal blocks.
- B. Cabinet Fronts: Steel, flush or surface type with screw cover front, concealed hinge and flush lock keyed to match branch circuit panel board; finish in baked enamel.

2.3 TERMINAL BLOCKS AND ACCESSORIES
- A. Terminal Blocks: NEMA ICS 4; UL listed.
- B. Power Terminals: Unit construction type, closed-back type, with tubular pressure screw connectors, rated 600 volts.
- C. Signal and Control Terminals: Modular construction type, channel mounted; tubular pressure screw connectors, rated 300 volts.

2.4 FABRICATION
- A. Shop assembles the enclosures and cabinets housing terminal blocks or electrical components in accordance with NEMA ICS 6.
- B. Provide knockouts on enclosures.
- C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout drawing of control wiring and components within enclosure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install cabinets and enclosures plumb; anchor securely to wall and structural supports at each corner, minimum.
B. Provide accessory feet for free-standing equipment enclosures.
C. Install trim plumb.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Receptacles
- B. Device plates

1.2 REFERENCES
- A. NEMA 5-WD 1 - Wiring Devices
- B. NEMA WD 6 - Wiring Devices – Dimensional Specifications

1.3 SUBMITTALS
- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.4 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3-years of experience.

1.5 ALLOWANCES
- A. Provide for twenty additional receptacles as directed in field.
  1. Allowance includes purchase, delivery, and installation of box, receptacle cover plate, wire, and 100 feet of conduit for each receptacle.

1.6 WARRANTIES
- A. Occupancy sensor manufacture shall provide 5-year warranty on parts and labor.

PART 2 PRODUCTS

2.1 RECEPTACLES
- A. Receptacles shall be 20 amps, 125 volts grounding type, industrial, specification grade, back and side wired, and with ground screw.
  1. Receptacles shall be single, duplex, quadplex. Outdoor GFCI (weather resistant and with heavy duty weatherproof cover) and as shown on the plans.
- B. General convenience receptacles shall be ivory color, receptacles supplied by branch circuits via emergency generator backed panels shall be red color, receptacles for communication systems equipment (computers) shall be gray color, and receptacles controlled automatically shall be green in color.
- C. Heavy-duty special receptacle outlets for dryers, kiln, and ranges as specified on the plans.
- D. Manufacturers
  1. Hubbell
  2. Leviton
  3. Pass & Seymour
  4. Substitutions: Under provisions of Section 01 60 00

2.2 WALL PLATES
- A. Decorative Cover Plate: Stainless steel type 302 satin finished, non-magnetic.
- B. Weatherproof Cover Plate: Cast type, UL listed for wet and damp locations.
  1. Sierra
  2. Hubbell
  3. Leviton
  4. Pass & Seymour
  5. Substitutions: Under provisions of Section 01 60 00
- C. Manufacturers
  1. Wattstopper, Model DT-300 Series
  2. Hubbell, Model ATD2000CRP Series
  3. Cooper OMC-DT Series
  4. Substitutions: Under provisions of Section 01 60 00

PART 3 EXECUTION

3.1 EXAMINATION
- A. Verify conditions under provisions of Section 01 31 00
- B. Verify outlet boxes are installed at proper height.
- C. Verify wall openings are neatly cut and completely covered by wall plates.
- D. Verify branch circuit wiring installation is complete, tested, and ready for connection to wiring devices.

3.2 PREPARATION
- A. Provide extension ring to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION
- A. Install products in accordance with manufacturer's instructions.
- B. Install devices plumb and level.
- C. Do not share neutral conductor on load side of dimmers.
- D. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- E. Install plates on receptacle, and blank outlets in finished areas.
- F. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- G. Provide one GFCI receptacle, minimum, in air conditioning equipment.
- H. When plans or the code specifies GFCI, use only GFCI receptacles.

3.4 INTERFACE WITH OTHER PRODUCTS
- A. Coordinate locations of outlet boxes provided under Section 26 27 16 to obtain mounting height specified and indicated on Drawings.
- B. Install outdoor receptacles 60" to center above finished grade.

3.5 FIELD QUALITY CONTROL
- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING
- A. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 26 28 13
FUSES (600 VOLT AND BELOW)

PART 1 GENERAL

1.1 FURNISH AND INSTALL FUSES OF THE TYPES AND SIZES AS INDICATED ON THE DRAWINGS AND/OR AS SPECIFIED HEREIN.
- A. All fuses furnished and installed under this specification shall be as specified; shall be new, unused fuses; shall be delivered to the job site in manufacturer's original boxes or cartons whether furnished by the Contractor or by the manufacturer of equipment.
- B. All fuses shall have a minimum interrupting rating of 200,000 amperes.
- C. Should utilization, conversion, or distribution equipment provided under any division of these specifications require fuse classes offering a higher degree of protection or different ampere ratings than fuses specified, such fuse classes and ampere ratings may be used.

1.2 EVENLY TORQUE ALL MOUNTING BOLTS OR NUTS TO ASTM RECOMMENDATIONS FOR TYPE AND DIAMETER OF MOUNTING BOLTS OR STUDS PROVIDED.
- A. The inside of each fuse enclosure shall contain a durable, readily visible label, which shall clearly indicate the correct type and size of replacement fuse.
- B. Label shall not cover or interfere with equipment manufacturer's instructions.

