PROJECT MANUAL

FOR

Site Work, Restroom & Fire Alarm Upgrades @ Quail Valley Middle School

Snowline Joint Unified School District
4075 Nielson Road
Phelan, CA 92371

SET NO. _____

FRICK, FRICK & JETTÉ ARCHITECTS
19153 TOWN CENTER DRIVE, SUITE 101
APPLE VALLEY, CA 92308
(760) 240-6211

PROJECT MANUAL

FOR

Site Work, Restroom & Fire Alarm Upgrades @
Quail Valley Middle School

Snowline Joint Unified School District
4075 Nielson Road
Phelan, CA 92371



IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 04-121057 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 02/22/2023

Gino C. Bastianon C-27546
ARCHITECT



Abby Banerjee M-29253
MECHANICAL ENGINEER



Rolando E. Sotelo E-17229
ELECTRICAL ENGINEER

DOCUMENT 00 01 10

TABLE OF CONTENTS

Section Title

SPECIFICATIONS GROUP
GENERAL REQUIREMENTS SUBGROUP

DIVISION 01 - GENERAL REQUIREMENTS

01 10 00 Summary
01 20 00 Price and Payment Procedures
01 30 00 Administrative Requirements
01 33 00 Submittal Procedures
01 40 00 Quality Requirements
01 41 00 Testing Laboratory Services
01 50 00 Temporary Facilities and Controls
01 60 00 Product Requirements
01 70 00 Execution and Closeout Requirements

FACILITY CONSTRUCTION SUBGROUP

DIVISION 02 - EXISTING CONDITIONS

02 41 19 Selective Structure Demolition

DIVISION 03 - CONCRETE

03 10 00 Concrete Forming and Accessories
03 20 00 Concrete Reinforcing
03 30 00 Cast-In-Place Concrete

DIVISION 04 – NOT USED

DIVISION 05 - METALS

05 50 00 Metal Fabrications
05 52 00 Metal Railings

DIVISION 06 – NOT USED

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 84 00 Firestopping
07 90 00 Joint Protection

DIVISION 08 - OPENINGS

08 11 13 Hollow Metal Doors and Frames
08 31 13 Access Doors and Frames
08 71 00 Door Hardware

DIVISION 09 - FINISHES

09 21 16 Gypsum Board Assemblies
09 30 11 Ceramic Tile Floor Finish
09 30 12 Ceramic Tile Wall Finish
09 60 00 Resilient Base and Stair Nosing
09 90 00 Painting and Coating

DIVISION 10 - SPECIALTIES

10 14 00 Signage
10 21 15 Plastic Toilet Compartments
10 28 00 Toilet & Bath Accessories

DIVISION 11 TO 19 - NOT USED

FACILITY SERVICES SUBGROUP

DIVISION 20 TO 21 - NOT USED

DIVISION 22 - PLUMBING

22 00 00 Plumbing
22 40 00 Plumbing Fixtures
22 49 00 Gas Piping

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

23 00 00 Heating, Ventilation and Air Conditioning
23 01 30 Existing Duct Cleaning
23 05 93 TAB
23 01 30 Carrier EMS

DIVISION 24 TO 25- NOT USED

DIVISION 26 – ELECTRICAL

26 00 00 General Electrical Requirements

DIVISION 27 - COMMUNICATIONS

27 51 23 Supervised Network Intercom And Paging System

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 16 00 Intrusion Alarm
28 31 00 Fire Alarm System

DIVISION 29 - NOT USED

SITE AND INFRASTRUCTURE SUBGROUP

DIVISION 30 - NOT USED

DIVISION 31 - EARTHWORK

31 05 13 Soils for Earthwork
31 05 16 Aggregates for Earthwork
31 23 16 Excavation
31 23 17 Trenching
31 23 23 Fill

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 12 16 Asphalt Paving
32 13 13 Concrete Paving
32 17 13 Parking Bumpers
32 17 23 Pavement Markings

DIVISIONS 33 TO 49 - NOT USED

END OF SECTION

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract description.

B. Work by Owner.

C. Owner supplied products.

D. Contractor's use of site and premises.

E. Work sequence.

F. Specification Conventions.

1.2 CONTRACT DESCRIPTION

A. Work of this Project includes the Site Work, Restroom & Fire Alarm Upgrades at Quail Valley Middle School located at 10058 Arrowhead Rd, Phelan, CA 92371 and related site work.

B. Perform Work of Contract under single lump sum contract with Owner in accordance with Conditions of Contract.

1.3 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be furnished and installed by Owner.

1.4 OWNER SUPPLIED PRODUCTS

A. Items noted OFCI (Owner Furnished, Contractor Installed) will be furnished by Owner for installation by Contractor.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limit use of site and premises to allow:
   1. Owner occupancy.
   2. Use of site and premises by Owner.

1.6 WORK SEQUENCE

A. Construct Work in phases to accommodate Owner's occupancy requirements during construction period, coordinate construction schedule and operations with Owner and Architect.

1.7 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of values.

B. Applications for payment.

C. Change procedures.

D. Cash allowances.

E. Alternates.

1.2 SCHEDULE OF VALUES

A. Submit typed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

B. Submit Schedule of Values for review in duplicate within 15 days after date established in Notice to Proceed.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds and insurance.

D. Include in each line item, the amount of Allowances specified in this Section.

E. Include separately from each line item, a directly proportional amount of Contractor's overhead and profit.

F. Revise schedule to list approved Change Orders, on continuation sheet, with each Application For Payment.

1.3 APPLICATIONS FOR PAYMENT

A. Submit six copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702. Contractor's standard form or electronic media printout will be considered.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: Submit at intervals stipulated in the Agreement.

1.4 CHANGE PROCEDURES

A. The Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by General Conditions on AIA Form G710 Architect's Supplemental Instructions.

B. The Architect may issue a Proposal Request including a detailed description of a proposed change with supplementary or revised Drawings and Specifications. Contractor will prepare and submit a detailed cost and time estimate within 14 days.

C. The Contractor may propose a change by submitting a Change Order Request to the Architect, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation.

D. Stipulated Sum Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's Change Order Request as approved by Architect.

E. Construction Change Directive: Architect may issue a directive signed by the Owner and Architect, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum or Contract Time. Promptly execute the change.

F. Change Order Forms: AIA G701 Change Order.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. Correlation Of Contractor Submittals:
   1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
   2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
   3. Promptly enter changes in Project Record Documents.

I. All Changes in the plans and specifications shall be approved by the Division of the State Architect and comply with the requirements of Title 21, Article I, Subsection 38.

1.5 CASH ALLOWANCES

A. Include in the Contract stipulated Cash Allowances as indicated in the following schedule for use upon Owner's instruction.

B. The Prime Contractor will be allowed no markup for overhead and profit or bond on Change Orders until Cash Allowance amount is depleted. Subcontractor and lower tier subcontractors will be allowed markups as indicated in the General Conditions.

C. Funds will be drawn from Cash Allowance only by written authorization.

D. At closeout of Contract, funds remaining in Cash Allowance will be credited to Owner by Change Order.

E. Schedule:
   1. None

1.6 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work.

C. Base Bid: Construct all work indicated on Contract Documents in its entirety with the exception of the Alternates listed below.

D. Schedule:
1. None

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.

B. Field engineering.

C. Preconstruction meeting.

D. Progress meetings.

E. Pre-installation meetings.

F. Cutting and patching.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and cleanup of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner’s occupancy.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of California and acceptable to the Architect.

B. Locate and protect survey control and reference points. Promptly notify Architect of discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey. Contractor to locate and protect survey control and reference points.

D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

E. Submit copy of site drawing and certificate signed by Land Surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.

F. Maintain complete and accurate log of control and survey work as Work progresses.

G. On completion of foundation walls and major site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

H. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

I. Promptly report to Architect/Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.

J. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

1.4 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting within 15 days after Notice of Intent to Award letter.

B. Attendance Required: Owner, Owner's Resident Inspector, Owner's Testing Laboratory Representative, Architect, Contractor, Contractor’s Project Manager and Contractor’s Job Superintendent.

C. Optional Attendance: Architect's consultants, subcontractors and utility company representatives.

D. Architect will preside at meeting, record minutes and distribute copies.

E. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Issue Notice to Proceed.
3. Submission of executed bonds and insurance certificates.
4. Distribution of Contract Documents.
5. Submission of list of Subcontractors, list of products, Schedule of Values, and progress schedule.
6. Designation of responsible personnel representing parties in Contract and Architect.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Scheduling activities of Geotechnical Engineer.

F. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, and those affected by decisions made.

1.5 PROGRESS MEETINGS

A. Architect will schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes (Field Reports), and distribute copies.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Owner's Resident Inspector, Architect, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review minutes (Field Reports) of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems impeding planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, and those affected by decisions made.

1.6 PRE-INSTALLATION MEETINGS

A. When required in individual specification Sections, convene pre-installation meetings prior to commencing work of specific Section.

B. Require attendance of parties directly affecting, or affected by, Work of specific Section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, and those affected by decisions made.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ original installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:
1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and non-conforming Work.
   4. Remove samples of installed Work for testing.
   5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Unless specifically shown on these plans, no structural member shall be cut, drilled or notched without prior written authorization from the Structural Engineer and the Division of the State Architect.

E. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.

F. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.

G. Provide protection from elements for areas which may be exposed by uncovering work.

H. Cut masonry and concrete materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

I. Restore Work with new products in accordance with requirements of Contract Documents.

J. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

K. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

L. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of penetrated element.

M. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

N. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Submittal procedures.
2. Construction progress schedules.
3. Proposed products list.
4. Product data.
5. Shop drawings.
6. Samples.
7. Certificates.
8. Manufacturers' instructions.
9. Erection drawings.

B. Related Sections:
1. Section 01 60 00 - Product Requirements: Product substitutions and substitution submittal procedures.

1.2 SUBMITTAL PROCEDURES

A. Prepare complete submittal packages for each individual specification Section.

B. Transmit a minimum of 6 copies of each submittal with Architect accepted form.

C. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

D. Identify Project, Architect's project number, Contractor, subcontractor and supplier; pertinent Drawing sheet and detail number(s), and specification Section number, appropriate to submittal.

E. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals without Contractor's stamp and signature will be returned without review.

F. Schedule submittals to expedite the Project, and deliver to Architect at business address. Coordinate submission of related items.

G. Make submittals in groups containing associated and related items to make sure that information is available for checking each item when it is received.

H. Make submittals enough in advance of scheduled dates for installation to provide time for review and possible revisions and resubmission prior to approval and subsequent placement of orders.

I. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.

J. Allow space on submittals for Contractor and Architect/Engineer review stamps.

K. When revised for resubmission, identify changes made since previous submission.

L. Distribute copies of reviewed submittals to concerned parties as appropriate. Instruct parties to promptly report any inability to comply with provisions.

M. Submittals not requested will not be recognized or processed.

N. Submittals that are required to be reviewed by the Architect more than twice are subject to a professional services fee as specified in the General Conditions.

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedules in duplicate within 14 days after date established in Notice to Proceed. After review, resubmit required revised data within ten days.

B. Submit revised Progress Schedules with each Application for Payment, identifying changes since previous version.

C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

E. Submit computer generated horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week. Provide critical path analysis.

F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, 50% completion, early and late finish, float dates, duration and other major milestones.

G. Indicate estimated percentage of completion for each item of Work at each submission.

H. Submit separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

I. Indicate delivery dates for Owner furnished products.

J. Revisions To Schedules:
   1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
   2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
   3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

1.4 PROPOSED PRODUCTS LIST

A. Within 14 days after date of Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number or each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. When specified in individual specification sections, submit number of copies of data for each product which Contractor requires, plus two copies which will be retained by Architect.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.6 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
   1. Include signed and sealed calculations to support design.
   2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. When specified in individual specification sections, submit number of copies Contractor requires, plus two copies which will be retained by Architect.

E. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 SAMPLES

A. Samples: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Samples For Selection as Specified in Product Sections:
   1. Submit to Architect for aesthetic, color, or finish selection.
   2. Submit samples of finishes from full range of manufacturers' standard and custom colors, textures, and patterns for Architect selection.
   3. Range shall include standard stocked color/texture/pattern, standard color/texture/pattern not stocked, but available from manufacturer, and special color/texture/pattern available from manufacturer as advertised in product data and brochures.
   4. Architect may select from any range at no additional cost to Owner.

C. Architect will make no color selections until all submittals related to color have been received and materials reviewed.

D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

E. Include identification on each sample, with full Project information.

F. Submit the number or samples which Contractor requires, plus two of which will be retained by Architect.

G. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

H. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00 - Execution and Closeout Requirements.

1.8 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect.

1.9 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 ERECTION DRAWINGS

A. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

B. Data indicating inappropriate or unacceptable Work may be subject to action by Architect.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance and control of installation.

B. Tolerances.

C. References.

D. Labeling.

E. Mock-up requirements.

F. Manufacturer's field services.

G. Examination.

H. Preparation.

1.2 QUALITY ASSURANCE AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturer's instructions, including each step in sequence.

C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids, except where specific date is established by code.

C. Obtain copies of standards when required by Contract Documents. Maintain copy at jobsite during progress of the specific work.

D. When specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 LABELING

A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
   1. Model number.
   2. Serial number.
   3. Performance characteristics.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this Section and identified in respective product specification Sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be comparison standard for remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification Sections to be removed; remove mock-up and clear area when directed to do so by Architect.

1.7 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification Sections.

D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

END OF SECTION

SECTION 01 41 00

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selection and payment.

B. Contractor submittals.

C. Laboratory responsibilities.

D. Laboratory reports.

E. Limits on testing laboratory authority.

F. Contractor responsibilities.

G. Schedule of inspections and tests by owner's testing laboratory.

H. Schedule of inspections and tests by contractor's testing laboratory.

I. Inspection by the Owner.

1.2 REFERENCES

A. ANSI/ASTM D3740 - Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

B. ANSI/ASTM E329 - Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

C. 2019 California Building Code.

D. 2019 California Fire Code.

E. Title 24 of the California Code of Regulations.

1.3 SELECTION AND PAYMENT

A. Owner will employ and pay for services of an independent testing laboratory approved by DSA to perform inspection and testing as specified by Owner's testing laboratory.

B. Contractor shall employ and pay for services of an independent testing laboratory to perform inspection and testing as specified by Contractor's testing laboratory.

C. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.4 OWNER'S LABORATORY RESPONSIBILITIES

A. Test samples of mixes submitted by Inspector.

B. Provide qualified personnel at site. Cooperate with Architect, Inspector and Contractor in performance of services.

C. Perform specified inspection, sampling and testing of products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify Architect, Inspector and Contractor of observed irregularities or non-conformance of Work or products.

F. Perform additional inspections and tests required by Architect, Inspector or Division of the State Architect.

G. Attend pre-construction meetings and progress meetings when requested by Architect.

1.5 LABORATORY REPORTS

A. After each inspection and test, promptly submit one copy of laboratory report to Architect, Engineer, Owner's Resident Inspector approved by DSA, Division of the State Architect and Contractor.

B. Reports shall include the following:
1. Date issued.
2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications Section.
6. Location in the Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

C. When requested by Architect, provide interpretation of test results.

D. Verification of Test Reports: Each testing agency shall submit to the Architect and the Division of the State Architect a verified report in duplicate covering all of the tests which were required to be made by that agency during the progress of the project. Such report shall be furnished each time that work on the project is suspended, covering the tests up to that time and at the completion of the project, covering all tests.

1.6 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop the Work.

1.7 CONTRACTOR RESPONSIBILITIES

A. Submit proposed mix designs to Architect for review in accordance with specification Section 03 30 00.

B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer's facilities.

C. The Contractor shall notify the Owner's representative a sufficient time in advance of the manufacture of material to be supplied by him under the Contract Documents, which must by terms of the Contract by tested, in order that the Owner may arrange for the testing of same at the source of supply.

D. Any material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required, shall not be incorporated in the job.

E. The Owner will select and pay testing laboratory, approved by DSA, costs for all tests and inspections, but may be reimbursed by the Contractor for such costs under the Contract Documents.

F. Notify Architect, Owner's Resident Inspector and laboratory 48 hours prior to expected time for operations requiring inspection and testing services.
   1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to the Contractor's negligence.

G. If additional testing/inspection is required for items described in paragraph 1.8, the Testing Lab approved by DSA must be employed by the Owner. All costs for additional testing/inspection required will be deducted by the Owner from the Contract Sum.

1.8 SCHEDULE OF INSPECTIONS AND TESTS BY OWNER'S TESTING LABORATORY

A. Perform tests and inspections in conformance with 2019 California Building Code and Title 24 of the California Code of Regulations for all items listed on the DSA approved Tests & Inspections form, including but not limited to the following:
   1. Foundations (Chapter 17A & 18A)
      a. Earth fill compaction – 1705A.6
   2. Concrete (Chapter 19A)
      a. Materials
         1) Portland Cement Tests - 1910A.1
         2) Concrete Aggregates - 1903A.5
         3) Reinforcing Bars - 1910A.2 & DSA IR 17-10
         4) Batch Plant Inspection - 1705A.3.3
         5) Waiver of Batch Plant Inspection and Tests - 1705A.3.3.2
      b. Concrete Quality
         1) Proportions of Concrete - 1904A, 1903A
         2) Strength Tests of Concrete - 1910A.1, 1905A.1.15

c. Concrete Inspection

1) Job Site Inspection – ACI 318-14: 26.5.1, 26.5.2.1(A)&(B), 26.6.1.2(D), 26.11.1.1(A)

2) Batch Plant or Weighmaster Inspection - 1705A.3.3, 1705A.3.3.2

3. Structural Steel (Chapter 22A)

a. Materials

1) Structural Steel, Cold Formed Steel – 2205A, 2210A & 2211A

2) Material Identification - 2202A.1, 2205A

b. Inspection of Structural Steel

1) Tests of Structural & Cold Formed Steel - 1705A.2

2) Tests of H.S. Bolts, Nuts, Washers - 2213A.

3) Shop Fabrication Inspection - 1704A.2.5

4) Welding Inspection - 1705A.2.5, DSA IR 17-3

5) High Strength Bolt Inspection - Table 1705A.2.1, DSA IR 17-9

1.9 SCHEDULE OF INSPECTIONS AND TESTS BY CONTRACTOR'S TESTING LABORATORY

A. Plumbing
1. Testing as specified in Division 22, including but not limited to: Sterilization, soil waste and vent, water piping, gas piping, downspouts and storm drains.

B. Heating, Ventilating and Air Conditioning
1. Testing as specified in Division 23, including but not be limited to: Ductwork tests, cooling tower tests, boiler tests, controls testing, piping tests, water and air systems, and test and balance of heating and air conditioning systems.

C. Electrical
1. Testing as specified in Division 26, including but not limited to: Equipment testing, all electrical system operations, and grounding system.

1.10 INSPECTION BY THE OWNER

A. An Inspector, approved by DSA, employed by the Owner in accordance with the requirement of State of California Code of Regulations, Title 24, Part 1 will be assigned to the Work. His duties are specifically defined in Section 4-342 of Title 24, Part 1.

B. The work of construction in all stages of progress shall be subject to the personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill this Contract.

C. The Owner and his representatives shall at all times have access for the purpose of inspection to all parts of the work and to the shops wherein the work is in preparation, and the Contractor shall at all times maintain proper facilities and provide safe access for such inspection.

D. The Owner shall have the right to reject materials and workmanship that are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected

materials shall be removed from the premises without charge to the Owner. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the Owner may correct same and charge the expense to the Contractor.

E. Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of the work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish all necessary facilities, labor and materials. If such work is found to be defective in any respect due to the fault of the Contractor or his subcontractor, he shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the Contractor.

1.11 DSA 103 STATEMENT OF STRUCTURAL TESTS & INSPECTIONS
The Division of the State Architect's (DSA) approved Form 103 is attached to the end of this section.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:
   1. Temporary electricity.
   2. Temporary lighting for construction purposes.
   3. Temporary heating.
   4. Temporary cooling.
   5. Temporary ventilation.
   6. Telephone service.
   7. Facsimile service.
   8. Temporary water service.
   9. Temporary sanitary facilities.

B. Construction Facilities:
   1. Field offices.
   2. Vehicular access.
   3. Parking.
   4. Progress cleaning and waste removal.
   5. Project identification.
   6. Fire prevention facilities.

C. Temporary Controls:
   1. Barriers.
   2. Enclosures and fencing.
   3. Security.
   4. Water control.
   5. Dust control.
   6. Erosion and sediment control.
   7. Noise control.

D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from utility source as needed for construction operation.

B. Provide temporary electric feeder from electrical service at location as directed by utility company. Do not disrupt Owner's use of service.

C. Complement existing power service capacity and characteristics as required for construction operations.

D. Provide power outlets, with branch wiring and distribution boxes located as required for construction operations. Provide flexible power cords as required for portable construction tools and equipment.

E. Provide main service disconnect and over-current protection at convenient location.

F. Permanent convenience receptacles may [not] be utilized during construction.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations to achieve minimum required lighting levels.

B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes.

C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for required lighting levels.

D. Maintain lighting and provide routine repairs.

E. Permanent building lighting may be utilized during construction.

1.4 TEMPORARY HEATING

A. Existing facilities shall not be used. Do not use permanent equipment for temporary heating purposes.

B. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.5 TEMPORARY COOLING

A. Existing facilities shall not be used. Do not use permanent equipment for temporary cooling purposes.

B. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.6 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Provide temporary fan units as required to maintain clean air for construction operations.

1.7 TELEPHONE SERVICE

A. Provide, maintain and pay for telephone service to field office and Owner's/Inspector's field office at time of project mobilization. Inspector's office to have separate telephone lines.

1.8 FACSIMILE SERVICE

A. Provide, maintain and pay for facsimile service with dedicated telephone line to field office at time of project mobilization.

1.9 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service as required to maintain specified conditions for construction operations. Contractor may obtain water from existing fire hydrant if appropriate clearances are acquired and fees paid.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation if required to prevent freezing.

1.10 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

1.11 FIELD OFFICES

A. Do not use existing facilities for field offices or for storage.

B. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment and equipped with sturdy furniture, drawing rack and drawing display table.

C. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

D. Locate offices minimum distance of 30 feet from structures.

E. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
   1. Construction: Structurally sound, secure, weather tight enclosures for office spaces. Maintain during progress of Work; remove at completion of Work.
   2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.
   3. Exterior Materials: Weather resistant, finished in one color.
   4. Interior Materials in Offices: Sheet type materials for walls and ceilings, pre-finished or painted; resilient floors and bases.

F. Environmental Control: Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions.

G. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.

H. Installation:
   1. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
   2. Parking: Two hard surfaced parking spaces for use by Owner and Architect, connected to office by hard surfaced walk.
   3. Employee Residential Occupancy: Not allowed on Owner's property.

I. Maintenance And Cleaning:
   1. Janitorial services for offices; periodic cleaning and maintenance for office.
   2. Maintain approach walks free of mud, water, and snow.

J. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

1.12 VEHICULAR ACCESS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Provide unimpeded access for emergency vehicles. Maintain 26 feet wide driveways with turning space between and around combustible materials.

E. Provide and maintain access to fire hydrants and control valves free of obstructions.

F. Provide means of removing mud from vehicle wheels before entering streets.

G. Do not use existing on-site roads for construction traffic.

1.13 PARKING

A. Arrange for temporary dirt surface parking areas to accommodate construction personnel.

B. When site space is not adequate, provide additional off-site parking.

C. Do not allow heavy vehicles or construction equipment in parking areas.

D. Do not allow vehicle parking on existing pavement.

E. Designate one parking space for Owner.

F. Permanent Pavements And Parking Facilities:
   1. Bases for permanent roads and parking areas may be used for construction traffic.
   2. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

G. Maintenance: Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice. Promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

H. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.14 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose legally and properly off-site. Debris may not be stockpiled.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.15 PROJECT IDENTIFICATION

A. Provide 8 foot x 4 foot project sign of exterior grade plywood and wood frame construction, painted, with exhibit lettering by professional sign painter to Architect's design and colors.

B. List title of Project, names of Owner, Architect, and Contractor.

C. Erect on site at location established by Architect.

D. Sign Painter: Experienced as professional sign painter for minimum three years.

E. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

F. No other signs are allowed except those required by law.

G. Maintenance: Maintain sign and supports clean, repair deterioration and damage.

H. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.16 FIRE PREVENTION FACILITIES

A. Prohibit smoking with buildings under construction.

B. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
   1. Provide one fire extinguisher at each building under construction.
   2. Provide minimum one fire extinguisher in every construction trailer and storage shed.
   3. Provide minimum one fire extinguisher on roof during roofing operations using heat producing equipment.

1.17 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.18 ENCLOSURES AND FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.19 SECURITY

A. Security Program:
   1. Protect Work and existing premises from theft, vandalism, and unauthorized entry.
   2. Initiate program at project mobilization.
   3. Maintain program throughout construction period until Owner occupancy.

1.20 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.21 DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.22 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.23 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.24 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities and materials prior to Final Application for Payment.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated on Drawings.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitutions.

F. Substitution submittal procedures.

1.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

F. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

G. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

H. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTIONS

A. The Contract is based upon the standards of quality established by those items of equipment and/or materials which are specifically identified in the Contract Documents.

B. Limitations On Substitutions:
1. Substitutions for products specified by proprietary name will be considered in accordance with substitutions Article of the General Conditions only when submitted on Architect's Substitution Request Form with complete data substantiating compliance of proposed substitution with Contract Documents within the time frame specified in the General Conditions.
2. Consideration by Architect of a Substitution Request will be made in conformance with provisions of this Section.
3. Substitutions will not be considered when requested or submitted directly by subcontractor or supplier.
4. Substitutions will not be considered as a result of the failure to pursue the work promptly or coordinate activities properly.
5. Burden of proof of merit of requested substitution is the responsibility of the Contractor.
6. It is the sole responsibility of the Contractor to establish proper content of submittal for request for Substitutions. Incomplete submittals will be rejected.
7. Owner shall receive full benefit of any cost reduction as a result of any request for Substitution.
8. Architect's decision on Substitution Requests are final and do not require documentation or justification.
9. When Substitution is not accepted, provide specified product.
10. Substituted products shall not be ordered or installed without written acceptance.

C. Consideration by Architect of Substitution Requests received after time frame specified in the General Conditions will only be made when one or more of the following conditions are met and documented:
1. Specified item fails to comply with regulatory requirements.
2. Specified item has been discontinued.
3. Specified item, through no fault of the Contractor, is unavailable in the time frame required to meet project schedule.
4. Specified item, through subsequent information disclosure, will not perform properly or fit in designated space.
5. Manufacturer declares specified product to be unsuitable for use intended or refuses to warrant installation of product.
6. Substitution would be, in the sole judgment of the Architect, a substantial benefit to the Owner in terms of cost, time, energy conservation, or other consideration of merit.

D. Notwithstanding the above, the Architect may consider a Substitution Request after the time specified in the General Conditions, if in the sole discretion of the Architect, there appears to be just cause for such a request. The acceptance of such a late request does not waive any other requirement as stated herein.

E. Regulatory Requirements:
1. It shall be the responsibility of the Contractor to obtain all regulatory approvals required for proposed Substitutions.
2. All regulatory approvals shall be obtained for proposed Substitutions prior to submittal of Substitution Request to Architect.
3. Substitution of materials or work procedures which affect the health, safety and welfare of the public shall have prior approval of the Division of the State Architect (DSA) field representative.
4. All costs incurred by the Owner in obtaining regulatory approvals for proposed Substitutions, including the costs of the Architect and any authority having jurisdiction over the project shall be reimbursed to the Owner by means of a Change of Order. Costs of these services shall be reimbursed regardless of final acceptance or rejection of substitution.

F. A Substitution Request constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner by means of Change Order to the Contract for the cost of Architect's review or redesign services associated with re-approval by authorities having jurisdiction.

G. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents. Review of shop drawings does not constitute acceptance of Substitutions indicated or implied on Shop Drawings.

1.7 SUBSTITUTION SUBMITTAL PROCEDURES

A. Submit six copies of each request for Substitution for consideration. Limit each request to one proposed Substitution.

B. Submit request with Architect's Substitution Request Form. Form may be obtained at the office of the Architect. Substitution requests received without request form will be returned without review.

C. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.

D. Request to include sufficient data so that direct comparison of proposed Substitution can be made.

E. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents. Include the following minimum information, as appropriate:
1. Statement of cause for substitution request.
2. Identify product by specification section and article number.
3. Provide manufacturer's name, address, and phone number. List fabricators, suppliers, and installers as appropriate.

4. List similar projects where proposed substitution has been used, dates of installation and names of Architect and Owner.
5. List availability of maintenance services and replacement materials.
6. Documented or confirmation of regulatory approval.
7. Product Data, including drawings and descriptions of products.
8. Fabrication and installation procedures.
9. Samples of proposed Substitutions.
10. Itemized comparison of significant qualities of the proposed Substitution with those of the product specified. Significant qualities may include size, weight, durability, performance requirements and visual effects.
11. Coordination information, including a list of changes or modifications needed to other items of work that will become necessary to accommodate proposed Substitution.
12. Statement on the Substitutions effect on the construction schedule.
13. Cost information including a proposal of the net change, if any, in the Contract sum.
14. Certification that the Substitution is equal to or better in every respect to that required by the Contract Documents and that Substitution will perform adequately in the application intended
15. Waiver of right to additional payment or time that may subsequently become necessary because of failure of Substitution to perform adequately.

F. Inadequate warranty, vagueness of submittal, failure to meet specified requirements, or submittal of insufficient data will be cause for rejection of Substitution Request.

G. Architect will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

S U B S T I T U T I O N R E Q U E S T F O R M

TO: F F & J ARCHITECTS, INC.

PROJECT: _____

SPECIFIED ITEM: _____ _____ _____ _____

SECTION PAGE PARAGRAPH DESCRIPTION

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION: _____

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

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

The undersigned states that the following paragraphs, unless modified on attachments, are correct:

1. The proposed substitution does not affect dimensions shown on Drawings.

2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.

3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature: _____ For use by FFJ

Firm: _____ [__] Accepted [__] Accepted as noted

Address: _____ [__] Not Accepted [__] Received too late

_____ By: _____

Date: _____ Date: _____

Telephone: _____ Remarks: _____

Attachments:

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Starting of systems.

D. Demonstration and instructions.

E. Adjusting.

F. Protecting installed construction.

G. Project record documents.

H. Operation and maintenance data.

I. Spare parts and maintenance products.

J. Product warranties.

K. Maintenance service.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.

B. Requirement Preparatory to Project Acceptance:
   1. Certifications delivered to Architect that no new materials containing asbestos have been included in the work.
   2. Temporary facilities shall be removed from site as specified in Section 01 50 00 Temporary Facilities and Controls.
   3. Building and site shall be thoroughly cleaned as specified in General Conditions and in this Section.
   4. Plumbing and mechanical equipment shall operate quietly and free from vibration. Properly adjust, repair, balance, or replace equipment producing objectionable noise or vibration in occupied areas of building. Provide additional brackets, bracing, etc., to prevent objectionable noise or vibration. Systems shall operate without humming, surging, or rapid cycling. Balance reports are required before Mechanical Engineer will prepare their Punch List.
   5. Operating instructions for equipment shall be properly mounted and posted.
   6. Record drawings shall be completed, signed by Contractor and Inspector and submitted to Architect as specified in General Conditions.
   7. Maintenance instructions and manuals shall be submitted to Architect as specified in General Conditions.

8. Guarantees and warranties shall be submitted to Architect as specified in General Conditions. Contractor's Final Verified Report (DSA Form SSS-6) and other Reports and Affidavits required by the Division of the State Architect shall be submitted.
9. Contractor shall notify Architect when Contractor, with concurrence of Inspector, feels project is complete enough to prepare Punch List. Architect will then notify Mechanical and Electrical Engineers to make their inspections and prepare Punch Lists. Mechanical and Electrical Punch Lists must be completed before Architect will make his Punch Lists.

C. Project Acceptance:
1. After requirements preparatory to project acceptance have been completed as herein specified, Contractor shall notify Architect to perform acceptance tour. Notice shall be given at least three days in advance of the time the acceptance tour is to be performed.
2. Contractor or his principal superintendent, authorized to act in behalf of Contractor, shall accompany Architect and Inspector on acceptance tour, as well as any principal subcontractors that Architect may request to be present.
   a. If work has been completed in accordance with Contract Documents, and no further corrective measures are required, Architect will recommend that Owner accept Project and file Notice of Completion.
   b. If work has been substantially completed in accordance with Contract Documents, and only minor corrective measures are required, Architect will recommend that Owner conditionally accept Project and file Notice of Completion based upon Contractor's assurance that corrective measures will be completed within shortest practicable time period.
   c. If work has not been substantially completed in accordance with Contract Documents, and several or many corrective measures are still required, Architect will recommend that Owner not accept project and not file Notice of Completion. Instead, based on information gathered from acceptance tour, Contractor will be required to complete all corrective measures and then call for another project acceptance tour following procedure outlined above. Owner will compensate Architect for additional acceptance tour and deduct amount paid from final payment to Contractor.
3. Upon acceptance of Project by Owner, Contractor shall submit his request for final payment, less retention. Retention payment will not be made by Owner until 35 days after filing of Notice of Completion.
   a. Retention payment will not be made until Contractor has filed the required DSA Form 6 to the Architect.
   b. Should any corrective measures remain incomplete at time retention is due, Contractor shall provide Owner with Cashier's Check(s) in exchange for retention. Cashiers Check(s) shall be in an amount twice the agreed estimated cost to accomplish the corrective measures to assure that Owner will have sufficient funds to accomplish work by others should Contractor not complete corrective measures in a reasonable amount of time.

D. Provide submittals to Architect that are required by authorities having jurisdiction.

E. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.3 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. At completion of work, remove marks, stains, fingerprints, dust, dirt, and paint drippings resulting from work of this Project. Wash tile, plumbing and other fixtures clean. Clean and polish hardware and other unpainted metals. Polish transparent and glossy surfaces. Remove temporary labels, tags and paper covering. Vacuum carpeted and soft surfaces.

C. Cleaning, polishing, sealing, waxing and other such finish operations indicated on Drawings or required in specifications shall be taken to indicate required condition at time of acceptance of work under Contract.

D. Before final acceptance, employ professional window cleaners to clean interior and exterior glass surfaces, plastic and mirrors exposed to view of putty, paint materials, stains and dirt, without scratching or injuring plastic and glass. Leave work bright, clean and polished.

E. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

F. Replace filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.4 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Owner seven days prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

1.5 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of final inspection.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

F. Required instruction time for each item of equipment and system is specified in individual Sections.

1.6 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.7 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.8 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work in contrasting color:
1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed Shop Drawings, Product Data and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store Record Documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record at each product section in contrasting color ink, description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item in contrasting color ink to record actual construction including:
1. Measured depths of foundations in relation to finish floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent 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 dimensions and detail.
5. Details not on original Contract Drawings.

G. Submit documents to Architect with claim for final Application for Payment.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit two sets of data prior to final inspection, bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.

B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Engineers, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by specification Section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
    a. Shop drawings and product data.
    b. Air and water balance reports.
    c. Certificates.
    d. Photocopies of warranties.

F. Provide data for:
1. Mechanical Equipment and Controls - Division 23.
2. Energy Management System - Division 23.
3. Electrical System - Division 26.
4. Security System - Division 28.

1.10 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification Sections.

B. Deliver to Owner; obtain receipt prior to final payment.

1.11 PRODUCT WARRANTIES

A. Obtain warranties executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

B. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include Table of Contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time Of Submittals:
1. Make submittals within ten days after Notice of Completion, prior to final Application for Payment.
2. For items of Work for which acceptance is delayed beyond Notice of Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.12 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification Sections during warranty period.

B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.

D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

The following items are required to be turned in before Final Payment is made by the District. Failure to submit any of the required documents/materials will delay final payment. Organize documents and assemble in order as listed below as applicable. To be delivered to Frick, Frick, & Jetté Architects for review.

	Attached		Received	
	Yes	No	Yes	No
Change Order/Amendment Certification (form provided)	___	___	___	___
Releases for each 20 Day California Preliminary Notice (Copies enclosed)	___	___	___	___
Releases for each Unconditional Waiver and Release	___	___	___	___
Releases for each Conditional Waiver and Release	___	___	___	___
All AS-BUILTS/Record Documents (as applicable)	___	___	___	___
All Equipment Manuals	___	___	___	___
All Extra Stock (as applicable)	___	___	___	___
Release for all Stop Notices	___	___	___	___
Warranty and Guarantee Certificate (sample provided)	___	___	___	___
Manufacturer's Engineers Close-out Documents (as applicable)	___	___	___	___
Final Verified Report (as applicable)	___	___	___	___
Copy of key receipt from Maintenance (as applicable)	___	___	___	___
Consent of surety for release of final payment	___	___	___	___
Certification of staff training (as applicable) (Fire Alarm, Stage, Pocket Table, Kitchen Equipment, Etc.)	___	___	___	___

SECTION 02 41 19

SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Demolishing designated building equipment and fixtures.
2. Demolishing designated construction.
3. Cutting and alterations for completion of the Work.
4. Removing designated items for reuse and Owner's retention.
5. Protecting items designated to remain.
6. Removing demolished materials.
7. Products and installation for patching and extending Work.
8. Transition and adjustments.
9. Repair of damaged surfaces, finishes, and cleaning.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.

C. Shop Drawings:
1. Indicate demolition and removal sequence.
2. Indicate location and construction of temporary work.

1.3 QUALITY ASSURANCE

A. Conform to 2019 CBC for demolition work, products requiring electrical disconnection and re-connection, and.

B. Notify owner, in writing immediately when hazardous or contaminated materials are discovered.

1.4 SEQUENCING

A. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

1.5 SCHEDULING

A. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.

B. Schedule Work to coincide with new construction. School District provided schedule.

C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation and student and staff operations in adjoining spaces.

D. Field conditions: take into consideration as necessary work, all obvious existing conditions, and installations in the area of new work as though they were completely shown or described. Accept the area of new work as it exists and clear obstructions to the work.

E. Examine the site and all conditions and limitations thereon and thereabouts. All proposals shall take into account all such conditions and limitations whether or not the same are specifically shown or mentioned in any of the Contract Documents and every proposal shall be construed as including whatever sums are needed to complete the work in every part as shown, described, or reasonably required or implied, and attain the completed conditions contemplated by the Contract.

F. Glass: Provide such protection as may be required to prevent glass breakage. At no additional cost, replace in kind all glass damaged during demolition. Unforeseen conditions: Include as part of this Work miscellaneous cutting and patching necessitated as a result of unforeseen conditions and the reworking of abutting surfaces as required to make new Work join and match existing surfaces to remain. No extra payments based on the plea of unforeseen conditions will be allowed.

G. Take careful note of the fact that the premise and activities will NOT be open to "business-as-usual" during the life of this Contract.

H. Phasing of the work: Confer with the Owner as to the sequencing and phasing of the performance of the various parts of the work. Cooperate fully to the end that certain facilities and services are maintained in operation until immediately before their removal is required to permit installation of the work.

I. Noise control: Carry on all work in a manner which will produce the least amount of noise. Instruct all workmen in noise control procedures.

J. Perform noisy, malodorous, or dusty, work: Between hours of 3 P.M. and 5 P.M.

K. Coordinate utility and building service interruptions with Owner.

L. Do not disable or disrupt building fire or life safety systems without three days prior written notice to Owner.

M. Schedule tie-ins to existing systems to minimize disruption.

N. Coordinate Work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.6 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent [and occupied] building areas.

B. Cease operations immediately if structure appears to be in danger and notify Architect. Do not resume operations until directed.

PART 2 PRODUCTS

2.1 PRODUCTS

A. Partitions: Remove partition finish, studs, plates and sills. Where only a partial run is removed, cut back finish material to the center line on the next adjacent support to remain. Leave remaining material with a clean terminal line with no loose material adhering.

B. Concrete, asphalt paving, and masonry: Saw cut not less than 4 inches at line of removal. Break out sections to be removed. Chip back face behind saw cut line.

C. Plaster: Cut back to sound plaster on straight lines, and back-bevel edges of remaining plaster. Trim and prepare existing lath for tying new lath.

D. Roofing: Remove only to the extent necessary for the new required roof penetrations, if any.

E. Miscellaneous materials: Cut to straight lines or joints.

2.2 PRODUCTS FOR PATCHING AND EXTENDING WORK

A. New materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspection and testing Products where necessary, referring to existing Work as a standard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices including warning signs and lights, and similar measures, for protection of the students, staff and existing improvements indicated to remain.

D. Erect and maintain weatherproof closures for exterior openings.

E. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy.

F. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.

G. Provide appropriate temporary signage including signage for exit or building egress.

H. Do not close or obstruct building egress path.

I. Do not disable or disrupt building fire or life safety systems without [3] days prior written notice to Owner and Architect.

J. Verify that demolition is complete and areas are ready for installation of new Work.

K. Beginning of restoration Work means acceptance of existing conditions.

L. Cut, move, or remove items as necessary for access to alterations and renovations Work. Replace and restore at completion.

M. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, deteriorated masonry and concrete. Replace materials as specified for finished Work.

N. Remove debris and abandoned items from area and from concealed spaces.

O. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.

P. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

Q. Where new Work abuts or aligns with existing, perform a smooth and even transition. Patched Work to match existing adjacent Work in texture and appearance.

R. When finished surfaces are cut so that a smooth transition with new work is not possible, request instructions from Architecture.

3.2 SALVAGE REQUIREMENTS

A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.

B. Tag components and equipment Owner designates for salvage.

C. Protect designated salvage items from demolition operations until items can be removed.

D. Carefully remove building components and equipment indicated to be salvaged.

E. Disassemble as required to permit removal from building.

F. Package small and loose parts to avoid loss.

G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.

H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.

I. Deliver salvaged items to Owner within 2 mile radius of site. Obtain signed receipt from Owner.

3.3 DEMOLITION

A. Conduct demolition to minimize interference with adjacent [and occupied] building areas.

B. Maintain protected egress from and access to adjacent existing buildings at all times.

C. Do not close or obstruct roadways or sidewalks without permits.

D. Demolish in orderly and careful manner. Protect existing improvements, [supporting structural members and adjacent surfaces.

E. Carefully remove building components indicated to be reused.
   1. Disassemble components as required to permit removal.
   2. Package small and loose parts to avoid loss.
   3. Mark components and packaged parts to permit reinstallation.
   4. Store components, protected from construction operations, until reinstalled.

F. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site. Dispose of in a legal manner.

G. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

H. Remove temporary Work.

I. Check drawings carefully and thoroughly investigate existing building construction. Furnish and install all shoring and bracing required or implied to positively protect all structural and non-structural elements of the building. Material used shall be adequate to support anticipated loads with properly calculated margin of safety. Remove all shoring and bracing when new construction is safely in place.

J. Where openings are cut over-size or in in-proper location, the excess removed material shall be replaced with new. Such repair work may entail the installation of new dowels and/or the installation of new concrete, masonry, or other materials as may be required.

K. Temporary partitions for the protection of the existing facility, contents and any new work of this Contract against dust, weather, damage and noise are to be in place and maintained. Relocate temporary partitions from time to time as work progresses.

L. Items of existing work, indicated to remain upon completion of the Contract, but witch require removal to complete the work, shall be carefully removed and replaced upon completion. The replaced work shall match its condition at the start of the work unless required by the Drawings, elsewhere herein, or in the various sections affected, to be done otherwise.

M. Leave all spaces broom clean with all ledges and corners properly cleaned.

N. Unless otherwise indicated, patch and finish surfaces as necessary to match existing, and in accord with the requirements of the various Specifications Sections.

3.4 ADJUSTMENTS

A. Where a change of plane of 1/8 inch or more occurs, request instructions from Architect.

B. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

C. Fit work at penetrations of surfaces.

END OF SECTION

SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork for cast-in place concrete.
2. Shoring, bracing, and anchorage.
3. Openings for other affected work.
4. Form accessories.
5. Form stripping.

B. Related Sections:
1. Section 03 20 00 - Concrete Reinforcing.
2. Section 03 30 00 - Cast-In-Place Concrete.
3. Section 05 50 00 - Metal Fabrications: Product requirements for metal fabrications for placement by this Section.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 347 - Guide to Formwork for Concrete.

B. American Forest and Paper Association:
1. AWC - National Design Specifications for Wood Construction.

C. The Engineered Wood Association:
1. DOC PS 1 - Voluntary Product Standard for Structural Plywood.

D. ASTM International:
1. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

E. West Coast Lumber Inspection Bureau:
1. WCLIB - Standard Grading Rules for West Coast Lumber.

F. 2019 California Building Code, Chapter 19A.

1.3 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 301 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301 and ACI 347.

B. For wood products furnished for work of this Section, comply with AWC.

1.5 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of 2019 California Building Code.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Plywood: DOC PS 1-09, 3/4 inch, 5-ply, C-B grade, Structural I; Exterior features.

B. Lumber Forms: "Standard" Grade Douglas Fir, conforming to WCLIB Standard Grading Rules for West Coast Lumber with grade stamp clearly visible. Surface boards on four sides.

2.2 PREFABRICATED FORMS

A. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, sizes as indicated on Drawings.

2.3 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, galvanized metal, adjustable length, cone type, 1 inch back break dimension, free of defects capable of leaving holes larger than 1 inch in concrete surface.

B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.