1.3 FUSES SHALL BE MADE BY ONE OF THE FOLLOWING MANUFACTURERS:
- A. Reliance Fuses
- B. Gould Shawmut
- C. Littlefuse
- D. Bussmann
- E. Substitutions:
  1. Should the Contractor propose to provide fuses other than those specified, at least six weeks prior to the installation of the fuses, he shall furnish the Engineer complete technical data sufficient for the Engineer to determine whether system function will be adversely affected, whether proposed fuses meet this specification and whether they are equal in quality.
  2. Proposal for substitution shall state the dollar cost savings to the Owner and reason for proposed substitution.

1.4 TO ASSURE SELECTIVE COORDINATION OF PROTECTIVE DEVICES, ALL FUSES SHALL BE OF THE SAME MANUFACTURER.

PART 2 PRODUCTS

2.1 FUSES FOR SERVICE, SWITCHBOARD MAINS, FEEDERS, AND BRANCH CIRCUITS
- A. 0 to 600 amperes: Fuses 0 to 600 amperes shall be UL listed RK1 dual-element, time-delay fuses with ampere ratings as indicated on the drawings except as modified by these specifications.
- B. Fuses for motor branch circuits 600 amperes and below, whether individual or grouped (MCC), shall be class RK1 fuses.
  1. To determine fuse ratings for motor branch circuits, use actual full-load currents of motors provided, not by NEC Table of Standard Motor Full Load Ampere.
  2. EXCEPTION
     a. Follow the fuse manufacturer's recommendations for Class CC fuses.
- C. Fuses for motor branch circuits requiring fuses over 601 amps, whether individual or grouped (MCC), shall be Class L fuses.
- D. Fuse holders shall be able to simultaneously disconnect all ungrounded conductors of the branch circuit by means of an adjacent disconnect or a multi-pole fuse holder.

2.2 FUSING OF CONTROL CIRCUITS
- A. General: Fuses shall be RK1 or time-delay Class CC fuses installed in Class CC fuse blocks.
- B. Control Power Transformers:
  1. Primary circuit of all control power transformers shall have proper fuse.
  2. Fuse ratings shall be in accordance with NEC requirements.
  3. Fuses shall be RK1 or time-delay UL Class CC fuses installed in Class CC fuse blocks.

2.3 INITIAL START-UP
- A. Contractor shall replace all fuses opened during start-up and testing.

B. At contract completion, all fuse holders shall contain serviceable fuses as specified.

PART 3 EXECUTION

3.1 Not Used.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Enclosed molded case circuit breakers

1.2 REFERENCES
- A. FS W-C-375 - Circuit Breakers, Molded Case, Branch Circuit and Service
- B. UL 489 - Molded Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

1.3 SUBMITTALS
- A. Submit product data under provisions of Section 01 30 00.
- B. Include circuit breaker and current limiter ratings, trip current and let-through current curves, outline dimensions, and terminal lug sizes.

1.4 COMMISSIONING
- A. Commissioning of a system or systems specified in this section is part of the construction process.
- B. Documentation and testing of these systems, as well as training of the Owner’s operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- E. Refer to Section 01 91 00 - Commissioning, for detailed commissioning requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. Square D
- B. General Electric
- C. Cutler Hammer
- D. Siemens/ITE

2.2 MOLDED CASE CIRCUIT BREAKER
- A. Circuit Breaker: UL 489

2.3 RATINGS
- A. UL 489; as scheduled

2.4 TERMINAL LUGS
- A. Provide and install UL 489 as scheduled and suitable for copper.

2.5 CURRENT LIMITERS
- A. Current Limiter: Use devices designed for application with molded case circuit breaker.
- B. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.
- C. Provide interlocks to trip circuit breaker and prevent closing the circuit breaker when limiter compartment covers off or when one or more limiter is not in place or has operated.

2.6 ENCLOSURE
- A. Enclosure: UL 489 type as required to meet conditions of installation unless indicated on the Drawings.
- B. Fabricate enclosure from steel.
- C. Finish using manufacturer's standard enamel color.

2.7 ACCESSORIES
- A. Provide accessories as scheduled, to UL 489.
- B. Shunt Trip Device: 120 volts AC
- C. Under voltage Trip Device: 120 volts AC
- D. Auxiliary Switch: 120 volts AC
- E. Alarm Switch: 120 volts AC
- F. Electrical Operator: 120 volts AC
- G. Handle Lock: Include provisions for padlocking.
- H. Provide mechanical trip device.

PART 3 EXECUTION

3.1 EXAMINATION
- A. Verify that surfaces are ready to receive work.
- B. Verify field measurements are as shown on Drawings.
- C. Verify that required utilities are available, in proper location, and ready for use.
- D. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION
- A. Install enclosed circuit breakers where shown on Drawings, in accordance with manufacturer's instructions.

3.3 ADJUSTING
- A. Adjust work under provisions of Section 01 75 00.
- B. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit.
- C. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

3.4 FIELD QUALITY CONTROL
- A. Perform field inspection and testing under provisions of Section 01 40 00.
- B. Inspect and test each circuit breaker to UL 489.
- C. Inspect visually and perform several mechanical ON-OFF operations on each circuit breaker.
- D. Verify circuit continuity on each pole in closed position.

3.5 FUNCTIONAL PERFORMANCE TESTING
- A. System Functional Performance Testing is part of the Commissioning Process.
  1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
  2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirements.
- B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.
- C. Perform the functional performance testing of Enclosed Circuit Breakers as part of the Electrical System Functional Performance testing.

3.6 DEMONSTRATION AND TRAINING
- A. Training of the Owner’s operation and maintenance personnel is required in cooperation with the Owner's Representative.
  1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
  2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
  3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.
- B. Provide demonstration and training for all types of enclosed circuit breakers installed in this project.

END OF SECTION