C. Form Release Agent: Colorless mineral oil that will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
   1. Manufacturers:
      a. Arcal Chemical Corporation Arcal-80.
      b. Industrial Synthetics Company Synthex.
      c. Nox-Crete Company Nox-Crete Form Coating.
      d. Substitutions: Section 01 60 00 - Product Requirements.

D. Corners: Fillet and Chamfer, wood strip type; 1/2 x 1/2 inch size; maximum possible lengths. Dovetail Anchor Slot: Galvanized steel, 22 gage thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

E. Flashing Reglets: Galvanized steel, 22 gage thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

F. Bituminous Joint Filler: ASTM D1751.

G. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

3.2 INSTALLATION

A. Earth Forms:
1. Obtain Architect's approval prior to the use of earth forms.
2. Trench earth forms neatly, accurately, and at least 2 inches wider than footing widths indicated on Drawings.
3. Hand-trim sides and bottom of earth forms.
4. Construct wood edge strips at top of each side of trench to secure reinforcing and prevent trench from sloughing.
5. Form sides of footings where earth sloughs.
6. Tamp earth forms firm and clean forms of debris and loose material before depositing concrete.
7. Remove loose dirt prior to placing concrete.

B. Formwork - General:
1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
1. Use steel, plywood or lined board forms.
2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
3. Install form lining with close-fitting square joints between separate sheets without springing into place.
4. Use full size sheets of form lines and plywood wherever possible.
5. Tape joints to prevent protrusions in concrete.
6. Use care in forming and stripping wood forms to protect corners and edges.
7. Level and continue horizontal joints.
8. Keep wood forms wet until stripped.

D. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.

E. Provide bracing to ensure stability of form work. Strengthen form work liable to be over stressed by construction loads.

F. Do not displace or damage vapor retarder placed by Section 03 30 00.

G. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar.

H. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

I. Install fillet and chamfer strips on external corners of columns and walls.

J. Reuse of formwork shall be subject to the inspection and approval of the Architect and/or Structural Engineer. Do not patch formwork. Reuse of forms without proper approval shall be grounds for rejection of work.

K. Construct forms of new and clean materials for all finished exposed surfaces except otherwise approved by the Inspector.

L. Provide all openings in concrete to accommodate mechanical and electrical work. Items required to be incorporated in concrete shall be accurately placed and supported on form work.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse, if approved. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer’s specifications. Do not coat forms for concrete indicated to receive “scored finish”. Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb in accordance with manufacturer’s instructions. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

G. Form Ties:
1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
2. Place ties at least 1 inch away from finished surface of concrete.
3. Leave inner rods in concrete when forms are stripped.
4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

H. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

I. Construction Joints:
1. Install surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints.
2. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage.
3. Show no overlapping of construction joints. Construct joints to present same appearance as butted plywood joints.
4. Arrange joints in continuous line straight, true and sharp.

J. Embedded Items:
1. Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, water stops, and other features.
2. Do not embed wood or uncoated aluminum in concrete.
3. Obtain installation and setting information for embedded items furnished under other Specification sections.
4. Securely anchor embedded items in correct location and alignment prior to placing concrete.

K. Openings for Items Passing Through Concrete:
1. Frame openings in concrete where indicated on Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections.
2. Coordinate work to avoid cutting and patching of concrete after placement.
3. Perform cutting and repairing of concrete required as result of failure to provide required openings.

L. Screeds:
1. Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs.
2. Slope slabs to drain where required or as shown on Drawings.
3. Before depositing concrete, remove debris from space to be occupied by concrete and thoroughly wet forms. Remove freestanding water.

M. Screed Supports:
1. For concrete over waterproof membranes and vapor retarder membranes, use cradle, pad or base type screed supports which will not puncture membrane.
2. Staking through membrane is not permitted.

N. Cleanouts and Access Panels:
1. Provide removable cleanout sections or access panels at bottoms of forms to permit inspection and effective cleaning of loose dirt, debris and waste material.
2. Clean forms and surfaces against which concrete is to be placed. Remove chips, saw dust and other debris. Thoroughly blow out forms with compressed air just before concrete is placed.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been permitted by Inspector.

B. Do not damage concrete surfaces during form removal. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Remove formwork progressively so no unbalanced loads are imposed on structure.

D. Remove formwork in the same sequence as concrete placement to achieve similar concrete surface coloration.

E. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

F. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.

G. Leave forms in place for minimum number of days as specified in ACI 347.

H. Re-shore structural members due to design requirements or construction conditions to permit successive construction.

3.7 CLEANING

A. Clean forms to remove foreign matter as erection proceeds.

B. Ensure that water and debris drain to exterior through clean-out ports.

3.8 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301 and as follows:
   1. Variation from plumb in lines and surfaces of columns, piers, walls and arises shall not exceed 1/8 inch in 10 feet; 1/4 inch in any story or 10 feet maximum; 3/8 inch in 40 feet or more.
   2. Variations from level or grades indicated in floors, ceilings, beam soffits and arises shall not exceed 1/8 inch in 10 feet; 1/4 inch in any bay or 20 feet maximum. For exposed lintels, sills, parapets, canopies, overhangs and the like, not to exceed 1/4 inch in 20 feet.
   3. Variation from linear building lines from established position on plan and related position of columns, walls and partitions shall not exceed 1/4 inch in any bay or 20 feet.
   4. Variation in size and location of sleeves, floor openings and wall openings, shall not exceed 1/4 inch.

5. Variations in footings: Dimensions shall lay between minus 1/2 inch and plus 2 inches. Misplacement or eccentricity shall not exceed 2% of footing width in direction of misplacement, but not over 2 inches.
6. Variation in steps shall not exceed 1/8 inch in rise or 1/4 inch in tread in a flight, and in consecutive steps 1/16 inch in rise and 1/8 inch in tread.

B. Camber slabs and beams in accordance with ACI 301.

3.9 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Architect/Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Reinforcing steel bars.
2. Welded wire fabric.
3. Reinforcement accessories.

B. Related Sections:
1. Section 03 10 00 - Concrete Forming and Accessories.
2. Section 03 30 00 - Cast-In-Place Concrete.

1.2 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI SP-66 - ACI Detailing Manual.

B. ASTM International:
1. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed for Concrete.
2. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
3. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

C. American Welding Society:
1. AWS A5.1 - Mild Steel Covered Arc-Welding Electrodes.
2. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Concrete Reinforcing Steel Institute:
1. CRSI - Manual of Standard Practice.
2. CRSI - Placing Reinforcing Bars.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
1. Submit certified copies of mill test report of supplied reinforcement materials indicating physical and chemical analysis.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI - Manual of Standard Practice and ACI 301.

B. Perform Work in accordance with 2019 California Building Code.

1.5 QUALIFICATIONS

A. Welders: AWS qualified within previous 12 months.

1.6 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate with placement of formwork, formed openings and other Work.

1.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 41 00 and as required by the Division of the State Architect and Project Inspector.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Welded Plain Wire Fabric: ASTM A1064; in flat sheets; unfinished.

B. Deformed Reinforcement: ASTM A615/A615M; 60 ksi yield strength, steel bars, unfinished.

C. Weldable Deformed Reinforcement: ASTM A706/A706M; 60 ksi yield strength, steel bars, unfinished.

D. Steel Dowels: Of same grade as bars to which dowels are to be connected.

2.2 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic-coated steel type; size and shape to meet Project conditions.

D. Electrodes for Welding: E90 series, low hydrogen having a minimum yield point of 90,000 psi.

2.3 FABRICATION

A. Fabricate concrete reinforcement in accordance with CRSI Manual of Practice, providing concrete cover specified in Section 03 30 00.

B. All reinforcement shall be fabricated to the shapes detailed on the drawings in accordance with sound engineering practice. Any bending or straightening shall be done only with an approved bar bender in a manner that will not injure the material. Bars with kinks or bends not shown on the drawings shall not be used. Exposed reinforcement bars intended for bonding with future extensions shall be protected against displacement by others. Bars shall not be bent out of the way unless approved by the Inspector and Structural Engineer.

C. Size of bends for stirrups, ties and hooks shall comply with ACI 318 Table 25.3.2, U.N.O. on drawings.

D. Bends for other bars, except hooks, shall be made around a pin having a diameter not less than six times the minimum thickness of the bar, except that for bars larger than one inch thick, the pin shall be not less than eight times the minimum thickness of the bar. All bars shall be bent cold.

E. Fabricate column reinforcement with offset bends at reinforcement splices.

F. Weld reinforcement in accordance with AWS D1.4.

G. Locate reinforcement splices not indicated on Drawings, at point of minimum stress. Obtain approval of location of splices with Architect/S.E.O.R. prior to installation.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
   1. Do not weld crossing reinforcement bars for assembly except as permitted by Architect/Engineer.

B. Do not displace or damage vapor retarder placed by Section 03 30 00.

C. Accommodate placement of formed openings.

D. Conform to ACI 318 Table 20.6.1.3.1 for concrete cover over reinforcement, U.N.O. on drawings.

E. Steel reinforcement shall be clean at the time concrete is placed around it free from rust scale, loose mill scale, oil paint or any coating that will destroy or reduce the bond between steel and concrete.

F. Particular care shall be taken in placing and securing reinforcement to maintain proper clearance between parallel bars and between bars and forms during the placing of concrete. Where dowels or bars extend through construction joints, they shall be secured firmly in position to avoid displacement during the placing of concrete. Before any concrete pouring operation is started, all reinforcement shall be in place and shall be inspected and approved.

G. The clear distance between parallel reinforcing bars shall be not less than 1-1/2 times the nominal diameter of the bars, but in no case shall the distance be less than 1-1/2 inches nor less than 1-1/3 times the maximum size aggregate.

H. Metal accessories shall be provided as required to properly install all reinforcement in accordance with the CSRI - Manual of Standard Practice.

I. In all footings, the reinforcing steel shall be supported from templates, from forms or on pre-cast concrete blocks. Bricks shall not be used to support reinforcing steel.

J. Reinforcing steel for slabs on ground or fill shall be supported on pre-cast concrete blocks of proper size, space so as to hold the steel at proper height in the slabs.

K. At those surfaces of footings and other principal structural members in which the concrete is deposited directly against the ground, steel reinforcement shall have a minimum covering of three

inches of concrete. At other surfaces where concrete may be exposed to the ground, but is placed in forms, the metal reinforcement shall be protected by at least two inches of concrete. At surfaces which are to be exposed to the weather, reinforcing bars more than 5/8 inch in diameter shall be protected by at least 2 inches of concrete, and bars 5/8 inch or less in diameter shall be protected by at least 1-1/2 inches of concrete.

L. Steel reinforcement in members not exposed to the ground or weather shall be protected by not less than 3/4 inch of Concrete protection for reinforcement shall in all cases be at least equal to the diameter of the bars.

M. Splices in Reinforcement:

1. Horizontal Bars: All reinforcing steel shall be accurately spaced and secured in place with annealed wire not smaller than 16 gage. Wall and slab steel shall be wired together at all points where bars cross. Splices in adjacent bars shall be separated by at least 4 feet except where otherwise specifically shown on the drawings. Bars shall be wired together at all laps, splice lengths shall be as indicated on structural drawings, U.N.O.

N. Welding of Reinforcing Bars: Welding shall be in conformity with ANSI/AWS D1.4. The carbon equivalent and welding procedures shall conform to 2019 California Building Code, Section 1903A.8. The inspection of welding reinforcing bars shall conform to 2019 California Building Code, Section 1705A.3.1.

O. As concrete in slabs in poured, lift mesh reinforcement.

3.2 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed by Project Inspector and Owner's testing laboratory in accordance with 2019 California Building Code.

C. Provide free access to Work and cooperate with appointed firm.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
   1. Foundation walls and footings.
   2. Slabs on grade.
   3. Control, expansion and contraction joint devices.
   4. Equipment pads.
   5. Light pole base.
   6. Thrust blocks.

B. Related Sections:
   1. Section 03 10 00 - Concrete Forming and Accessories: Formwork and accessories.
   2. Section 03 20 00 - Concrete Reinforcing.

1.2 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete
   2. ACI 305R – Guide to Hot Weather Concreting
   3. ACI 306.1 - Standard Specification for Cold Weather Concreting
   4. ACI 308.1 - Standard Specification for Curing Concrete

B. ASTM International:
   1. ASTM C33 - Standard Specification for Concrete Aggregates.
   2. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   3. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
   4. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
   5. ASTM C150 - Standard Specification for Portland Cement.
   6. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   7. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
   8. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
   9. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
   10. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
   11. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
   12. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

C. 2019 California Building Code, Chapter 19A.

1.3 PERFORMANCE REQUIREMENTS

A. Vapor Retarder Permeance: Maximum 0.3 perm when tested in accordance with ASTM E96, Procedure A.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on joint devices, attachment accessories, admixtures and instructions for color additives.

C. Design Data:
1. Submit design mix for each class of concrete, prepared by a California Registered Civil Engineer, to Architect for approval. Include historical test data, admixture data, name, address and telephone number of batch plant, mix ingredients and proportions.
2. The compressive strength of each class of concrete shall be proportioned per ACI 318; Section 26.4.3.

D. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

E. Samples for Concrete Color Selection: Color additive manufacturer's color chart or sample chip set; indicate color additive number and required dosage rate.

F. Samples for Verification of Concrete Color: Sample chips of specified colors indicating color additive numbers and required dosage rates.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Conform to ACI 305R and ACI 318,26.5.5 when concreting during hot weather.

C. Conform to ACI 306.1 and ACI 318, 26.5.4 when concreting during cold weather.

D. Acquire cement and aggregate from one source for Work.

E. Mock-Up: Provide full-scale mock-up to demonstrate methods of obtaining consistent visual appearance of colored concrete.
1. Construct at least one month before start of actual work, using materials and methods to be used in actual work.
2. Paving: 4 by 4 feet.
3. Locate mock-up on site.
4. Accepted mock-up constitutes visual standard for work.
5. Remove mock-up when no longer required for comparison with finished work.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.

1.8 TESTS

A. Testing and analysis of concrete will be performed under provisions of Section 01 41 00 and as required by the Division of the State Architect and Project Inspector.

B. Owner's Inspector will take cylinders and perform slump tests in accordance with ACI 301 and deliver to Testing Laboratory.

C. Three cylinders of each class of concrete placed each day shall be taken for every 50 cubic yards of concrete, or fraction thereof, nor less than 2,000 square feet of surface area of slabs, walls or mat ftg. for strength tests.

D. Samples for strength tests for each class of concrete shall be taken for seven-day tests at the beginning of the concrete work or whenever the mix or aggregate is changed.

E. Tests of cement and aggregates will be performed by Testing Laboratory to ensure conformance with requirements stated herein.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type V unless soil report provides corrosive information s.

B. Normal Weight Fine and Coarse Aggregates: ASTM C33.

C. Water: ASTM C 1602 Clean, potable, without deleterious amounts of chloride ions and not detrimental to concrete.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260

B. Water Reducer: ASTM C 494/C 494M, Type A.

2.3 ACCESSORIES

A. Vapor Retarder: ASTM E1745 Class A; 10 mil thick clear polyethylene film; type recommended for below grade application. Furnish joint tape recommended by manufacturer. Provide under any new portions of concrete slab under buildings.

B. Non-Shrink Grout and Drypack: ASTM C1107, Grade A; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

C. Sand Fill: Natural river or bank sand free of silt, clay, loam, friable or soluble materials or organic matters, all passing the No. 4 sieve and only 5% passing the No. 200 sieve.

D. Waterproof, Seal and Cure Application: Wherever concrete slab is covered with resilient flooring including sheet vinyl and vinyl cementitious tile, wood flooring, carpet with a vinyl, rubber or unitary type backing, sports flooring or other moisture sensitive flooring as shown on the drawings, provide Atlas Tech-1315 as manufactured by Atlas Tech Products, (858) 277-0585, applied in accordance with manufacturer's written documentation and this Specification.
   1. Labor and Materials Warranty: 15 years backed by a $1,000,000 Insurance Policy.

2. A trained applicator shall apply Waterproof, Seal and Cure Application, or a technician must be on site during the spraying applications for verification to receive the 15 year warranty on floor coverings.
3. When a floor covering system is installed on a slab treated with the product according to manufacturer's instructions, the manufacturer shall warrant the floor covering system against delamination due to negative, ground originated moisture migration or moisture-born contaminates for a period of 15 years from the date of original installation. The warranty shall cover labor and materials necessary to replace the floor covering system if repair cannot be made.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt, 1/4 inch thick; tongue and groove profile.

B. Construction Joint Devices: Integral galvanized steel; formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

C. Sealant and Primer: Type as specified in Section 07 90 00.

2.5 CONCRETE MIX

A. Select proportions for normal weight concrete in accordance with ACI 301 Method 1.

B. Provide concrete of the following characteristics:
1. Foundations: Compressive strength of 4,500 psi (stone) at 28 days. Unless noted otherwise on the drawings.
2. Building slabs on grade: compressive strength of 4,500 psi (stone) at 28 days. Unless noted otherwise on the drawings.
3. Remainder of concrete: compressive strength of 4,500 psi (stone) at 28 days, Unless noted otherwise on the drawings.

C. Measurements:
1. Measure water by volume or weight.
2. Measure all other materials by weight.
3. One bag of cement is considered as one cubic foot or 94 lbs.
4. One gallon of water as 8.33 lbs.
5. Minimum 5 sack mix.

D. Slump: Unless specifically specified, the slump at no time during batching, mixing, transporting or placing shall exceed that stated in the design mix.
1. Slump for formed concrete shall not exceed four (4) inches.
2. Slump for slabs on grade shall not exceed four (4) inches.

E. Admixtures: Include admixture types and quantities indicated in concrete mix designs only when approved by Architect, Structural Engineer and District of State Architects.
1. Do not use calcium chloride nor admixtures containing calcium chloride.
2. Add air entrainment admixture to concrete mix for work exposed to freezing and thawing.

F. Ready Mixed Concrete: Mix and deliver concrete in accordance with ASTM C94/C94M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

D. Concrete shall not be placed until the forms and reinforcement have been inspected and approved by the Structural Engineer, the Inspector and Special Inspector.

E. Concrete shall not be placed until all preparations for the pour have been completed, and the preparations have been checked by the Inspector subject to approval by the Structural Engineer.

F. At the beginning of the work and from time to time as the work progresses, the Contractor shall verify and check dimensions on drawings with field conditions.

G. The Contractor shall be responsible for the accuracy of the work, and bear all expense of any changes or extra work resulting from inaccuracies in the construction.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Remove laitance, coatings, and unsound materials.

B. In locations where new concrete is doweled to existing work, install dowels as detailed on the drawings.

C. All masonry against which concrete is to be deposited shall be thoroughly wetted.

D. Remove water from areas receiving concrete before concrete is placed.

E. Forms shall be wetted or oiled prior to placing concrete. Remove any excess form oil.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify Testing Laboratory and Architect minimum 48 hours prior to commencement of operations.

C. Concrete shall be placed only in the presence of the Inspector. The Inspector shall be notified at least 48 hours in advance of pours outside of regular working hours. Comply with CBC 1705A.3.5.

D. Continuous batch plant inspection required, in accordance with California Code of Regulations, Section 1705A.3.3 Section 01 40 00 – Quality Requirements: Field Inspecting, testing, adjusting and balancing.

E. Ensure reinforcement, inserts, embedded parts, formed joints and vapor barriers are not disturbed during concrete placement.

F. Install vapor retarder under interior slabs on grade in accordance with ASTM E1643. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

G. Exercise care in placing reinforcing steel, mesh and concrete, to avoid puncturing the sheeting.

H. Do not drive stakes through barrier. Use flat base screed supports.

I. Do not disturb or damage vapor barrier while placing concrete. Repair damaged vapor retarder. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

J. Tape tightly around all vertical sleeves that perforate barrier.

K. Coordinate with work specified under other divisions or sections of the specifications, affording every reasonable facility for the introduction, storage and installation of all necessary materials and equipment into the work.

L. Size and locations of boxing, sleeves, cans, recesses, chases, etc. shall be subject to approval of the Architect, and unless otherwise shown or specified shall clear all reinforcing by a minimum of 1 inch, and the size shall allow a minimum of 3 inches of concrete to opposite face of walls.
   1. Set and build-in materials which are required in concrete construction.
   2. Include all anchors, anchor slots, bolts, plates, brackets, etc. which are specified in other sections of the specifications but which are to be embedded in concrete.
   3. Become familiar with and be responsible for work which is to be set and built-in under this section as well as that which will be set by other trades and built-in under this section.
   4. No pipes shall be embedded in structural concrete except where specifically detailed.

M. Pipes other than conduits for electrical circuits shall not be embedded in structural concrete. Comply with ACI 318 Section 20.7, 26.8 unless specified or detailed otherwise on structural drawings.

N. Install sleeves and provide boxing or other devices necessary to form openings for the passage of pipes and conduits.

O. Properly prepare reglets, rebates, recesses, platforms and bases as detailed or required for work or equipment.

P. Deposit concrete at final position. Convey as rapidly as possible, by methods avoiding segregation or loss of ingredients and re-handling.

Q. Keep concrete as level as possible, with a minimum flow from one portion of the work to another.

R. Tamp and vibrate so as to produce a dense smooth job, free from rock pockets and voids.

S. Use acceptable trunks and chutes to limit the free drop to not more than five feet.

T. Do not use aluminum or aluminum lined pipe. Prevent concrete from contacting aluminum fittings.

U. Under no circumstances shall concrete that has partially hardened be deposited in the work.

V. Use only piston type pumps. Pumps shall be reversible.

W. Compact each layer of concrete as placed with mechanical vibrators or equivalent equipment. Transmit vibration directly to concrete and in no case through forms or reinforcements. Accomplish thorough compaction. Supplement by rodding or spading by hand adjacent to forms. Compact concrete into corners and angles of forms and around reinforcement and embedded fixtures. Re-compact deep section with congestion due to reinforcing steel.

X. Do not transport concrete in forms with vibrators nor allow vibrators to contact forms or reinforcing.

Y. Excessive honeycomb or embedded debris in concrete is not acceptable.

Z. Separate exterior slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface. Conform to Section 07 90 00 for finish joint sealer requirements.

3.4 CONSTRUCTION JOINTS

A. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

B. Clean and roughen construction joints in accordance with ACI 318 Section 26.5.6.

C. Place floor slabs on fill in checkerboard pattern.

D. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 into depth of slab thickness.

E. Provide off-set keyways or prefabricated metal construction joints in floor slabs where shown.

F. Wherever possible, the concrete in any one unit of the construction shall be placed in one continuous operation with vertical and horizontal construction joints in approved locations. Before starting work in any unit of construction, the Contractor shall submit to the Architect and obtain approval of locations or proposed construction joints.

G. Chip or roughen entire contact surface of hardened concrete by sandblasting to expose aggregate. Thoroughly clean concrete, reinforcing steel, forms and screed reglets of all mortar drippings, sand, loose aggregate, excess water, and other extraneous matter before placing next layer of concrete. Saturate all cold joints with water 24 hours in advance of placing fresh concrete. Maintain hardened concrete in a moist condition until fresh concrete is placed. Comply with ACI 318 Section 26.5.6.

H. In case the above cleaning was not done or failed to produce approved results, the entire contact surface shall be thoroughly cleaned by chipping or sandblasting not earlier than five (5) days after the concrete was placed.

I. Typical details and proposed locations of construction joints shall be as indicated on plans. Joints not indicated on plans shall be so made and located to least impair the strength of the structure and shall conform to typical details. Joint locations shall be approved by Structural Engineer of Record prior to construction.

J. Vertical construction joints shall be cleaned immediately after removal of the end forms and shall be well soaked with water on the day preceding the next pour. Immediately before pouring against a vertical construction joint it shall again be wet down and slushed with a coat of neat cement grout.

K. In the event that contact surfaces become coated with earth, sawdust or other debris after having been cleaned, they shall be re-cleaned by sandblasting if necessary before proceeding with the next concrete pour.

3.5 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.

B. Uniformly spread, screed and float concrete for floor slabs. Do not spread concrete by vibration.

C. Finish concrete floor surfaces in accordance with ACI 301.

D. Wood float surfaces receiving quarry tile or ceramic tile with full bed setting system.

E. Steel trowel surfaces receiving carpeting, resilient flooring or seamless flooring.

F. Steel trowel surfaces which are indicated to be exposed.

G. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1/4 inch per foot nominal.

3.6 CURING AND PROTECTION

A. Protect finished work under provisions of Section 01 70 00.

B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
1. Protect concrete footings from freezing for minimum 5 days.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

D. Concrete placing operations and freshly poured work shall be protected from rain with canvas or other approved covering until set, giving special attention to protection of floor slabs during this period.

E. Cure concrete in accordance with ACI 308.1.

F. Apply curing compound on finished slab surfaces in accordance with manufacturer's instructions.

G. Vertical Surfaces: Thoroughly wet forms containing concrete, including the tops and exposed portion of concrete, and maintain in a thoroughly moist condition until the forms are removed, but no less than 7 consecutive days from time of placing concrete.

H. Continuously wet concrete between the hours of 8:00 a.m. and sunset each day, including Saturday, Sunday, and Holidays, for the first 4 days, and not less than 3 times daily for the 3 remaining days until the concrete reaches design strength.

I. Foundations: Keep forms wet prior to stripping.

J. Floor Slabs: The exposed surfaces of slabs shall be protected by an effective covering for a period of at least 7 days or as required by sealer manufacturer.

K. Miscellaneous Curing: Thoroughly cure all work involving portland cement such as dry pack, patching, hole filling and mortar application. Water cure such work for at least 3 days.

3.7 INTERIOR CONCRETE SLAB CURING AND PROTECTION

A. After pouring, placing, bullfloating, final finishing, soft cutting, and the surface of the concrete has hardened sufficiently to sustain foot traffic, sealer shall be applied.

B. Apply sealer at the rate of 200 square feet per gallon coverage. If puddling or bird bathing occurs lightly, broom product evenly over the substrate.

C. Continue brooming the product evenly over the substrate until the product has penetrated into the concrete.

3.8 FIELD QUALITY CONTROL

A. Section 01 40 00 - Testing Laboratory Services: Field inspecting, testing, adjusting, and balancing.

B. Field inspection and testing will be performed under provisions of Section 01 41 00.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken. Comply with CBC 1705A.3.6.

3.9 PATCHING

A. Allow Architect to review concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.

C. Patch imperfections in accordance with ACI 301.

3.10 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements and/or specified strength.

B. Repair or replacement of defective concrete will be determined by Architect.

C. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

D. Repair or replace concrete not properly placed or of the specified type.

E. Whenever the 28-day tests fail to develop the required strength, the Testing Laboratory shall adjust the mix by increasing the amount of cement or decreasing the amount of water sufficiently so that the resulting concrete shall attain the specific requirements.

F. Defective concrete in place must be tested by the core method and show a compressive strength at least equal to the design strength.

G. When required by the Architect, tests of hardened concrete shall be made in accordance with "Standard Method of Securing Specimens of Hardened Concrete from the Structure", ASTM C-42.

H. Test specimens shall be secured and tested by the Testing Laboratory under the direction of the Architect.

I. The Contractor shall pay all expense of such tests.

J. If the compressive tests of the core specimens fail to show the compressive strength assumed in the design, the concrete will be deemed defective and shall be removed and replaced or adequately strengthened in a manner acceptable to the Architect, Structural Engineer and the Division of the State Architect.

3.11 SLAB TOLERANCES

A. Maintain surface flatness with maximum variation of 1/8 inch in 10 feet.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel and Aluminum pipe and tube handrails, balusters, and fittings.

1.2 REFERENCES

A. ASTM International:
1. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
3. ASTM B241 - Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

B. Steel Structures Painting Council.

1.3 DESIGN REQUIREMENTS

A. Railing assembly, wall rails, and attachments to resist lateral force as set forth in Section 1607A.8 2019 California Building Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

PART 2 PRODUCTS

2.1 STEEL RAILING SYSTEM

A. Steel Tubing: ASTM A500, Grade B.

B. Rails and Posts: 1-1/2 inch O.D. steel tubing; welded joints.

C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.

D. Mounting: Brackets and flanges, with steel inserts for casting in concrete and with steel brackets for embedding in masonry.

E. Splice Connectors: Steel welding collars.

F. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

G. Galvanizing: 1.25 oz/sq.ft. zinc coating in accordance with ASTM A123.

2.2 FABRICATION

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Continuously seal joined pieces by continuous welds.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius. All welded joints and surfaces shall be ground smooth, no sharp or abrasive corner edges or surfaces. Wall adjacent to handrail shall be smooth.

G. Accurately form components to suite stairs and landings, to each other and to building structure.

H. Railings and handrails requirements per CBC Section 11B-505

1. Top of gripping surfaces of handrails shall be 34" minimum and 38" maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height above such surfaces.

2. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1½" minimum. Handrail may be located in a recess if the recess is 3" maximum deep and 18"minimum clear above the top of the handrail.

3. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20% of their length. Where provided, horizontal projections shall occur 1 ½" minimum below the bottom of the handrail gripping surfaces.

4. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1 1/4" minimum and 2" maximum.

5. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4" minimum and 6 ¼" maximum, and a cross-sectional dimension of 2" maximum.

6. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.

7. Handrails shall not rotate within their fittings.

8. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with CBC Section 11B-505.10. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.

9. A 2" minimum high curb or a barrier shall be provided to prevent the passage of a 4" diameter sphere rolling off the sides of a ramp surface. Such a curb or a barrier shall be continuous and uninterrupted along the length of a ramp. CBC Section 11B-405.9.2

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors required for connecting railings to structure. Anchor railing to structure.

D. Field weld anchors as indicated on Drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Handrails for stairs and ramps shall be 1 1/4" to 1 1/2" diameter (1 1/2" nominal) and mounted 1 1/2” clear from sidewalls.

G. No sharp or abrasive corner edges or surfaces. Wall adjacent to handrail shall be smooth.

END OF SECTION

SECTION 05 52 00

METAL RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Steel and Aluminum pipe and tube handrails, balusters, and fittings.

1.2 REFERENCES

A. ASTM International:
1. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
3. ASTM B241 - Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

B. Steel Structures Painting Council.

1.3 DESIGN REQUIREMENTS

A. Railing assembly, wall rails, and attachments to resist lateral force as set forth in Section 1607A.8 2019 California Building Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

PART 2 PRODUCTS

2.1 STEEL RAILING SYSTEM

A. Steel Tubing: ASTM A500, Grade B.

B. Rails and Posts: 1-1/2 inch O.D. steel tubing; welded joints.

C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined steel.

D. Mounting: Brackets and flanges, with steel inserts for casting in concrete and with steel brackets for embedding in masonry.

E. Splice Connectors: Steel welding collars.

F. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide.

G. Galvanizing: 1.25 oz/sq.ft. zinc coating in accordance with ASTM A123.

2.2 FABRICATION

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Continuously seal joined pieces by continuous welds.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius. All welded joints and surfaces shall be ground smooth, no sharp or abrasive corner edges or surfaces. Wall adjacent to handrail shall be smooth.

G. Accurately form components to suite stairs and landings, to each other and to building structure.

H. Railings and handrails requirements per CBC Section 11B-505

1. Top of gripping surfaces of handrails shall be 34" minimum and 38" maximum vertically above walking surfaces, stair nosings, and ramp surfaces. Handrails shall be at a consistent height above such surfaces.

2. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1½” minimum. Handrail may be located in a recess if the recess is 3" maximum deep and 18"minimum clear above the top of the handrail.

3. Handrail gripping surfaces shall be continuous along their length and shall not be obstructed along their tops or sides. The bottoms of handrail gripping surfaces shall not be obstructed for more than 20% of their length. Where provided, horizontal projections shall occur 1 ½” minimum below the bottom of the handrail gripping surfaces.

4. Handrail gripping surfaces with a circular cross section shall have an outside diameter of 1 1/4” minimum and 2" maximum.

5. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4" minimum and 6 ¼” maximum, and a cross-sectional dimension of 2” maximum.

6. Handrail gripping surfaces and any surfaces adjacent to them shall be free of sharp or abrasive elements and shall have rounded edges.

7. Handrails shall not rotate within their fittings.

8. Handrail gripping surfaces shall extend beyond and in the same direction of stair flights and ramp runs in accordance with CBC Section 11B-505.10. Such extensions are not required for continuous handrails at the inside turn of switchback or dogleg stairs and ramps.

9. A 2" minimum high curb or a barrier shall be provided to prevent the passage of a 4" diameter sphere rolling off the sides of a ramp surface. Such a curb or a barrier shall be continuous and uninterrupted along the length of a ramp. CBC Section 11B-405.9.2

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors required for connecting railings to structure. Anchor railing to structure.

D. Field weld anchors as indicated on Drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Handrails for stairs and ramps shall be 1 1/4" to 1 1/2" diameter (1 1/2" nominal) and mounted 1 1/2” clear from sidewalls.

G. No sharp or abrasive corner edges or surfaces. Wall adjacent to handrail shall be smooth.

END OF SECTION

SECTION 07 90 00

JOINT PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparing sealant substrate surfaces.

B. Sealant and backing.

1.2 REFERENCES

A. ASTM International:
1. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
2. ASTM C804 - Use of Solvent-Release Type Sealants.
3. ASTM 962 - Guide for Use of Elastomeric Joint Sealants.

B. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.

1.3 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, color availability .

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples 4" long in size illustrating colors selected.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.

B. Applicator: Company specializing in applying the work of this Section with minimum three years documented experience, approved by sealant manufacturer.

C. Conform to Sealant and Waterproofers Institute requirements for materials and installation.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers and products are listed for each sealant type.

B. Substitutions: Under provisions of Section 01 60 00.

2.2 SEALANTS

A. Acrylic Sealant: One-part, nonsag solvent-release-curing, acrylic terpolymer sealant complying with ASTM C920 for Type S; Grade NS; except for selected test properties which are revised as follows: Heat aged hardness; 40-50. Weight loss, 15 percent; maximum cycle movement capability, plus or minus 12-1/2 percent.
1. Protective Treatments Inc., "PT1 738".
2. Protective Treatments Inc., "PT1 767".
3. Tremco Inc., "Mono."

B. Butyl Sealant: One-part, nonsag solvent-release-curing sealant complying with FS TT-S-001657 for Type 1 and formulated with a minimum of 75% solids.
1. Bostik Construction Products Div., "Chem-Calk 300".
2. Pecora Corp. "BC-158".
3. Tremco Inc., "Tremco Butyl Sealant."

C. Polysulphide Sealant: One-part chemical curing elastomeric sealant complying with ASTM C920, Type S; Grade NS, Class 12-1/2.
1. Bostik Construction Products Div., "Chem-Calk 400".
2. Pecora Corp., "GC-9".
3. Product Research & Chemical Corp., "PRC Rubber" Nonacid Calk 7000.

D. Silicone Sealant: One part nonacid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.
1. Dow Corning Corp., "Dow Corning 790".
2. General Electric Co., "Silproof".
3. Tremco, Inc., "Spectrum 1".

E. Acid-Curing Silicone Sealant: One part acid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.
1. Dow Corning Corp. "Dow Corning 999A".
2. General Electric Co., "Construction 1200."
3. Tremco, Inc., "Proglaze".
4. Rhone-Poulene, Inc., "Rhodorsil 90".

F. One-Part Mildew-Resistant Silicone Sealant: Complying with ASTM C920, Type S, Grade NS, Class 25.
   1. Dow Corning Corp., "Dow Corning 786".
   2. General Electric Co., "Sanitary 1700".
   3. Rhone-Poulene Inc., "Rhodorsil 6 B White".
   4. Tremco, Inc., "Proglaze White".

G. One-Part Nonsag Urethane Sealant: Complying with ASTM C920, Type S, Grade NS, Class 25.
   1. Bostik Construction Products Div., "Chem-Calk 900".
   2. Pecora Corp., "Dynatrol I".
   3. Mameco International, Inc., "Vulkem 116".
   4. Tremco, Inc., "Dymonic".

H. One-Part Pourable Urethane Sealant: Complying with ASTM C920, Type S, Grade P, Class 25.
   1. Bostik Construction Products Div., "Chem-Calk 950".
   2. Mameco International, Inc., "Vulkem 45".
   3. Pecora Corp., "NR-201 Urexpan".

2.3 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suite application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means installer accepts existing substrate.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions. Prime if recommended by manufacturer.

B. Remove loose materials and foreign matter that might impair adhesion of sealant.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance with ASTM C804 for solvent release sealants, and C962 for elastomeric sealants.

E. Protect elements surrounding the work of this Section from damage or disfiguration.

3.3 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

D. Install bond breaker where joint backing is not used.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints concave, unless otherwise detailed.

3.4 LEANING AND REPAIRING

A. Clean work under provisions of Section 01 70 00.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

3.6 SCHEDULE

	LOCATION	TYPE	COLOR
A.	Exterior & interior joints in horizontal surfaces of concrete; between metal and concrete masonry and mortar	One-Part Pourable Urethane	To Match Adjacent Material
B.	Exterior door, entrance & window frames. Exterior & Interior vertical concrete & masonry metal siding metal flashing	One-Part Nonacid One Part Urethane	To Match Adjacent Material
C.	Joints within glazed curtain wall system skylight framing system aluminum entrance system glass & glazing	Acid Curing Silicone	Translucent Black/Bronze

D.	Interior joints in ceramic tile and at plumbing fixtures	Mildew-Resistant Silicone	Translucent
E.	Under thresholds	Butyl	Black
F.	All interior joints not otherwise scheduled	Acrylic solvent	To Match Adjacent Surfaces

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. WORK under this section comprises of furnishing and installing hollow metal frames for doors, windows and hollow metal doors and panels.

B. Related Documents
1. Drawings and general provisions of contract, including General and Supplementary conditions and Division 1 Specification Sections apply to this Section.

C. Related Sections:
1. Section 08 71 00 Finish Hardware.
2. Section 09 90 00 Painting.

1.2 REFERENCES

A. American National Standards Institute:
1. ANSI A117.1 – Accessible and Usable Buildings and Facilities.
2. ANSI A250.8/SDI-100 – Recommended Specifications for Standard Steel Doors and Frames.
3. ANSI A250.11 – Recommended Erection Instructions for Steel Frames.
4. ANSI A250.4 and ANSI-A250.5 – Test Procedure and Acceptance Criteria for Physical Endurance, Steel Doors and Frames.
5. ANSI A250.10 – Test Procedure and Acceptance Criteria for Painted Steel Surfaces for Steel Doors and Frames.

B. ASTM International:
1. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Allow and High-Strength Low-Allow with Improved Formability.
2. ASTM A568 – General Requirements for Steel, Carbon and High Strength Low Alloy Hot Rolled Strip, and Cold Rolled Sheet.
3. ASTM A924 – General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
4. ASTM E283 – Standard Test Method for Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.

C. National Fire Protection Association:
1. NFPA-80 – Standard for Fire Doors and Windows.
2. NFPA-101 – Life Safety Code.

3. NFPA 105 – Smoke and draft control assemblies.

D. Steel Door Institute:
   1. SDI-107 – Hardware on Steel Doors (Reinforcement Application).

E. Underwriters Laboratories Inc.:
   1. UL 10B – Fire Tests of Door Assemblies.
   2. UL 10B or NFPA 252 at Atmospheric Pressure.
   3. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies, UBC 7-2-1997 Fire Tests of Door Assemblies.
   4. UL 1784 – Air leakage test of door assemblies.

F. ADA – The Americans with Disabilities Act - Title III - Public Accommodations.

G. CBC – California Building Code and Local Codes Including Authority Having Jurisdiction.

H. ITS – Intertek Testing Service [Warnock Hersey].

1.3 SUBMITTALS

A. Shop Drawings: Indicate door and frame elevations and sections, materials, gages, finishes, fabrication, and erection details, Locations of finish hardware by dimension and locations/details of all openings and louvers. Do not proceed with any fabrication until all details are approved.

B. Certification of Compliance: Submit any information necessary to indicate compliance to these specifications.

C. Submit samples if requested by the Architect.

D. Job Close-out: Provide 1 complete manufacturer's catalog to the District Locksmith.

1.4 QUALITY ASSURANCE

A. All hollow metal doors and frames shall be the product of one (1) manufacturer. Exceptions will not be permitted under any circumstances.

B. Certification of label construction: For components exceeding Underwriters Laboratories, Inc. (UL)- furnish inspection certificate stating that component construction conforms to UL rating requirements only if architect is aware of such a limitation and has allowed the non-labeled unit.

C. Certification that the Polystyrene Core Swinging Type Fire Doors – Model 707 as manufactured by The Curries Company has been investigated by Underwriters Laboratories and certified for Standard(s) of Safety: UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies, UBC 7-2-1997, Fire Tests of Door Assemblies.

D. Hollow metal manufacture shall be a SDI member.

E. The Hollow Metal Manufacturer shall supply doors and frames through a national distribution system as described in 1.06.D herein. Marketing material through a factory direct method will not be acceptable to the District.
   1. Successful distributor shall be located within the Southern California area.

F. Hollow metal supplier shall be a qualified "local direct distributor" of products to be furnished. The distributor shall have in their regular employment an AHC and/or CDC with a local business address, telephone and fax line, which will be available at reasonable times through-out the project, to consult with the Architect, Contractor and District facilities regarding matters affecting the door and frame openings.

G. **Contractor will allow in his bid for the replacement of <u>two (2) exterior doors</u>** to be selected at random by the project architect for dismantling and inspection of internal construction and compliance with the specification. Contractor to provide labor and tools for inspection under architect's direction. Exceptions will be Ceco and/or Curries.

H. Failure of any hollow metal frame or door to meet specified standards shall be grounds to reject the entire shipment of hollow metal doors and frames, including the hollow metal manufacturer. Items shall be replaced at contractor's expense, including two additional doors for dismantling. No extensions of time or additions to the contract will be allowed due to a rejection of material and substitution of the hollow metal manufacturer.

I. Installer requirement: Firm with a minimum of five (5) years experience in the installation of metal doors and frames similar in the type included in this specification.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames cardboard wrapped, crated, palletized or otherwise protected during transit and site storage.

B. Inspect doors and frames upon delivery for damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and accepted by the architect. Otherwise remove and replace damaged items.

C. Store doors and frames at the building site in a dry, secure place.
1. Place units on minimum 4 inch high wood blocking.
2. Avoid non-vented plastic or canvas shelters which could create a humidity chamber.
3. If cardboard wrapper on door becomes wet, remove carton immediately.
4. Provide ¼ inch spaces between stacked doors to promote air circulation.

1.6 SEQUENCING AND SCHEDULING

A. Deliver all doors and frames to the jobsite in a timely manner so not to delay progress of other trades.

B. Issue purchase orders to frame, door and hardware suppliers in sufficient time so as not to interfere with normal quoted delivery of materials.

1.7 WARRANTY

A. Hollow metal doors and frames shall be supplied with a one (1) year warranty against defects in materials and workmanship.

B. Warranty to commence with substantial completion of the job.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers
   1. Curries, (641) 423-1334.
   2. Republic Door, (800) 733-3667.
   3. Steelcraft, (513) 745-6400.
   4. Security Metal Products, (310) 641-6690.
   5. Substitutions: Under provisions of Section 01 33 00.

B. Or Equal, provided products meet the specified performance requirements and are acceptable to the District. Such products are subject to California Public Contracts Code Section 3400.

C. Performance criteria as specified in 2.3 will be supported by factory cycle and twist test certification document by an independent lab, and will be included in supplier's shop submittals. Exceptions will not be considered.

D. Any proposed substitution will be reviewed by the District facilities, including the District locksmith. Request will be required ten (10) days before bid. Request will require a complete sample of a product as specified herein, and which will become the permanent property of the District. In addition, the District will be furnished a list of a minimum of twenty (20) local (within a 75 mile radius of the District) institutional end-user customers, with facilities locksmith names and telephone numbers.

2.2 MATERIALS

A. Steel requirements, all doors and frames to be manufactured of commercial quality, stretcher leveled flatness, cold rolled steel per ASTM-A1008 and A-568 general requirements or galv. to A60 minimum coating weight standard per ASTM-A924 or A653 hot dip galvanized to A60 minimum coating weight standard. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A1011.

B. Coating Materials Primer: all doors and frames to be bonderized and finished as standard with manufacturer's baked-on primer conforming to ANSI-A250.10.
   1. In addition to factory primer, the paint contractor is responsible for a field applied second primer coating. Primer to be equal to primer coating used by the door and frame Manufacturer.
   2. Painting contractor to apply two (2) coats of field applied finish coats per specification requirements.
   3. Initial field finish coat to be applied after doors are installed. Final coat to be applied after finish hardware templating and pilot holes have been made.
   4. Prior to the application of the final field applied finish coat, all surface installed hardware shall be removed, and then carefully reinstalled after the final coat has been applied and dried. Scratches and mars shall be repaired to the satisfaction of the project Architect and District.
   5. Contractor shall protect door and frame surfaces until job completion and final acceptance by the District.

C. Door Core

1. Polystyrene core. All doors to have:
   a. Non-labeled or labeled doors: polystyrene slab [minimum .24 U factor], self extinguishing, non-toxic in case of fire.
   b. Permanently bonded to the inside of each face sheet providing rigidity, insulating and sound deadening properties to the door.
   c. Refer to 2.3 for additional specification
2. Steel ribbed and honeycomb doors are not acceptable, and will not be considered by the District.
3. Temperature rise rated doors should be provided for stairwell enclosures, which indicate "Temperature rise 30 minutes - 450 degrees F maximum or 250 degrees F maximum" as required by the local building code.

D. Glass lite frames in doors fabricated of not less than 18GA. galvanized steel with attachment screws allowed only on the non-secure side, screws not visible when viewing door lite frame face.

E. Electric Through-Wire [HMD]

1. Provide all hollow metal doors receiving electrified hardware with electrical through-door wiring harness and concealed plug connectors on each end to accommodate up to twelve wires.
2. Coordinate electrical connectors on each end of the wiring harness to plug directly into the electrified hardware and the electric hinge.

F. Electric Through-Wire [HMF]

1. Provide all hollow metal frames receiving electrified hardware with electrical wiring harness and concealed plug connectors on one end to accommodate up to twelve wires.
2. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the electric hinge.

2.3 FABRICATION

A. General

1. Fabricate all doors and frames in accordance with ANSI A250.8-1998/SDI-100 except where more stringent requirements are specified.
2. As detailed on plans, fabricated "welded" frame units to be delivered to job site as single units. Transoms, sidelights, and window walls which are "oversize" for transportation and installation, shall be furnished with field splices to be field assembled by the general contractor.
3. Supply only doors and frames manufactured by the acceptable manufacturer listed in this specification.
4. Doors to be 707 Series as manufactured by the Curries Co, Mason City, IA. 727 Series at Temperature rise rated doors, which indicate "Temperature rise 30 Min.-450F degrees maximum or 250F degrees maximum" as required by local building code.
5. Prepare doors to receive door hardware per approved schedule, including internal reinforcing. Through-Bolts (SNB) are not permitted unless specifically requested by the Architect and/or District. Do not include unnecessary cutouts in door faces not required by hardware template.

B. Door Construction

1. Classification: SDI Level III - Model 2 (16GA. doors).
2. Face sheets formed of cold rolled steel.
3. Exterior doors to be galvanized to A60 minimum weight standard.
   a. Perimeter fence hollow metal door gates/frames to be galvanized to G90 and fabricated per architect's drawings/elevations. Refer to dwgs/elevs.
4. Seamless construction **[Equal to Curries 707T]** by **continuous wire weld** of both edges full height of door, and to be done at the factory.
5. Lite and louver door cutouts: Furnish perimeter channel reinforcement seal watertight by supplier.
6. Lock edges beveled 1/8 inch in 2 inches.
7. Door lock edge reinforcing shall be **one-piece, full height 14GA. Channel.** Door hinge edge reinforcing shall be **one-piece, full height 12GA. Channel** formed and tapped for hinges or as required per listed hardware.
8. Both hinge and lock channels to be welded to each face sheet of the door.
9. Top and bottom channels:
   a. Not less than 16GA. - flush or inverted.
   b. Welded to the face sheet.
   c. Close tops of exterior doors flush by the addition of 16GA. Galvanized. Steel channel fillers. Channel filler to be sealed watertight.
10. Astragals: To be flat security type or 'Z' as called for in drawings or specifications.
11. All doors to conform to A.N.S.I.-A 250.4 Test Procedure and Acceptance Criteria for Physical Endurance. Door size cycle tested to be 4070 to minimum Level A performance for 18 or 16GA. door. **Doors will have been subjected to an additional one (1) million cycle and twist tests with a combined two (2) million cycles and 46 twist tests. Testing to be accomplished by an independent lab. Certification of these criteria to be submitted with approval drawings by the supplier. Exceptions will not be considered.**
12. Transom Panels: To be constructed similar to doors.
13. Where indicated, provide insert type louvers in bottom of doors. Louvers to be not less than 18 GA. prime coated steel.
14. Minimum HG/FG stiles shall be six (6) inches wide. Top rail shall be a minimum eight (8) inches.

C. Door and Window Frame Construction

1. Frames shall comply with ANSI/SDI A250.5 Level A, one million cycle swing test performance for a 4070 door frame.
2. All frames to be formed from cold rolled steel. Furnish 14GA. exterior door and window frames and 16GA. interior door and window frames. Both exterior door and window frames to be galvanized to A60 minimum weight standard.
   a. Where specified, perimeter fence hollow metal door gates/frames to be galvanized to G90 and fabricated per architect's drawings/elevations.
3. All frames are to be **Full Profile welded**, ground smooth, and re-primed at the welded area.
4. Window frame glass stops shall be minimum 18GA.steel and 5/8" in height. Exterior stops & countersunk flat-head attachment screws to be galvanized.

5. Provide temporary shipping bars to help protect from damage during transit and handling.

6. Temporary shipping bars to be removed before setting frames.

7. All welds on frames, transoms and sidelites to be flush with neatly mitered or butted material cuts.

8. Water Penetration: Borrowed lite assemblies, transom, sidelite and combination transom sidelite frames are not factory sealed to prevent water penetration. In situations where water penetration is a concern, contractor must seal with quality long lasting sealant, all joints that are exposed to the elements after the frame assembly is installed. **Whenever possible, it is recommended that glass and glazing be installed on the exterior rabbet of the frame assembly. This will help act as a deterrent to water penetration. The member companies of the hollow metal industry cannot control the workmanship associated with the frame installation; therefore, it is the responsibility of the installer to assure all steps are taken to prevent water penetration.**

D. Frame Anchors

1. Provide sufficient anchorage to attach to wall in accordance with ANSI/SDI A250.5-'94 Test Compliance Level 'A' of one million cycles, or anchorage as detailed on plans to specific wall conditions.

2. Wall anchor for frame attachment to masonry construction: Masonry anchors, adjustable, flat, corrugated or perforated 'T' shaped anchors with leg not less than 2 inches wide by 10 inches long or masonry "wire" type not less than 3/16 inch dia.

3. All frame jamb anchors to be provided: one each jamb per 30 inches of frame height or fraction thereof. Furnish anchors at headers exceeding 48 inches.

4. Floor anchors - angle clip type:
   a. Minimum 16 GA.
   b. To receive 2 fasteners per jamb.
   c. Welded to the bottom of each jamb.

5. In place masonry or concrete:
   a. 3/8 inch countersunk flat head stove bolt and expansion shields.
   b. Spaced 6 inches from top and bottom of frame and at 26 inches on center maximum between.
   c. Weld pipe spacers or other type of spacers per Manufacturer's standard design in back of frame soffit to protect frame profile during tightening of bolts and anchors.

6. Head struts: for frames not anchored to masonry or concrete construction provide ceiling struts spot welded to jambs each side extending to building structure where called for on schedule.

E. Hardware Preparation

1. Reinforcements: reinforce components for hardware installation in accord with SDI -107 and ANSI-A115. Provide minimum gauge hardware reinforcing for mortise or surface applied hardware as follows:
   a. Hinges - 10 GA. or equivalent number of threads on doors; 7 GA. on frames for mortise butt hinge type; 12 GA. full length on frames for continuous hinge.
   b. Locks - 12 GA. or equivalent number of threads.
   c. Panic Devices - 12 GA.
   d. Surface Closers - 12 GA.

e. Hold Open Device - 12 GA.

2. Field drilling and/or tapping for surface applied hardware is installation contractor's responsibility. Refer to SDI 107 as a recommended guide for proper reinforcement and installation.
   a. Lock reinforcement shall be 16 GA. channel type typical of Curries G3 [86] four sided compression resistant design.
   b. Panic reinforcement to be 14 GA. channel type.
   c. Closer reinforcement to be 12 GA. channel type.
   d. Hinge and lock reinforcing on doors to be channel type, continuous from top to bottom of door welded to face sheets.
3. Punch single leaf frames to receive three (3) silencers. Double leaf frames to receive one silencer per leaf at head.
4. Factory prepared hardware locations to be in accord with "Recommended locations for Builders' Hardware for Standard Steel Doors and Frames", as adopted by the Steel Door Institute.
5. Grout solid all frames in masonry or concrete walls. Provide steel plaster guards or mortar boxes, welded to frame, at back of hardware cutouts where installed in concrete, masonry or plaster openings. Protect inside throat of each frame in grout filled wall conditions or where antifreeze additives are used in fill, with a waterproof undercoating material minimum 1/8" thick, field applied by installer.

F. Excess Material
   1. Contractor to deliver any unused doors and frames to the District facilities.

2.4 PROTECTIVE COATINGS

A. Bituminous Coating: Fibered asphalt emulsion to be applied to the interior of all hollow metal frames set in concrete block walls.

B. Primer: Zinc chromate type.

PART 3 EXECUTION

3.1 SETTING FRAMES

A. Set all frames in accord with SDI 122 "Installation and Trouble-Shooting Guide for Standard Steel Doors and Frames" or "The Installation of Commercial Steel Doors and Steel Frames" and "Builders Hardware" as published by the DHI are recommended guidelines.

B. Set welded frames in position prior to beginning partition work. Brace frames until permanent anchors are set.

C. Set anchors for frames as work progresses. Install anchors at hinge and strike levels.

D. Use temporary setting spreaders at all locations. Use intermediate spreaders to assure proper door clearances and header braces for grouted frames.

E. Install frames in prepared openings in concrete and masonry walls using countersunk bolts and expansion anchors.

F. Install all fire rated frames in accord with requirements of N.F.P.A.80.

G. Where frames require ceiling struts or other structural overhead bracing, they shall be anchored securely to structure above, as required.

H. Frames shall be filled solid with Portland cement grout where shown or required by class of opening in masonry or concrete walls. Provide steel plaster guards or mortar boxes, welded to frame, at back of hardware cutouts where installed in concrete, masonry or plaster openings. Protect inside throat of each frame in grout filled wall conditions or where antifreeze additives are used in fill, with a waterproof undercoating type material minimum 1-2 mils thick, field applied by installer.

3.2 DOOR INSTALLATION

A. Install hollow metal doors in frames using hardware specified in Section 08710 Finish Hardware. Doors are to be expertly hung and shall fit snug against all stops. Doors shall fit accurately and hang free from hinge bind with a uniform clearance of 1/8 inch at head and jambs. After hanging, make all adjustments and then remove respective hardware for finish painting. Reinstall hardware after finish painting.

B. Maximum clearances at edge of doors:

1. Between door and frame at head and jambs: 1/8 inch.
2. At meeting edges pairs of doors and at mullions: 1/8 inch.
3. At transom panels, without transom bars: 1/8 inch.
4. At sills without thresholds: 5/8 inch max above finish floor.
5. At sills with thresholds: 1/8 inch above threshold.

C. Hardware Installation: to be installed securely without marking or defacing hardware or Finish work. Protect finish hardware with suitable protective covering until completion of building. Leave all hardware in perfect working order. Clean and polish.

3.3 ADJUSTMENT AND CLEANING

A. Remove dirt and excess sealant, mortar or glazing compounds from exposed surfaces.

B. Adjust for smooth operation as required. Install shims as required to allow for proper closing.

C. Fill all dents, holes, etc. with metal filler and sand smooth and flush with adjacent surfaces - reprime/paint to match finish.

END OF SECTION

SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood Doors fire rated and non-rated.

B. Door louvers.

1.2 RELATED SECTIONS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 71 00 - Finish Hardware.

1.3 REFERENCES

A. NWWDA I.S.1 - Industry Standard For Wood Flush Doors (Includes Standards I.S.1.1 through I.S.1.7).

B. UL 10B - Fire Tests of Door Assemblies.

C. Woodwork Institute - Manual of Millwork.

1.4 QUALITY ASSURANCE

A. Conform to requirements of W.I. Manual of Millwork, Section 20, Custom/Premium Grade except where otherwise indicated.

B. Construction: Conform to UL 10B.

C. Installed Doors : Conform to NFPA 80 for fire rated class indicated.

D. Issue a W.I. Certified Compliance Certificate prior to delivery of doors certifying that doors meet all requirements of W.I. Grade or Grades specified.

1.5 REGULATORY REQUIREMENTS

A. Conform to 2019 California Building Code fire rated doors.

1.6 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00. Shop drawings shall bear the "W.I. Certified Compliance Label" on the first page of each set.

B. Indicate door elevations, stile and rail reinforcement, internal blocking for hardware attachment, and cutouts for glazing and louvers.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples 12 x 12 inch in size illustrating each species.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Protect products under provisions of Section 01 70 00.

B. Package, deliver, and store doors in accordance with W.I. requirements as set forth in Technical Bulletin 419-R.

1.8 WARRANTY

A. Provide five year manufacturer's warranty under provisions of Section 01 70 00.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers - Flush Faced Doors
1. Cal Wood, Santa Rosa, CA 95402 (800) 582-7333.
2. Eggers Industries, Rancho California, CA 92390 (714) 676-5351.
3. Glen Mar Door Mfg. Co., Phoenix, AZ 85005, (800) 528-6339.
4. Wyerhauser Company, Los Angeles, CA 90007 (213) 748-5451.
5. Substitutions: Under provisions of Section 01 60 00.

2.2 DOOR CONSTRUCTION

A. Solid Non-Rated Core: Solid wood block, framed block glued, or solid particleboard.

B. Solid, Special Function Core: Labeled fire performance type.

C. Flush Interior Door Veneer: White Oak species; sliced with pair matched grain, for transparent finish. Medium density overlay plywood face veneer for paint finish.

D. Glazing Frames: 18 gauge steel with mitered and welded corners, ground smooth. Complete with binder posts through bolts. Finish with baked-on prime coat for painting.

2.3 ADHESIVES

A. Interior Doors: W.I. Type I.

2.4 FABRICATION

A. Fabricate non-rated wood doors to requirements of W.I. "Manual of Millwork", Section 20, latest edition, in the W.I. Grade or Grades specified.

B. Fabricate fire rated doors per manufacturer's standard construction, and labeling agency requirements. Face veneer shall conform to W.I. Grade and species specified.

C. Pre-machine doors for finish hardware.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install doors in accordance with W.I. "Manual of Millwork" Section 26 and W.I. Technical Bulletin 420-R. Conform to W.I. requirements for fit tolerances. Coordinate installation of glass and glazing. Install door louvers as specified. Adjust doors for smooth and balanced movements.

B. Contractor shall provide to architect a W.I. Certified Compliance Certificate for installation at the completion of project installation.

C. Fire doors and frames shall be installed in accordance with their listing, NFPA #80 and the manufacturer's instructions.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-rated access doors and frames.

1.2 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Include sizes, types, finishes, scheduled locations, and details of adjoining work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers
1. Bar-Co., Enterprise, AL 36331 (205) 347-9451.
2. J.L. Industries, Los Angeles, CA 90001 (415) 489-4441.
3. Milcor Incorporated, Lima, OH 45804 (419) 227-6899.
4. Substitutions: Under provisions of Section 01 60 00.

2.2 ACCESS UNITS

A. Non Rated Units: Equivalent to Milcor Style M.

2.3 FABRICATION

A. Non-Rated Units: Fabricate frames of 16 gage steel and door panels of 20-gauge steel.

B. Units shall be 24" x 24", unless noted otherwise on plans.

C. Weld, fill, and grind joints to assure flush and square unit.

D. Hardware: Continuous type steel hinges with stainless steel pin, cylinder lock with latch, two keys for each unit.

E. Anchors: Provide masonry anchors where required for wall construction.

2.4 FINISH

A. Prime coat units with baked on electrostatic primer.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify rough openings for door and frame are correctly sized and located.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install frame plumb and level in wall and ceiling openings.

B. Position to provide convenient access to concealed work requiring access.

C. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door hardware, including electric hardware.
2. Storefront and entrance door hardware.
3. Power supplies for electric hardware.

B. Related Divisions:

1. Division 07 – sealant at exterior thresholds
2. Division 08 – metal doors and frames, interior aluminum frames, wood doors, integrated security systems, specialty doors, storefront and glazed curtainwall systems.
3. Division 28 – security access systems

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Installation.
6. Rough hardware.
7. Conduit, junction boxes & wiring.
8. Folding partitions, except cylinders where detailed.
9. Sliding aluminum doors, except cylinders where detailed.
10. Access doors and panels, except cylinders where detailed.
11. Corner Guards.
12. Welded steel gates and supports.

1.2 REFERENCES**:**

A. Use date of standard in effect as of Bid date.

1. American National Standards Institute
    a) ANSI 156.18 – Materials and Finishes.
2. BHMA – Builders Hardware Manufacturers Association
3. 2019 California Building Code
    a) Chapter 11B – Accessibility To Public Buildings, Public Accommodations, Commercial Buildings and Public Housing
4. DHI – Door and Hardware Institute
5. NFPA – National Fire Protection Association
    a) NFPA 80 2019 Edition – Standard for Fire Doors and Other Opening Protectives.
    b) NFPA 105 – Smoke and Draft Control Door Assemblies
    c) NFPA 252 – Fire Tests of Door Assemblies
6. UL – Underwriters Laboratories
    a) UL10C – Positive Pressure Fire Tests of Door Assemblies.

b) UL 305 – Panic Hardware

7. WHI – Warnock Hersey Incorporated State of California Building Code
8. Local applicable codes
9. SDI – Steel Door Institute
10. WI – Woodwork Institute
11. AWI – Architectural Woodwork Institute
12. NAAMM – National Association of Architectural Metal Manufacturers

B. Abbreviations

1. Manufacturers**:** see table at 2.1.A of this section
2. Finishes**:** see 2.7 of this section.

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS**:** Submit six copies of schedule per D. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Minimum 10pt font size. Include following information**:**

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.
11. Point-to-point wiring diagrams.
12. Manufacturer's technical data and installation instructions for electronic hardware.
13. Date of jobsite visit. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

B. Deviations**:** Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.

C. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

D. Substitutions per Division 1. Include product data and indicate benefit to the Project. Furnish operating samples on request.

E. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

F. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, riser and point-to-point wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.4 QUALITY ASSURANCE**:**

A. Qualifications**:**

1. Hardware supplier**:** direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

    a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware**:** Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors**:** Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings**:** NFPA 80 compliant. Hardware UL10C (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions and code requirements.

F. Pre-Installation Meetings**:** Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

1.5 DELIVERY, STORAGE AND HANDLING**:**

A. Delivery**:** coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores**:** secured delivery direct to Owner's representative.

B. Acceptance at Site**:** Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage**:** Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION**:**

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination**:** Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information**:**

1. Location of embedded and attached items to concrete.
2. Location of wall-mounted hardware, including wall stops.
3. Location of finish floor materials and floor-mounted hardware.
4. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation by placing a strip of insulation, wood, or foam, on the back of the hollow metal frame behind the rabbet section for continuous hinges, as well as at rim panic hardware strike locations, silencers, coordinators, and door closer arm locations. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.

5. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
6. Coordinate: flush top rails of doors at outswinging exteriors, and throughout where adhesive-mounted seals occur.
7. Manufacturers' templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

D. Environmental considerations**:** segregate unused recyclable paper and paper product packaging, uninstalled metals, and plastics, and have these sent to a recycling center.

E. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.

1. Submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.7 WARRANTY**:**

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties.

B. Include factory order numbers with close-out documents warranty information:

1.8 COMMISSIONING**:**

A. Conduct these tests prior to request for certificate of substantial completion**:**

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.
2. With installer, access control contractor and electrical contractor present, test electrical, electronic and electro-pneumatic hardware systems for satisfactory operation.
3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

1.9 REGULATORY REQUIREMENTS**:**

A. Locate latching hardware between 34 inches to 44 inches above the finished floor, per 2019 California Building Code, Section 11B-404.2.7.

1. Panic hardware: locate between 36 inches to 44 inches above the finished floor.

B. Handles, pull, latches, locks, other operable parts on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position,operating hardware shall be exposed and usable from both sides CBC Section 11B-404.2.7.

C. The force for pushing or pulling open a door shall be as follows: CBC Section 11B-404.2.9.

1. **Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds (22.2 N) maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds (66.7N). These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.**

2. **The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds (22.2N) maximum to comply withCBC Section 11B-309.4.**

D. Door closing speed shall be as follows: CBC 11B-404.2.8

1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum

2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum

E. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests, per 2019 California Building Code Section 11B-404.2.10.

1. Applied kickplates and armor plates: bevel the left and right edges; free of sharp or abrasive edges.

2. Tempered glass doors without stiles: bottom rail may be less than 10 inches if top leading edge is tapered 60 degrees minimum.

F. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches. 2019California Building Code Section 11B-404.2.3.

1. Exception**:** doors not requiring full passage through the opening, that is, to spaces less than 24 inches in depth, may have the clear opening width reduced to 20 inches. Example**:** shallow closets.

2. Door closers and overhead stops: not less than 78 inches above the finished floor or ground, per 2019California Building Code 11B-307.4.

G. Thresholds**:** floor or landing no more than 0.50 inches below the top of the threshold of the doorway, per 2019California Building Code Section 11B-404.2.5. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches**:** beveled to slope no greater than 1**:**2 (50 percent slope). 2019California Building Code Section 11B-303.2 & ~.3.

H. Floor stops**:** Do not locate in path of travel. Locate no more than 4 inches from walls, per DSA Policy #99-08 (Access).

I. Pairs of doors with independently-activated hardware both leafs**:** limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage, per 2019California Building Code Section 11B-703.4.2.1

J. Door and door hardware encroachment**:** when door is swung fully-open into means-of-egress path, the door may not encroach/project more than 7 inches into the required exit width, with the exception of door release hardware such as lockset levers or panic hardware. These hardware items must be located no less than 34-inches and no more than **44-inches maximum** above the floor/ground. 2019California Building Code, Section 1005.7.1.

1. In I-2 occupancies, latch release hardware is not permitted to project in the required exit width, regardless of its mounting height, per 2019California Building Code, Section 1005.7.1 at Exception 1.

L. Hardware (including panic hardware) shall not be provided with "night latch" (NL) function for any accessible doors or gates unless the following conditions are met per DSA interpretation 10-08 DSA/AC (external), revised 4/28/09. Such conditions must be clearly demonstrated and indicated in the specifications:

1. Such hardware has dogging feature

2. It is dogged during the time the facility is open

3. Such dogging operation is performed only by employees as their job function (non-public use)

PART 2 PRODUCTS

2.1 MANUFACTURERS**:**

A. Listed acceptable alternate manufacturers**:** these will be considered; submit for review products with equivalent function and features of scheduled products.

ITEM**:**	MANUFACTURER**:**	ITEM**:**
Hinges	(IVE) Ives	Hinges
Pivots	(IVE) Ives	Pivots
Key System	(SAR) Sargent	Key System
Mechanical Locks	(SCH) Schlage	Mechanical Locks
Electronic Locks	(SCH) Schlage	Electronic Locks
Exit Devices	(VON) Von Duprin	Exit Devices
Closers	(LCN) LCN	Closers
Auto Flush Bolts	(IVE) Ives	Auto Flush Bolts
Coordinators	(IVE) Ives	Coordinators
Silencers	(IVE) Ives	Silencers
Push & Pull Plates	(IVE) Ives	Push & Pull Plates
Kickplates	(IVE) Ives	Kickplates
Stops & Holders	(IVE) Ives	Stops & Holders
Overhead Stops	(GLY) Glynn-Johnson	Overhead Stops
Thresholds	(ZER) Zero	Thresholds
Seals & Bottoms	(ZER) Zero	Seals & Bottoms
Aluminum Door Locks	(ADA) Adams Rite	Aluminum Door Locks

2.2 HINGING METHODS**:**

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Doors 3’6” or wider use 5” X 41/2” heavy weight hinges

C. Doors 8’0” use 4 hinges and add 1 hinge for every foot thereafter

D. Conform to manufacturer’s published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer’s standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

E. Conventional Hinges**:** Steel or stainless steel pins and approved bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors**:** stainless steel hinges with non-removable (NRP) pins and security studs.
2. Stainless steel material exteriors and at doors subject to corrosive atmospheric conditions.

F. Continuous Hinges**:**

1. Geared-type aluminum.

a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
b) If units are used at storefront openings, color-coordinate hinge finish with storefront color. Custom anodizing and custom powdercoat finishes subject to Architect approval.

2. Pinned steel/stainless steel type**:** continuous stainless steel, 0.25-inch diameter stainless-steel hinge pin.

a) Use engineered application-specific wide-throw units as needed to provide maximum swing degree of swing, advise architect if required width exceeds 8 inches.

G. Pivots**:** high-strength forged bronze or stainless steel, tilt-on precision bearing and bearing pin.

1. Bottom and intermediate pivots**:** adjustability of minus 0.063 inch, plus 0.125 inch.

H. Floor Closers**:** hydraulically controlled, cement case, maximum degree dead stop permitted by trim or adjacent structure. Special pins, floor pans and longer spindles when needed to accommodate floor and jamb conditions.

2.3 LOCKSETS, LATCHSETS, DEADBOLTS**:**

A. Mortise Locksets and Latchsets**:** as scheduled.

1. Chassis**:** cold-rolled steel, handing field-changeable without disassembly.
2. Floating mounting tabs automatically adjusts to fit a beveled door edge.
3. Latchbolts**:** 0.75 inch throw stainless steel anti-friction type.
4. Lever Trim**:** through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
5. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
6. Turnpieces**:** accessible offset turn-lever design not requiring pinching or twisting motions to operate.
7. Deadbolts**:** stainless steel 1-inch throw.
8. Electric operation**:** Manufacturer-installed continuous duty solenoid.
9. Strikes**:** 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
10. Scheduled Lock Series **:** Sargent 8200
11. Certifications**:**

a) ANSI A156.13, 1994, Grade 1 Operational,
b) ANSI/ASTM F476-84 Grade 31 UL Listed.

12. Accessibility: Require not more than 5 lb to retract the latchbolt or deadbolt, or both, per CBC 201911B-404.2.7 and 11B-309.4.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features**:**

13. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
14. Deadlocking latchbolts, 0.75 inch projection.
15. End caps**:** impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
16. No exposed screws to show through glass doors.
17. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
18. Releasable in normal operation with 15-pound maximum operating force per UBC Standard 10-4, and with 32-pound maximum pressure under 250-pound load to the door.
19. Lever design to match locksets
20. Accessibility: Require not more than 5 lb to retract the latchbolt, per CBC 201911B-404.2.7 and 11B-309.4.

2.6 CLOSERS

B. Surface Closers**:** Sarget 350 series

2.7 OTHER HARDWARE

A. Automatic Flush Bolts**:** Low operating force design.

B. Overhead Stops**:** Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates**:** Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops**:** Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type.
2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum**:** 90deg stop / 95deg deadstop. Note degree of opening in submittal.

E. Automatic door bottoms**:** low operating force units.

1. Include automatic type door bottoms, as opposed to fixed sweeps, at stairs and elevator lobbies to allow fine-tuning of pressurization systems.

F. Thresholds**:** As scheduled and per details. Comply with CBC 201911B-404.2.5. Substitute products**:** certify that the products equal or exceed specified material's thickness. Proposed substitutions**:** submit for approval.

1. Saddle thresholds**:** 0.125 inches minimum thickness.
2. Exteriors**:** Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Minimum 0.25 inch diameter fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors. National Guard Products' "COMBO" or Pemko Manufacturing's "FHSL".

3. Fire-rated openings, 90-minutes or less duration**:** use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, include a 0.25in high 5in wide saddle in the bid, and request direction from Architect.
4. Fire-rated openings, 3-hour duration**:** Thresholds, where scheduled, to extend full jamb depth.
5. Acoustic openings**:** Set units in full bed of Division-7-compliant, leave no air space between threshold and substrate.
6. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
7. Fasteners**:** Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws**:** full-thread. Sleeve nuts**:** full length to prevent door compression.

G. Through-bolts**:** Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.

1. Exception**:** surface-mounted overhead stops, holders, and friction stays.

H. Silencers**:** Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Leave no unfilled/uncovered pre-punched silencer holes. Intent**:** door bears against silencers, seals make minimal contact with minimal compression – only enough to effect a seal. Provide where seals are not used

I. Wall- & Floor-mounted electromagnetic door holders**:** LCN's SEM series or approved equivalent. Incorporate into U.L. listed fire & life-safety system, doors release to allow closure and latching when door's zone is in alarm state. Use minimum projection required to allow door to open as widely as allowed by wall conditions and projection of door hardware.

2.8 FINISH**:**

1. Generally**:** BHMA 626 Satin Chromium Areas using BHMA 626: furnish push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise scheduled.

J. Door closers**:** factory powder coated to match other hardware, unless otherwise noted.

2.9 KEYING REQUIREMENTS**:**

A. KEYING REQUIREMENTS**:**

B. Key System**:** Sargent existing system. Check with locksmith for requirements

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS**:**

A. Can read and understand manufacturers' templates, suppliers' hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION**:**

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation. Installation denotes acceptance of wall/frame condition.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.
1. Locate latching hardware between 34 inches to 44 inches above the finished floor, per California Building Code, Section 1010.1.9.2 and 11B-404.2.7.
2. Locate panic hardware between 36 inches to 44 inches above the finished floor.
3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops**:** before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

D. Existing frames and doors to be retrofitted with new hardware**:**

1. Field-verify conditions and dimensions prior to ordering hardware. Fill existing hardware cut outs not being reused by the new hardware. Remove existing hardware not being reused, return to Owner unless directed otherwise.
2. Remove existing floor closers not scheduled for reuse, fill cavities with non-shrinking concrete and finish smooth.
3. Cut and weld existing steel frames currently prepared with 2.25 inch height strikes. Cut an approximate 8 inch section from the strike jamb and weld in a reinforced section to accommodate specified hardware's strike.
4. Patch and weld flush filler pieces into existing door hardware preparations in steel doors and frames, leave surfaces smooth.
5. Glue in solid wood block fillers to fill cut outs in existing wood doors, sand surfaces smooth. Alternatively, use an approved epoxy-based wood filler product, submit product data for approval.

3.3 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets**:** install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps. **Sweeps to be located on the pull sideof doors so not to encroach into the 10" min. high absolute smooth kick at each door.**
2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
4. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.

D. Locate overhead stops for minimum 90 degrees at rest and for maximum allowable degree of swing.

E. Drill pilot holes for fasteners in wood doors and/or frames.

F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

G. Field-verify existing conditions and measurements prior to ordering hardware. Fill existing hardware cut outs not being used by the new hardware.

H. Remove existing hardware not being reused. Tag and bag removed hardware, turn over to Owner.

I. Where existing wall conditions will not allow door to swing using the scheduled hinges, provide wide-throw hinges and if needed, extended arms on closers.

J. Provide manufacturer's recommended brackets to accommodate the mounting of closers on doors with flush transoms.

3.4. ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods**:** repair or replace to Owner's satisfaction.
2. Adjust doors to fully latch with no more than 1 pound of pressure.

a) Door closer valves: turn valves clockwise until at bottom – do not force. Turn valves back out one and one-half turns and begin adjustment process from that point. Do not force valves beyond three full turns counterclockwise.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
4. Adjust door closers per 1.9 this section.

B. Fire-rated doors**:**

1. Wood doors**:** adjust to 0.125 inches clearance at heads, jambs, and meeting stiles.
2. Steel doors**:** adjust to 0.063 inches minimum to 0.188 inches maximum clearance at heads, jambs, and meeting stiles.
3. Adjust wood and steel doors to 0.75 inches maximum clearance (undercut) above threshold or finish floor material under door.

C. Final inspection**:** Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following**:**

1. Has re-adjusted hardware.
2. Has evaluated maintenance procedures and recommend changes or additions, and instructed Owner's personnel.
3. Has identified items that have deteriorated or failed.
4. Has submitted written report identifying problems.

3.5 DEMONSTRATION**:**

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING**:**

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation / reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Do not order material until submittal has been reviewed, stamped, and signed by Architect's door hardware consultant.

C. Manufacturers and their abbreviations used in this schedule:

B/O	By Others
GLY	Glynn-Johnson Hardware
IVE	H. B. Ives
KNO	Knox Company
LCN	LCN Closers
SCE	Schlage Electronics
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International

D. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

E. Hardware Groups:

70948 OPT0257482 Version 1

Hardware Group No. 1

For use on Door #(s):
201A
Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
1	EA	REMOVABLE MULLION	KR4954		689	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-99-EO		626	VON
1	EA	PANIC HARDWARE	CDSI-PA-AX-99-NL-OP-110MD		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX (MULLION)		619	SCH
2	EA	MORTISE CYLINDER	20-061 ICX X XQ11-948 (DOGGING) DOGGING		626	SCH
4	EA	FSIC CORE	23-030 TIE TO EXISTING KEY SYSTEM		626	SCH
1	EA	DOOR PULL	VR910 DT		630	IVE
1	EA	DOOR PULL	VR910 NL		630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH		689	LCN
2	EA	MOUNTING PLATE	4040-18		689	LCN
2	EA	MULLION SEAL	8780NBK PSA		BK	ZER
1		SEALS	BY DOOR MANUFACTURER			B/O
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A OR PER SILL DETAIL		A	ZER

FIELD VERIFY NEW HARDWARE IS COMPATIBLE WITH EXISTING DOOR/FRAME CONDITIONS PRIOR TO PLACING ORDER

5 INCH MINIMUM STILES REQUIRED FOR HARDWARE SPECIFIED

Hardware Group No. 2

For use on Door #(s):
603A 604A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		630	IVE
1	EA	CLASSROOM DEAD LOCK	L9463T L283-721 XB11-720		626	SCH
1	EA	FSIC CORE	23-030 TIE TO EXISTING KEY SYSTEM		626	SCH
1	EA	PUSH PLATE	8200 8" X 16"		630	IVE
1	EA	DOOR PULL	VR900		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS18S/L AS REQ		BLK	IVE
1	EA	RAIN DRIP	142AA - OMIT IF SHELTERED		AA	ZER
1	SET	GASKETING	429AA-S HEAD AND JAMBS INSTALL HEAD SEAL BEFORE CLOSER		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A OR PER SILL DETAIL		A	ZER

FIELD VERIFY NEW HARDWARE IS COMPATIBLE WITH EXISTING DOOR/FRAME CONDITIONS PRIOR TO PLACING ORDER

Hardware Group No. 3

For use on Door #(s):
202A 203A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM DEAD LOCK	L9463T L283-721 XB11-720		626	SCH
1	EA	FSIC CORE	23-030 TIE TO EXISTING KEY SYSTEM		626	SCH
1	EA	PUSH PLATE	8200 8" X 16"		630	IVE
1	EA	DOOR PULL	VR900 SNB		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

FIELD VERIFY NEW HARDWARE IS COMPATIBLE WITH EXISTING DOOR/FRAME CONDITIONS PRIOR TO PLACING ORDER

Hardware Group No. 4

For use on Door #(s):
211A 211B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	CDSI-PA-AX-99-NL-OP-110MD		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	MORTISE CYLINDER	20-061 ICX X XQ11-948 (DOGGING) DOGGING		626	SCH
2	EA	FSIC CORE	23-030 TIE TO EXISTING KEY SYSTEM		626	SCH
1	EA	DOOR PULL	VR910 NL		630	IVE
1	EA	SURFACE CLOSER	4040XP EDA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS18S/L AS REQ		BLK	IVE
1	EA	RAIN DRIP	142AA - OMIT IF SHELTERED		AA	ZER
1	SET	GASKETING	429AA-S HEAD AND JAMBS INSTALL HEAD SEAL BEFORE CLOSER		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	103A OR PER SILL DETAIL		A	ZER

FIELD VERIFY NEW HARDWARE IS COMPATIBLE WITH EXISTING DOOR/FRAME CONDITIONS PRIOR TO PLACING ORDER

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal channel ceiling framing.

B. Gypsum board.

C. Taped and sanded joint treatment.

D. Texture finish.

1.2 REFERENCES

A. ASTM International:
1. ASTM C1396 - Gypsum Wallboard.
2. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
3. ASTM C514 - Nails for the Application of Gypsum Wallboard.
4. ASTM C-1396 - Water Resistant Gypsum Backing Board.
5. ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track, and Rigid Furring Channels for Screw Application of Gypsum Board.
6. ASTM C754 - Installation of Steel Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
7. ASTM C840 - Application and Finishing of Gypsum Board.
8. ASTM C1002 - Steel Drill Screws for the Application of Gypsum Board.
9. ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
10. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
11. ASTM C1658 - Standard Specification for Glass Mat Gypsum Panels Section 7
12. ASTM D3273- Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

1.3 QUALITY ASSURANCE

A. Applicator: Company specializing in gypsum board systems work with three years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Conform to 2019 CBC Chapter 7, Section 703.1 and table 706.4, 707.3.10, 721.1 for fire rated assemblies.

B. Conform to 2019 CBC Chapter 25.

1.5 ENVIRONMENTAL REQUIREMENTS

A. During cold weather, in areas receiving gypsum board installation, maintain temperature range between 55° F. to 70° F. for 24 hours before, during and after gypsum board and joint treatment application.

B. Provide ventilation during and following adhesives and joint treatment application. Use temporary air circulators in enclosed areas lacking natural ventilation. Under slow drying conditions, allow additional drying time between coats of joint treatment. Protect installed materials from drafts during hot, dry weather.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Deliver materials to the project site with manufacturer's labels intact and legible. Handle materials with care to prevent damage. Deliver fire rated materials bearing testing agency label and required fire classification numbers.

B. Store materials inside under cover, stack flat, off of floor. Stack gypsum board so that long lengths are not over short lengths. Avoid overloading floor system. Store adhesives, joint treatment materials, metal items and gypsum board in a dry area.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturers - Gypsum Board System
   1. United States Gypsum Co. 800-874-4968
   2. Gold Bond Building Products Div., 800-628-4625
   3. Georgia Pacific Corp., 800-2256119.
   4. Substitutions: Under provisions of Section 01 60 00.

2.2 GYPSUM BOARD MATERIALS

A. Glass Mat Firecode X Gypsum Board (Glass-Mat Panels Mold Tough): ASTM C1177 and meet Section 7 of ASTM C1658; 5/8 inch thick unless otherwise indicated, maximum permissible length; ends square cut, tapered and beveled edges. Scores a 10 in mold resistance per ASTM D3273.
   1. USG Sheetrock Glass Mat Mold Tough

B. Fire Rated Gypsum Board: ANSI/ASTM C1396; fire resistive type, UL rated type x, type C or type ULIX as required by fire design; 5/8 inch thick unless otherwise indicated, maximum permissible length; ends square cut, tapered and beveled edges.
   1. USG Sheetrock Firecode X, Firecode C and USG Sheeetrock EcoSmart ULIX

C. Moisture and Mold Resistant Gypsum Board: ASTM C1396 scoring 10 in mold resistance in accordance ASTM D3273; 5/8 inch thick unless otherwise indicated, maximum permissible length; ends square cut, tapered and beveled edges located in moisture sensitive areas.
   1. USG Sheetrock Mold Tough gypsum panels
   2. USG Sheetrock EcoSmart Mold Tough gypsum panels

2.3 ACCESSORIES

A. Acoustical Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board suitable for STC rating required. USG Acoustical sealant manufactured by United States Gypsum Company.

B. Corner Beads: Paper faced, galvanized metal with 30 year warranty against edge cracking, USG Sheetrock B1 XW corner bead

C. Edge Trim: GA 201 and GA 216; Type LC bead with 30 year warranty against edge cracking, unless otherwise indicated. USG SHEETROCK Paper faced metal "J" trim, B9

D. Control Joints: CEMCO 093 control joints

E. Joint Materials: ASTM C475; reinforcing tape, joint compound, adhesive, water, and fasteners. Use tapes and compound recommended by gypsum board manufacturer for the use intended. Use ready mixed, drying type compounds except for moisture and glass mat panels subject to moisture after installation, use setting type joint compound, USG Easy Sand. Use taping compound for embedding tape and first coat over fasteners and flanges of corner beads and trim. Use topping compound for fill and finish coats.

F. Spray Texture Finish: Equivalent to USG Spray Texture Finish manufactured by United States Gypsum Company.

G. Fasteners:
1. To Metal: Self-drilling, self tapping, type S, countersunk bugle head, drywall screws, conforming to ASTM C646, for use with power driven tools.
2. To Wood: Type W screws length as required to provide minimum 3/4-inch penetration into wood and meet requirement of fire rating
3. Fire-Rated Construction: Type and length of fasteners to comply with 2019 CBC Chapter 7, Section 703.1 and table 706.4, 707.3.10, 721.1

H. Drywall Primer – USG Sheetrock First Coat

I. Skim Coat material – USG Sheetrock All-Purpose joint compound

PART 3 EXECUTION

3.1 INSPECTION

A. Examine surfaces scheduled to receive gypsum board construction for conditions that will adversely affect execution, permanence and quality of work.

B. Do not proceed with installation until conditions are satisfactory.

C. Beginning of installation means acceptance of existing substrate.

D. Beware of a condition known as "critical lighting." This condition causes shadows that accentuate even the slightest surface variations. A pigmented sealer will provide tooth for succeeding decorative coating, but "does not" equalize smoothness or surface texture. Any corrective active of the drywall must be done by the drywall contractor prior to decorating.

3.2 CEILING FURRING INSTALLATION

A. Space 8 ga. hanger wires at 48" o.c. along carrying channels and within 6" of ends of carrying channel runs. Use suitable fasteners for connection to wood as detailed on drawings.

B. Install 1-1/2" carrying channels 36" o.c. and within 6" of walls. Position channels for proper ceiling height, level, and secure with hanger wire saddle-tied along channel. Provide 1" clearance between runners and abutting walls and partitions. At channel splices, interlock flanges overlap ends 12" and secure each end with double strand 16-ga. tie wire.

C. Erect metal furring channels at right angles to 1-1/2" carrying channels or main support members. Space furring 16" o.c. and within 6" of walls. Provide 1" clearance between furring ends and abutting walls and partitions. Secure furring to carrying channels with clips or saddle-tie to supports with double-strand 16 ga. tie wire. At splices, lap furring channels at least 8" and securely wire-tie each end with double-strand 16 ga. tie wire.

D. At light troffers or any openings that interrupt the carrying or furring channels, install additional cross reinforcing to restore lateral stability of grillage.

3.3 ACOUSTICAL ACCESSORIES INSTALLATION

A. Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

B. Install acoustical sealant within partitions in accordance with manufacturer's instructions.

C. Install continuous beads of the specified acoustical sealant to produce an effective sound seal at intersections of all partitions with floors, ceilings, walls, columns and other abutting construction so that the entire perimeter is sealed.
   1. Apply two continuous beads of sealant, one on each side of the partition.
   2. Sealant shall be power gun applied in the joints.
   3. Backs of electrical boxes and similar appurtenances in the gypsum board shall be buttered with sealant and the perimeters sealed.

D. All materials used in sound rated partitions shall be the same manufacture as that used in the tested, rated and approved partition.

3.4 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with ASTM C840 and manufacturer's instructions.

B. Framing members: Examine all surfaces to receive gypsum board. Make certain that framing is plumb and true.
   1. The fastening surface of any framing or furring member shall not vary more than 1/8 in. from the plane of the faces of adjacent framing or furring members.

C. Cutting: Cut gypsum board by scoring or by sawing, working from the face side. When cutting by scoring, the face paper shall be cut with a knife.

D. The gypsum board shall then be snapped back away from the cut face. The back paper may be broken by snapping the gypsum board in the reverse direction or the back paper may be cut.

E. All cut edges and ends shall be sanded, where necessary, to obtain neat joining when gypsum board is erected.

F. Cut-outs or small openings in gypsum board shall be scored in outline on the face and back before knocking out or shall be cut out with a saw or other suitable tool. Openings shall not be made by punching.

G. Neatly cut gypsum board to fit around all outlets and switch boxes. Where gypsum board meets projecting surfaces, scribe and neatly cut.

H. Apply gypsum board with long dimension at parallel to framing members, and all abutting ends over framing members. Stagger end joints.

I. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.

J. Gypsum board of the maximum practicable length shall be used to minimize end joints. All end joints shall be neatly fitted and staggered. Joints on opposite sides of the partitions shall be so arranged as to occur on different studs.

K. At door openings, cut gypsum board so that no joints occur within 12 in. of the corners of door openings.

L. Use screws when fastening gypsum board to metal furring.

M. Use screws when fastening gypsum board to wood furring or framing except where nails are required for UL fire rated assembly.

N. Place control joints consistent with lines of building spaces as indicated.

O. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abutts dissimilar materials.

3.5 JOINT TREATMENT

A. Inspect gypsum board installation prior to applying joint treatment. Correct all defects before proceeding.

B. Taping and finishing compounds: Prepare and mix in accord with manufacturer's printed directions.

C. Exposed surface of gypsum board in place shall be fully acceptable for application of deferred finishes to provide completed work free of flaws, with fasteners recessed and joints invisible.

D. Spread joint compound evenly over all joints using a suitable tool and fill fastener depressions and metal trim.

E. Center reinforcing tape on joint and press into fresh taping compound. Wipe down with sufficient pressure to remove excess compound and to leave sufficient compound under tape for proper bond, feathering and leaving free from blisters and tape wrinkles. Allow to dry.

F. Fold reinforcing tape along center and apply to interior angles, following procedure for joints.

G. With fine sandpaper, lightly sand the dry compound between coats to remove irregularities.

H. Second coat of taping compound shall be applied to joints, feathering approximately 3 in. beyond edges of tape. Apply another coat to fastener heads, leaving flush with gypsum board surfaces.

I. After sanding second coat, apply final skim coat feathering out approximately 2 in. beyond second coat. Apply a third coat to all fastener depressions and metal trim. Skim-coat all interior angles.

J. After drying, sand lightly all surfaces; using caution not to excessively damage the face paper of the gypsum board.

3.6 FINISHING

A. All drywall surfaces to receive paint shall receive a standard "orange-peel" texture. After the gypsum board is completely taped and sanded, apply a uniform splatter spray of finishing compound, Level 3. Prior to applying texture, roller apply a uniform coat of drywall primer to entire surface

B. All drywall to receive vinyl wall covering or vinyl wall covering over tackable underlayment shall be taped, sanded, and prepared for the wall finish, Level 3.

C. Where one (1) hour drywall assemblies are located above the ceiling as shown on the plans, the following applies: Drywall finish above the ceiling line does not require sanding of the taped joints or spackled screws, Level 1.

D. Where gloss, semi-gloss, enamel or non-textured flat paints are used or where severe lighting conditions occur provide a Level 5 finish. A Level 5 finish per ASTM C840 requires a skim coat of joint compound and a uniform coat of drywall primer roller applied.

E. Glass Mat panels will require two skim coats and a drywall primer roller applied

F. Levels of gypsum board finish:

1. Level 1: All joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

2. Level 2: All joints and interior angles shall have a tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound tool marks and ridges are acceptable provided they do not impair the installation of any wall covering.

3. Level 3: All joints and interior angels shall have tape embedded in joint compound and two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges. The prepared surface shall be coated with a drywall primer prior to the application of final finishes. See painting specification Section 09 90 00 for paint system to go over drywall primer.

4. Level 4: All joints and interior angels shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges. The prepared surface shall be coated with a drywall primer prior to the application of final finishes. See painting specification Section 09 90 00 for paint system to go over drywall primer.

5. Level 5: All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angels, fastener heads, and accessories. A thin skim coat of joint compound, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. The prepared surface shall be coated with a drywall primer prior to the application of finish paint. See painting specification Section 09 90 00 for paint system to go over drywall primer.

3.7 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction. (please note this is not attainable with a drywall system)

3.8 CLEAN-UP

A. Remove all rubbish and surplus materials from premises and dispose of it legally away from site.

END OF SECTION

SECTION 09 30 11

CERAMIC TILE FLOOR FINISH

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic tile floor and base finish using the **thin-set** application method.

1.2 REFERENCES

A. Tile Council of America:
   1. ANSI/TCA A108.1 - Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile Installed with Portland Cement Mortar.
   2. ANSI/TCA A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
   3. ANSI/TCA A118.4 - Latex-Portland Cement Mortar.
   4. ANSI/TCA A137.1 - Specifications for Ceramic Tile.
   5. Tile Council of America (TCA) - Handbook for Ceramic Tile Installation.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.

B. Submit shop drawings indicating tile layout and patterns, color arrangement, perimeter conditions, and junctions with dissimilar materials.

C. Submit samples under provisions of Section 01 33 00.

D. Mount tile and apply grout on two 24 x 24 inch plywood panels, to indicate pattern, color variations, and grout joint size variations.

E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

F. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed ANSI/TCA A137.1.

G. Submit maintenance data under provisions of Section 01 70 00.

H. Include recommended cleaning and stain removal methods, and cleaning materials.

1.4 QUALITY ASSURANCE

A. Conform to ANSI/TCA A137.1.

B. Conform to Tile Council of America (TCA) Handbook for Ceramic Tile Installation.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum three years documented experience.

B. Installer: Company specializing in applying the work of this Section with minimum three years documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees F during installation of mortar materials. Heat rooms thoroughly prior to beginning work.

PART 2 PRODUCTS

2.1 MANUFACTURERS - TILE

A. Interceramic, Inc., (714) 956-7565.

B. Dal-Tile Corp., (714) 825-1514.

C. Substitutions: Under provisions of Section 01 60 00.

2.2 TILE MATERIAL

A. Ceramic Floor Tile: ANSI/TCA A137.1, conforming to the following:
1. Moisture Absorption: 0 to 0.5 percent.
2. Size: 12 x 12 x 1/4" inch.
3. Edge: Square.
4. Surface Finish: Mottle glazed with 10% non-skid aggregate in glaze.
5. Friction Coefficient: 0.6 or higher per ASTM C1028.
6. Ceramic Tile Flooring shall be stable, firm, and slip resistant. CBC Section 11B-302.1
7. Color: As selected by Architect from manufacturer's full range of standard and premium colors, maximum of 3 colors.

B. Base: Match floor tile for moisture absorption, surface finish and color; tile 8" inch long x 6" inch high; special order non-bullnosed, flat top edge, coved internal corner. Face of base tile shall be flush with face of wall tile.

2.3 MANUFACTURERS - MORTAR AND GROUT

A. Custom Building Products, (213) 728-7571.

B. Dal-Tile Corp., (714) 825-1514.

C. W.R. Bonsal Company, (818) 333-2217.

D. H.B. Fuller Company, (213) 582-0846.

E. L & M Manufacturing Inc., (201) 254-4830.

F. Substitutions: Under provisions of Section 01 60 00.

2.4 MORTAR MATERIALS

A. Portland Cement Mortar Materials: ANSI/TCA A108.1.

B. Latex-Portland Cement Mortar: ANSI/TCA A118.4 and the following:
1. Acrylic resin latex additive.
2. Dry mortar mix supplied by latex manufacturer.

2.5 GROUT MATERIALS

A. Commercial Portland Cement Grout: ANSI/TCA A118.6 of color selected.

B. Latex-Portland Cement Grout: ANSI/TCA A118.6 of color selected and the following:
1. Acrylic resin latex additive.
2. Dry mortar mix supplied by latex manufacturer.

C. Grout product shall be similar to Polyblend Sanded Tile Grout as manufactured by Custom Building Products.

2.6 ACCESSORIES

A. Shower Pan Material: ASTM D4551, Grade 40, composeal polyvinyl chloride sheet manufactured by Compotite Corporation, (213) 483-4444.

B. Reinforcing Mesh: 2 x 2-inch size weave of WO3/WO3 wire size; welded fabric, galvanized.

2.7 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions, and referenced standards.

2.8 GROUT SEALER

A. TileLab Grout and Tile Sealer as manufactured by Custom Building Products, or an approved equal.

2.9 EXTRA MATERIAL

A. Provide 150 square feet of each color of floor tile under provisions of Section 01 70 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install shower pan in accordance with manufacturer's instructions, using recommended solvent cement to weld joints when pan dimensions exceed maximum width roll.

3.3 INSTALLATION - FULL MORTAR BED METHOD

A. Over interior concrete slabs, install in accordance with TCA handbook method W244, with standard grout.

B. Lay tile to pattern indicated on Drawings, or if not indicated, request from Architect. Do not interrupt tile pattern through openings.

C. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base, and wall joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight without voids, cracks, excess mortar, or excess grout. Pour metal reducer edge strips at transitions upper doors to different material.

E. Sound tile after setting. Replace hollow sounding units.

F. Keep control joints free of mortar or grout.

G. Allow tile to set for a minimum of 48 hours prior to grouting. Protect surface from other trades.

H. Grout tile joints.

I. Provide expansion joints around entire perimeter of each room and every 100 square feet maximum. Provide and install per Tile Counsel of America (TCA) Handbook. Include a flexible sealant atop each expansion joint per manufacturer’s recommendations.

3.4 CLEANING

A. Clean work under provisions of 01 70 00.

B. Clean tile surfaces.

3.5 PROTECTION

A. Protect grout against staining until sealer is applied. Stained grout shall be removed and replaced prior to Notice of Completion.

B. Protect finished installation under provisions of Section 01 70 00.

C. Do not permit traffic over finished floor surface for 72 hours after installation.

END OF SECTION

SECTION 09 30 12

CERAMIC TILE WALL FINISH

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ceramic tile walls and wainscot finish using the **Full Setting Bed** application method.

1.2 REFERENCES

A. Tile Council of America:
   1. ANSI/TCA A108.1 - Glazed Wall Tile, Ceramic Mosaic Tile, Quarry Tile and Paver Tile Installed with Portland Cement Mortar.
   2. ANSI/TCA A108.5 - Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
   3. ANSI/TCA A118.4 - Latex-Portland Cement Mortar.
   4. ANSI/TCA A137.1 - Specifications for Ceramic Tile.
   5. Tile Council of America (TCA) - Handbook for Ceramic Tile Installation.

1.3 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

C. Submit maintenance data under provisions of Section 01 70 00.

D. Include recommended cleaning and stain removal methods, and cleaning materials.

1.4 QUALITY ASSURANCE

A. Conform to ANSI/TCA A137.1.

B. Conform to Tile Council of America (TCA) Handbook for Ceramic Tile Installation.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum three years documented experience.

B. Installer: Company specializing in applying the work of this Section with minimum three years documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS - TILE

A. Interceramic, Inc., (714) 956-7565.

B. Dal-Tile Corp., (714) 825-1514.

C. Substitutions: Under provisions of Section 01 60 00.

2.2 TILE MATERIAL

A. Ceramic Wall Tile: ANSI/TCA A137.1, conforming to the following:
   1. Moisture Absorption: 0.5 to 3.0 percent.
   2. Size: 4 1/4 x 4 1/4 x 1/8 inch.
   3. Edge: Cushioned.
   4. Surface Finish: Semi-Gloss.
   5. Color: As selected from manufacturer's full range of standard and premium colors, minimum two primary colors and four accent colors. Specific pattern to be issued by Architect prior to installation. Bid shall allow for 45-degree cuts to accent tiles.

B. Wainscot Cap: Match wall tile for moisture absorption, surface finish and color; tile length 4 1/4" long x 4 1/2" high, bullnosed top edge.

2.3 ACCENT TILE MATERIAL

A. Glass Wall Tile: Conforming to the following:
   1. Moisture Absorption: 0.5 to 3.0 percent.
   2. Size: 4-1/4 x 4-1/4 x 5/16 inch.
   3. Edge: Cushioned.
   4. Color: As selected from manufacturer's full range of standard and premium colors, minimum four accent colors. Specific pattern to be issued by Architect prior to installation. Bid shall allow for 45-degree cuts to accent tiles.

2.4 MANUFACTURERS - MORTAR AND GROUT

A. Custom Building Products, (213) 728-7571.

B. Dal-Tile Corp., (714) 825-1514.

C. W.R. Bonsal Company, (818) 333-2217.

D. H.B. Fuller Company, (213) 582-0846.

E. L & M Manufacturing Inc., (201) 254-4830.

F. Substitutions: Under provisions of Section 01 60 00.

2.5 MORTAR MATERIALS

A. Portland Cement Mortar Materials: ANSI/TCA A108.1.

B. Latex-Portland Cement Mortar: ANSI/TCA A118.4 and the following:
1. Acrylic resin latex additive.
2. Dry mortar mix supplied by latex manufacturer.

2.6 GROUT MATERIALS

A. Latex-Portland Cement Grout: ANSI/TCA A118.6 of color selected and the following:
1. Acrylic resin latex additive.
2. Dry mortar mix supplied by latex manufacturer.

B. Grout product shall be similar to Polyblend Non-Sanded Tile Grout as manufactured by Custom Building Products.

2.7 ACCESSORIES

A. Cleavage Membrane: 4-mil thick polyethylene film.

B. Reinforcing Mesh: 2 x 2 inch size weave of WO.3 wire size; welded fabric, galvanized.

2.8 MORTAR MIX AND GROUT MIX

A. Mix and proportion pre-mix setting bed and grout materials in accordance with manufacturer's instructions, and referenced standards.

2.9 GROUT SEALER

A. TileLab Grout and Tile Sealer as manufactured by Custom Building Products, or an approved equal.

2.10 EXTRA MATERIAL

A. Provide 150 square feet of each color under provisions of Section 01 70 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3 INSTALLATION – FULL SETTING BED METHOD

A. Over interior walls, install in accordance with TCA handbook method W244, with standard grout.

B. Apply mortar bed over surfaces to a thickness of 5/8 inch.

C. Lay tile to pattern indicated on Drawings, or if not indicated, request from Architect. Do not interrupt tile pattern through openings.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base, and wall joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight without voids, cracks, excess mortar, or excess grout.

F. Form internal angles square and external angles bullnosed.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control joints free of mortar or grout. Supply sealant to joints.

I. Allow tile to set for a minimum of 48 hours prior to grouting.

J. Grout tile joints.

3.4 CLEANING

A. Clean work under provisions of 01 70 00.

B. Clean tile surfaces.

3.5 PROTECTION

A. Protect grout against staining until sealer is applied. Stained grout shall be removed and replaced prior to Notice of Completion.

B. Protect finished installation under provisions of Section 01 70 00.

C. Protect corner tiles from damage by other trades.

END OF SECTION

SECTION 09 60 00

RESILIENT BASE AND STAIR NOSING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient base.

B. Interior stair nosing and riser faces.

1.2 REFERENCES

A. ASTM E84 - Surface Burning Characteristics of Building Materials.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source (Flooring Radiant Panel Test).

C. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, Vinyl Composition.

D. FS LLL-F-1238A Residual Indentation.

E. FS SS-W-40 - Wall Base: Rubber and Vinyl Plastic.

1.3 REGULATORY REQUIREMENTS

A. Conform to 2019 California Building Code for flame/fuel/smoke rating requirements in accordance with ASTM E84.

B. Resilient Flooring shall be stable, firm, and slip resistant. CBC Section 11B-302.1

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Submit samples under provisions of Section 01 33 00.

C. Submit three samples 3 x 3 inches in size, illustrating color and pattern for each floor material specified.

D. Submit three 2 inch long samples of base material for each color specified.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit cleaning and maintenance data under provisions of Section 01 70 00.

B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Store materials for three days prior to installation in area of installation to achieve temperature stability.

B. Maintain ambient temperature required by adhesive manufacturer three days prior to, during and 24 hours after installation of materials.

1.7 EXTRA MATERIALS

A. Provide extra flooring equal to 3% of the total units installed, but not less than two full boxes of each material specified under provisions of Section 01 70 00.

B. Provide extra base material equal to 3% total material installed, but not less than 30 lineal feet of each material specified under provisions of Section 01 70 00.

C. Provide extra a minimum of 10 gallons of adhesive material as specified under provisions of Section 01 70 00.

PART 2 PRODUCTS

2.1 MANUFACTURERS - RESILIENT BASE

A. Burke Flooring Products, (213) 724-0330.

B. Armstrong World Industries, (714) 680-7200.

C. Flexco Co., (800) 633-3151.

D. R.C. Musson Rubber Co., Inc., (216) 773-7651.

E. Substitutions: Under provisions of Section 01 33 00.

2.2 BASE MATERIALS

A. Base: FS SS-W-40, Type I rubber; 4 inch high, 1/8 inch thick; rolled top set coved with pre-molded external corners. Provide base from roll stock, not 4 foot pieces.

B. Base Accessories: Pre-molded end stops and external corners of same material, size, and color as base.

C. Color: Allow for a maximum of three colors as selected by Architect from full range of manufacturer's colors.

2.3 INTERIOR STAIR NOSING AND RISER FACES MATERIALS

A. Rubber stair nosing and riser faces as manufactured by Flexco Company or equal.

B. Color: As selected by Architect from manufacturer's full range of colors.

2.4 ACCESSORIES

A. Sub-floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Edge Strips: Flooring material.

D. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are smooth and flat with maximum variation of 1/8 inch in 10 ft, and are ready to receive work.

B. Beginning of installation means installer accepts condition of the existing substrate and site conditions.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

B. Apply, trowel, and float filler to leave a smooth, flat, hard surface.

C. Prohibit traffic from area until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to concrete slab surfaces if recommended by flooring manufacturer.

3.3 INSTALLATION - BASE MATERIAL, STAIR NOSINGS AND RISER FACES

A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends use pre-molded units.

C. Install base on solid backing. Bond tight to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.4 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

3.5 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. The following process is to be done with a mop bucket and wringer utilizing a cotton mop head for absorbency.
   1. Mix Waxie Re-Mov-It Stripper(320802)at a rate of 10 to 1 dilution rate and apply by flooding and leave standing for 15 minutes without allowing the floor to dry (Dry Back).
   2. With a 175 RPM rotary floor machine and a black pad thoroughly scrub the floor to remove finish and then remove slurry with a wet/dry vacuum.
   3. Clean floor edges and base with the appropriate scrapers, brushes and chemical to completely clean these surfaces.
   4. With a fresh mop bucket and wringer, clean cotton mop head and clean water, double rinse the floor using two Waxie Neutralizing pouches (320250). Wait for floor to completely dry.

5. Apply Butcher's Ironstone Floor finish (931702) in accordance with the manufacturer's instructions.
   a. With a clean Synthetic mop head apply three coats of Ironstone Floor Finish, allowing 30 minutes drying time between coats.

6. Clean up all materials and equipment used and store properly.

3.6 MAINTENANCE

A. Return six months after Notice of Completion to replace and reattach loose tile and base.

B. Clean and reapply wax at any area where repairs are made.

END OF SECTION

SECTION 09 90 00

PAINTING AND COATING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Surface finish schedule.

1.2 REFERENCES

A. ASTM International:

1. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
2. ASTM D2016 - Test Method for Moisture Content of Wood.

B. Structural Steel Painting Council.

1.3 DEFINITIONS

A. Conform to ANSI/ASTM D16 for interpretation of terms used in this Section.

1.4 QUALITY ASSURANCE

A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with three years experience.

B. Applicator: Company specializing in commercial painting and finishing with three years documented experience.

C. Regulatory Requirements: Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with these Specifications, comply with the more stringent provisions. Regulatory changes may affect the formulation, availability, or use of specified coatings. Confirm availability of coatings to be used prior to job going out to bid and before start of painting project.

1. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).

D. Field Sample: When and as directed by the Architect, apply one complete coating system for each color, gloss and texture required. When approved, the sample panel areas will be deemed incorporated into the work and will serve as the standards by which the subsequent work of this Section will be judged.

1.5 SUBMITTALS

A. Submit samples under provisions of Section 01 33 00.

B. Submit two samples 8 x 10 inch in size of each paint color and texture applied to cardboard. Resubmit samples until acceptable color, sheen and texture is obtained.

C. On actual wood surfaces, submit two 4 x 8 inch samples of natural wood.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site and store and protect under provisions of Section 01 70 00.

B. Deliver products to site in new, original, sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

B. Do not apply exterior coatings during fog, rain, mist or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish and Urethane Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

F. Avoid painting surfaces when exposed to direct sunlight.

G. No exterior or interior painting shall be done until the surfaces are thoroughly dry and cured.

1.8 EXTRA STOCK

A. Provide a three-gallon container of each color to Owner.

B. Label each container with color, texture, and room locations, and in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PAINT

A. Sherwin-Williams, John Dumesnil,619-665-9341 or john.t.dumesnil@sherwin.com.

B. Frazee Paint & Wallcovering, (714) 936-2890

C. PPG Industries, (800) 441-9695, resource contact Peg Collins, (909) 509-1402; peg.collins@ppg.com.

D. Substitutions: Under provisions of Section 01 60 00.

2.2 MATERIALS

A. Coatings: Ready mixed, except field-catalyzed coatings. Pigments shall be fully ground maintaining a soft paste consistency, capable of being readily and uniformly dispersed to complete a homogeneous coating.

B. Coatings: Good flow and brush properties; capable of drying or curing free of streaks or sags.

C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated, but required to achieve the finishes specified, of commercial quality and approved by manufacturer.

2.3 FINISHES

A. Refer to schedule at end of Section for surface finish schedule.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Beware of a condition known as "critical lighting." This condition causes shadows that accentuate even the slightest surface variations. A pigmented sealer will provide tooth for succeeding decorative coating, but "does not" equalize smoothness or surface texture. Any corrective action of the drywall must be done by the drywall contractor prior to decorating.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Plaster and Gypsum Wallboard: 12 percent
2. Masonry, Concrete and Concrete Unit Masonry: 12 percent
3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016
4. Exterior Located Wood: 15 percent, measured in accordance with ASTM D2016

E. Beginning of installation means acceptance of existing surfaces.

3.2 SURFACE PREPARATION FOR PREVIOUSLY COATED SUBSTRATES

A. No substrate is to be painted until proper preparation is completed. Do test area for each coating specified to determine compatibility with, and adherence to existing coatings on surfaces. When coating to be applied is incompatible with existing coating, mechanical blasting will be required to remove the existing coating completely.

B. Remove hardware, light fixtures, electrical plates, and any other devices which don't require painting.

C. Plaster, concrete, wood, and metal will be washed with TSP to remove all dirt, grease, and any foreign matter which could prevent proper adhesion of coatings. Cleaning to be in accordance with paint manufacturer's recommendations. All loose paint will be removed by whatever means required. Surfaces must be sound and existing coatings completely removed if necessary. Light sanding (scuffing) followed by dust removal will be done to degloss surfaces. Cracks, gouges, and holes will be filled with appropriate filler and smoothed to blend with adjacent areas. Metal surfaces will be prepared to SSPC-SP11.

D. Gypsum board will be cleaned with soap and warm water. Cracks and holes will be filled with patching compound and finished to Level 4 as defined in Section 09 21 16 – Gypsum Board Systems. Where textured surfaces exist, repairs will be done to match textures on adjacent areas.

E. Areas where all existing coatings have been removed, creating a bare substrate, shall be spot primed with appropriate primer before full prime coat is applied.

F. All new coatings will be applied according to manufacturer's directions, and will follow the Painting Schedule bellow.

3.3 PREPARATION

A. Perform preparation and cleaning procedures in strict accordance with manufacturer's instructions for each substrate condition.

B. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.

C. Correct minor defects and clean surfaces that affect work of this Section.

D. Shellac and seal marks which may bleed through surface finishes.

E. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.

J. Galvanized Surfaces: Best Surface Prep for Galvanized is SSPC-SP16 (Sixteen). If blasting is not feasible then remove surface contamination and oils via SSPC-SP1 (One) and apply coat of etching primer that neutralizes or removes all passivation films, especially chromate passivation films. Then apply a TEST PATCH of the proposed coating system and allow to cure 1 week prior to testing adhesion via TAPE TEST ASTM D3359 (Tape Adhesion).

K. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

L. Plaster Surfaces: Fill hairline cracks, small holes and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

M. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

N. Shop Primed Steel Surfaces: Sand thoroughly and scrape to remove films, loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

O. Interior Wood Items Scheduled to Receive Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes, spot prime, cracks and other defects repairs when fully cured after primer has dried; sand between coats.

P. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit and foreign matter. Seal knots, pitch streaks and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

Q. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

R. Thoroughly back paint all surfaces of exterior and interior finish lumber and millwork, including doors and window frames, trim, cabinet work, etc., that will be concealed after installation. Back paint items to be painted or enameled with the priming coat. Use a clear sealer for back priming where transparent finish is required.

S. All drywall surfaces must be completely dry and dust free from decorating. Skim coated drywall must be sealed with an alkyd based sealer. Textured and non-textured drywall surfaces can be sealed with a waterborne sealer provided they are completely dry and dust free. Otherwise an alkyd-based sealer should be used.

T. Wood and Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

U. Metal frames and metal doors shall be re-primed with a rust inhibitor primer compatible with the shop primer and subsequent coats specified.

3.4 PROTECTION

A. Protect pre-finished surfaces, lawns, shrubbery and adjacent surfaces surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish sufficient drop cloths, shields, protective methods and equipment to prevent spray, splatter or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

E. Protect surfaces, equipment, and fixtures from damage resulting from use of fixed, movable and hanging scaffolding, planking, and staging.

F. Provide WET PAINT signs, barricades, and other devices required to protect newly finished surfaces. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

G. Mask off areas where necessary.

H. Cover fixtures and remove hardware not to be painted.

I. Replace hardware only when paint finishes are thoroughly dry.

3.5 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Brush applications:

1. Brush out and work the brush coats onto the surface in an even film.
2. Cloudiness, spotting, holidays, laps, brush marks, runs, sabs, ropiness and other surface imperfections will not be acceptable.

C. Spray applications:

1. Except as specifically otherwise approved by the Architect, confine spray application to metal framework and similar surfaces where hand brushing would be inferior.
2. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats. Back roll all sprayed applications with roller 90º to direction paint was applied.
3. Do not double back with spray equipment to build up film thickness of two coats in one pass.

D. Use applicators and techniques best suited for the material and surfaces to which applied.

E. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color and appearance.

F. All undercoats shall be tinted slightly to approximate the color of the finish coat.

G. Apply each material at not less than the manufacturer's recommended spreading rate:

H. Provide a total dry film thickness of not less than 1.2 mils for each required coat.

I. Apply prime coat to material that is required to be painted or finished.

J. Finish exterior doors on tops, bottoms, and edges same as exterior faces, after fitting. Where opening into rooms having different finishes, finish door edges as directed.

K. Do not apply finishes to surfaces that are not dry.

L. Apply each coat to uniform finish.

M. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

N. Sand lightly between coats to achieve required finish.

O. Allow applied coat to dry before next coat is applied.

P. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

Q. Prime back surfaces of interior and exterior woodwork with primer paint.

R. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

S. Do not paint over rated labels or any ID label.

3.6 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Electrical and Mechanical Divisions for schedule of color-coding and identification banding of equipment, ductwork, piping and conduit.

B. Paint shop primed equipment. Do not paint shop pre-finished items.

C. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are pre-finished.

E. Replace identification markings on mechanical or electrical equipment when painted accidentally.

F. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

G. Paint exposed conduit and electrical equipment occurring in finished areas.

H. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

I. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated. Color band and identify with flow arrows, names and numbering.

J. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

3.7 CLEANING

A. As work proceeds, promptly and carefully remove paint where spills, splashes, spattering, spots and blemishes have occurred on surfaces throughout the project.

B. During progress of work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

D. Upon completion of painting work remove all rubbish, paint cans, and accumulated materials resulting from work in each space or room. All areas shall be left in a clean, orderly condition.

E. Runs, sags, misses, holidays, stains and other defects in the painted surfaces, including inadequate coverage and mil thickness shall be satisfactorily touched up, or refinished, or repainted as necessary.

3.8 SCHEDULE - EXTERIOR SURFACES

PPG	**Frazee**	**Sherwin-Williams**
1. Wood - Painted (Flat Acrylic)		
1st coat: Seal Grip Primer 17-921XI	168 PrimePlus	B51 Series Preprite ProBlock Primer
2nd Coat: Speedhide Flat 6-610XI	203 Duratec	A6 Series A-100 Flat
3rd Coat: Speedhide Flat 6-610xI	203 Duratec	A6 Series A-100 Flat
2. Wood - Painted (Semi-Gloss Acrylic)		
1st Coat: Seal Grip Primer 17-921XI	168 PrimePlus	B51 Series Preprite ProBlock Primer
2nd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
3rd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG

3. Wood - Painted (Gloss Acrylic)	168 Prime+Plus	B51 Series Preprite ProBlock Primer
1st Coat: Seal Grip Primer 17-921XI	143 Mirro Glide GL	A77 Solo Acrylic GL
2nd Coat: Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
3rd Coat: Advantage 900 Gloss 909-10		
4. Wood - Semi-Transparent		
1st Coat: Flood ST Stain FLD812	385 Madera (Oil)	A15T5 Woodscapes ST Stain
5. Stucco or Concrete (Flat Finish)		
Perma-Crete Conditioner 4-808		Loxon Conditioner
2nd Coat: Perma-Crete Pitt-Flex 4-110XI		Conflex XL
3rd Coat: Perma-Crete Pitt-Flex 4-110XI		Conflex XL
6. Concrete Masonry Units (Flat Acrylic)		
1st Coat: Speedhide Block Filler 6-15XI		
2nd Coat: Speedhide Ext. Flat 6-610XI	C302 Block Filler	B25W25 Preprite Block Filler
3rd Coat: Speedhide Ext. Flat 6-610xI	203 Duratec	A6 Series A-100 Flat
	203 Duratec	A6 Series A-100 Flat
7. Steel - Primed or Unprimed (Flat Acrylic)		
1st Coat: Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Speedhide Ext. Flat 6-610XI	203 Duratec	A6 Series A-100 Flat
3rd Coat: Speedhide Ext. Flat 6-610XI	203 Duratec	A6 Series A-100 Flat
8. Steel - Primed or Unprimed (Semi-Gloss Acrylic)		
1st Coat: Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
3rd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
9. Steel - Primed or Unprimed (Gloss Acrylic)		
1st Coat; Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
3rd Coat; Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
10. Steel - Galvanized (Flat-Acrylic)		
1st Coat: Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Advantage 900 SG 919-10		
3rd Coat: Advantage 900 SG 919-10	203 Duratec	A6 Series A-100 Flat
	203 Duratec	A6 Series A-100 Flat
11. Steel - Galvanized (Semi-Gloss - Acrylic)		
1st Coat: Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Advantage 900 SG 919-10		
3rd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
	124 Mirro Glide SG	A76 Solo Acrylic SG
12. Steel l- Galvanized (Gloss - Acrylic)		
1st Coat; Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Advantage 900 Gloss 909-10		
3rd Coat; Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
	143 Mirro Glide GL	A77 Solo Acrylic GL

3.9 SCHEDULE – EXTERIOR METAL ROOFING

PPG Industries

1. Existing Metal Roofing (Water Base Epoxy)

PRIME: 1 Coat PPG Paints Amerlock 2/400 VOC Epoxy Primer
FINISH: 1 Coat PPG Paints PSX-805 SATIN POLYSILOXANE

Surface Prep: Best Surface Prep is complete removal of prior Coatings via SSPC-SP6 (Six) Commercial Blast. If the Owner does not wish to remove prior coatings, then painting subcontractor should abrade the existing coating via SSPC2/3 until existing coatings are SOUND AND ADHERENT, and an anchor profile of 1.0-1.5 mils is achieved. Then a TEST PATCH should be done of the chosen system, allowed to cure one week and a TAPE ADHESION TEST ASTM D3359 (Tape Adhesion) should be performed prior to painting the entire roof.

2. New Metal Roofing

OPTION ONE: EPOXY PRIMER/URETHANE TOP COAT; THREE (3) COAT SYSTEM

1. NEW FERROUS METAL: Surface Prep: SSPC-SP6 (Six) Commercial Blast
2. PRIME: 1 Coat PPG PMC Amercoat 68HS Zinc Rich Epoxy Primer
3. INTERMEDIATE: 1 Coat PPG PMC Amerlock 2/400 VOC Epoxy
4. FINISH: 1 Coat PPG PMC Amershield VOC Aliphatic Urethane

5. NEW GALVANIZED: Surface Prep: SSPC-SP16 (Sixteen) Galvanized Blast
6. PRIME: 1 Coat PPG PMC Amerlock 2/400 VOC Epoxy
7. FINISH: 2 Coat PPG PMC Amershield VOC Aliphatic Urethane

OPTION TWO: EPOXY PRIMER/POLYSILOXAE TOP COAT; TWO (2) COAT SYSTEM

1. NEW FERROUS METAL: Surface Prep: SSPC-SP6 (Six) Commercial Blast
2. PRIME: 1 Coat PPG PMC Amercoat 68HS Zinc Rich Epoxy Primer
3. FINISH: 1 Coat PPG PMC PSX PMC 805 Satin Polysiloxane or PSX PMC 700 Gloss Polysiloxane

5. NEW GALVANIZED: Surface Prep: SSPC-SP16 (Sixteen) Galvanized Blast
6. PRIME: 1 Coat PPG PMC Amerlock 2/400 VOC Epoxy
7. FINISH: 1 Coat PPG PMC PSX PMC 805 Satin Polysiloxane or PSX PMC 700 Gloss Polysiloxane

3.10 SCHEDULE - INTERIOR SURFACES

PPG	**Frazee**	**Sherwin-Williams**
1. Wood – Painted (Semi-GlossAcrylic)		
1st Coat: Seal Grip Primer 17-921XI	168 PrimePlus	B51 Series Preprite ProBlock Primer
2nd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
3rd Coat; Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
2. Wood - Painted (Gloss Acrylic)		
1st Coat: Seal Grip 17-921XI	168 PrimePlus	B51 Series Preprite ProBlock Primer
2nd Coat: Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
3rd Coat: Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL

3. Glue-Laminated Wood and Wood Timber Members (Stain-Flat Varnish)		
1st Coat: Deft WB Stain DFT300	685 Wood Stain	Minwax WB Stain
2nd Coat: Deft Polyurethane DFT159		
3rd Coat: Deft Polyurethane DFT159	6701 Satin (McCloskey)	Minwax Polycrylic Satin
	6701 Satin (McCloskey)	Minwax Polycrylic Satin
4. Wood – Transparent (Stain - Semi-gloss Varnish)		
1st Coat: Deft WB Stain DFT300	685 Wood Stain	Minwax WB Stain
Filler Coat: Filler not required		
2nd Coat: Deft Sealer DFT61	Jasco Filler	Minwax Paste Filler
3rd Coat: Deft Polyurethane DFT158		
4th Coat: Deft Polyurethane DFT158	6200 Sealer (McCloskey)	Minwax Pre-Stain Conditioner
	6702 Semi-Gloss Varnish (McCloskey)	MinwaxPolycrylic Semigloss
	6702 Semi-Gloss Varnish (McCloskey)	MinwaxPolycrylic Semigloss
5. Wood – Transparent (Stain - Semi-Gloss Lacquer)		
1st coat: CC24XX Series Craftman Collection Oil Base Wiping Stain	685 Wood Stain	9 Wood Classics
2nd coat: 200-0045 275 VOC Clear Lacquer Sealer	760 Sanding Sealer	60FH27 Sanding Sealer
3rd coat: 500-0111 257 VOC Lacquer Clear Semi-Gloss	723 Semi-Gloss Lacquer	T70FH52 Semigloss Lacquer
4th coat: **	723 Semi-Gloss Lacquer	T70FH52 Semigloss Lacquer
6. Concrete, Concrete Block, Cement Plaster (Flat-Latex)		
1st Coat: Seal Grip Primer 17-921XI	168 PrimePlus	B51 Series Preprite ProBlock Primer
2nd Coat: Speedhide Zero 6-4110XI	002 Majestic	B30-2600 ProMar 200 Zero VOC Flat
7. Concrete, Concrete Block, Cement Plaster (Semi-Gloss-Latex)		
1st Coat: Seal Grip Primer 17-921XI	168 PrimePlus	B51 Series Preprite ProBlock Primer
2nd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
3rd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
8. Steel - Primed or Unprimed (Flat - Latex)		
1st Coat: Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Speedhide Zero 6-4110XI	002 Majestic	B30-2600 ProMar 200 Zero VOC Flat
3rd Coat: Speedhide Zero 6-4110XI	002 Majestic	B30-2600 ProMar 200 Zero VOC Flat
9. Steel - Primed or Unprimed (Semigloss - Latex)		
1st Coat: Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
3rd Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG

10. Steel - Primed or Unprimed (Gloss Acrylic)

1st Coat: Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat: Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
3rd Coat: Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL

11. Steel - Galvanized and Aluminum (Flat-Latex)

1st Coat: Pitt-Tech Plus 4020	Jasco Prep & Prime	GLL Clean n Etch
2nd Coat: Speedhide Zero 6-4110XI	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
3rd Coat: Speedhide Zero 6-4110XI		
	002 Majestic	B30-2600 ProMar 200 Zero VOC Flat
	002 Majestic	B30-2600 ProMar 200 Zero VOC Flat

12. Steel - Galvanized and Aluminum (Semi-gloss-Latex)

1st Coat: Prep 88	Jasco Prep & Prime	GLL Clean n Etch
2nd Coat; Pitt-Tech Plus 4020	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
3rd Coat: Advantage 900 SG 919-10		
4th Coat: Advantage 900 SG 919-10	124 Mirro Glide SG	A76 Solo Acrylic SG
	124 Mirro Glide SG	A76 Solo Acrylic SG

13. Steel - Galvanized (Gloss Acrylic)

1st Coat: Prep 88	C309 Acrylic Metal Primer	B66 ProCryl Acrylic Metal Primer
2nd Coat; Pitt-Tech Plus 4020		
3rd Coat: Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
4th Coat: Advantage 900 Gloss 909-10		
	143 Mirro Glide GL	A77 Solo Acrylic GL

14. Plaster, Gypsum Board (Flat Latex)

1st Coat: Speedhide Primer 6-2	061 Aqua Seal	B28W8000 PVA Primer
2nd Coat: Speedhide Zero 6-4110XI		
3rd Coat: Speedhide Zero 6-4110XI	002 Majestic	B30-2600 ProMar 200 Zero VOC Flat
	002 Majestic	B30-2600 ProMar 200 Zero VOC Flat

15. Plaster, Gypsum Board (Eggshell Latex)

1st Coat: Speedhide Primer 6-2	061 Aqua Seal	B28W8000 PVA Primer
2nd Coat: Speedhide Zero 6-4310XI		
3rd Coat: Speedhide Zero 6-4310XI	022 Lo Glo	B20-2600 ProMar 200 Zero VOC Eg-shel
	022 Lo Glo	B20-2600 ProMar 200 Zero VOC Eg-shel

16. Plaster, Gypsum Board (Gloss Acrylic)

1st Coat: Speedhide 6-2	061 Aqual seal	B28W8000 PVA Primer
2nd Coat: Advantage 900 Gloss 909-10		
3rd Coat; Advantage 900 Gloss 909-10	143 Mirro Glide GL	A77 Solo Acrylic GL
	143 Mirro Glide GL	A77 Solo Acrylic GL

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. ES plastic signs.

B. Acrylic panel signs.

C. Site graphics.

D. Metal letters and numbers.

E. Cast metal plaques.

1.2 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.

B. Submit shop drawings listing sign styles, lettering and locations, spacing and installation method.

C. Submit samples under provisions of Section 01 33 00.

D. Submit two samples illustrating full size sample sign, of type, style and color specified including method of attachment.

E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

F. Include installation templates and hardware.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect products under provisions of Section 01 70 00.

B. Package signs, labeled in name groups.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesive mounted signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

1.5 REGULATORY REQUIREMENTS

A. Conform to California Code of Regulations for installing work in conformance with signage for the physically disabled.

B. All signage shall conform to CBC Sections 11B-703.

C. Tactile exit signage shall be provided per CBC 1013.4.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acrylic Panel Signs:
1. Mohawk Sign Systems, (518) 370-3433.
2. A2Z Sign Company, (909) 949-4442
3. Best Sign Systems, (800) 235-2378.
4. ASI Sign Systems, (916) 924-1939.
5. Substitutions: Under provisions of Section 01 60 00.

B. Accessible and Traffic Signage:
1. STOPSignsAndMore.com, (888) 931-1793.
2. ADA Sign Depot, adasigndepot.com, (858) 385-9095.
3. Myparkingsign.com, (800) 952-1457.

C. Substitutions: Under provisions of Section 01 60 00. Metal Letters and Numbers:
1. Gemini, (507) 263-3957.
2. Nelson-Harkins Inc., (714) 946-9392.
3. Vomar Products, Inc., (209) 276-9589.
4. Substitutions: Under provisions of Section 01 33 00.

D. Cast Metal Plaques:
1. Lake Shore Markers, (800) 458-0463.
2. Matthews, (800) 235-6574.
3. Metallic Arts, Inc., (714) 925-7285.
4. Substitutions: Under provisions of Section 01 33 00.

2.2 Accessories

A. Provide all anchors, adhesives, and accessories for a complete installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install true, plumb, level and adequately secured to substrate with tamper proof mechanical fasteners. Paint all exposed fasteners to match sign color.

C. Clean and polish.

3.3 SIGN TYPES

A. MP plastic - Series 200A SAND CARVED as manufactured by Mohawk Sign Systems or equal. Material shall be 1/4" thick hard phenolic ES plastic laminate. See plans for location. (Max. of 16 characters per sign)

1. International Symbol of Accessibility 6 X 6 w/c. Contractor shall also furnish directional arrows indicating the accessible path of travel to be visible to persons approaching pedestrian ways. Provide #M203-6 frame series.

2. Room identification sign: 3-11/32" high with 1" high room name text and grade 2 Braille. Provide M202-X frame series. Note: California Contracted Grade 2 Braille shall be used wherever Braille symbols are shown. Dots shall be 1/10 inch (2.54 mm) on centers in each cell with 2/10 inch (5.08mm) space between cells. Dots shall be raised a minimum of 1/40 inch (0.635mm) above the background. Dots to be rounded or eased.

3. Signage and graphics:

a. Raised characters shall comply with CBC Section 11B-703.2:

b. Depth: It shall be 1/32 inch minimum above their background and shall be san serif uppercase and be duplicated in Braille.

c. Height: It shall be 5/8 inch minimum and 2 inches maximum based on the height of the uppercase letter "I". CBC Section 11B-703.2.5

d. Finish and contrast: Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background. CBC Section IIB-703.5.1.

e. Proportions: It shall be selected from fonts where the width of the uppercase letter “0’ is 60 % minimum and 110 % maximum of the height of the uppercase letter “I”. Stroke thickness of the uppercase letter “I” shall be 15 % maximum of the height of the character. CBC Sections IIB-703.2.4 and 11B-703.2.6

f. Character Spacing: Spacing between individual tactile characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8

g. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9

h. Braille: It shall be contracted (Grade 2) and shall comply with CBC Sections IIB-703.3 and 11B-703.4. Braille dots shall have a domed or rounded shape and shall comply with CBC Table and Figure 11B-703.3.1.

i. Mounting height: A tactile sign shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface.

j. Mounting location: A tactile sign shall be located per CBC Section and Figure 11B -703.4.2 as follows:

1) Alongside a single door at the latch side.

2) On the inactive leaf at double doors with one active leaf.

3) To the right of the right hand door at double doors with two active leafs.

4) On the nearest adjacent wall where there is no wall space at the latch side of a single door or at the right side of double doors with two active leafs.

5) So that a clear floor space of 18" x18" minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

k. Visual characters shall comply with CBC Section 11B-703.5 and shall be 40" minimum above finish floor or ground. Visual character stroke thickness of the uppercase letter "I" shall be 10 % minimum and 20% maximum of the height of the character. CBC Section 11B-703.5.7

1) Line Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.5.

2) Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.5.8.

l. Pictograms shall comply with CBC Section IIB-703.6.

m. Symbol of accessibility shall comply with CBC Section 11B-703.7.

n. Variable message signs shall comply with CBC Section 11B-703.8.

B. Acrylic Signs: Series 200 with 1/4" thick dimensional letters as manufactured by Mohawk Sign Systems or equal. Chemically welded to colored acrylic. See plans for location.

1. Restroom Identification Signs: circle or triangle with ambulatory figure and international symbol of accessibility. Similar to "Mohawk" MCA-VM-3, MCA-UM-4 and unisex. See plans for location and gender designation.

C. Site Graphics: Minimum .063" aluminum with 3M Engineer Grade Prismatic Reflective Sheeting, 3M Inks, and 3M Protective Overlay Film (POF).

1. Parking Stall: 8" X 10" international symbol of accessibility, post one sign at every stall per detail on drawings.

2. Driveway Entrance: 17" X 22" (minimum) tow-away sign with local towing address and phone number of enforcement. Post one sign at each drive entrance per detail on drawings.

D. Metal letters and Numbers: Prismatic cast baked enamel satin finish as manufactured by Gemini, Inc. Submit (4) copies of fabrication drawings and one full size paper template for architects review prior to fabrication. Individual letters to be projected mounted with spacers and threaded studs set in epoxy adhesive. Allow for a minimum of 40 12" high letters and 20 8" high letters. Color as selected by Architect for manufacturer's full color line.

E. Cast Metal Plaques: Cast Bronze, Satin Finish.

1. Dedication Plaque: 24 x 36 x 1" thick, cast bronze with sculptured finish at all fields and smooth flat finish at all borders, text and graphics. Layout and location as provided by Architect.

END OF SECTION

SECTION 10 21 15

PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor mounted solid plastic toilet partitions.

B. Urinal screens.

C. Attached hardware.

1.2 REFERENCES

A. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00.

B. Submit shop drawings indicating partition layout and dimensions, panel and door sizes, door swings, elevations, anchorage and mounting details, and finishes.

C. Submit samples under provisions of Section 01 33 00.

D. Submit three samples 6 x 6 inch in size illustrating panel colors.

E. Provide a sample of each type of hardware.

1.4 REGULATORY REQUIREMENTS

A. Conform to Title 24 of the California Administrative Code.

1.5 FIELD MEASUREMENTS

A. Verify field measurements are the same as shown on shop drawings.

PART 2 PRODUCTS

2.1 MANUFACTURES

A. Comtec Industries, (800) 445-5148.

B. PSISC, (866) 337-7286.

C. Weis/Robart, (714) 666-0822.

D. Substitutions: Under provisions of Section 01 60 00.

2.2 MATERIALS

A. Solid Plastic: High density, solid polyethylene with homogeneous color throughout. Provide material not less than 1-inch thick, seamless construction with edges eased.

2.3 ACCESSORIES

A. Pilaster Shoe: ASTM A167, Type 304 stainless steel, 3 inch high with adjustable screw jack.

B. Attachments, Screws, and Bolts: Stainless steel, theft proof type, heavy-duty extruded aluminum brackets.

C. Through Bolts and Nuts: Stainless steel with tamperproof heads.

D. Continuous stainless steel strip at bottom edge of panel partitions.

E. Ceiling attachment.

2.4 HARDWARE

A. Hinges: Continuous, stainless steel, self closing gravity hinges, adjustable for door close positioning, equivalent to Capitol #605.

B. Latch and Keeper: Stainless steel slide latch, door strike and keeper with rubber bumper.

C. Coat Hook: Stainless steel hook with rubber bumper tip mount at 48” AFF at accessible compartment.

D. Wall Brackets: Full length, continuous stainless steel wall brackets.

E. Accessible Compartment: Hand activated slide bolt latch at + 36" above finish floor.

F. Door Pulls: Stainless steel, “U” shaped door pulls, equivalent to Capitol #356. Install each side of accessible compartment at 34” - 44”. Locate directly beneath latch.

G. Panel Brace: Stainless steel full height “T” brace where required to limit panel deflection.

2.5 FABRICATION

A. Fabricate components of 1 inch thick high density polyethylene polymer. Flame spread of 25.

B. Doors and Panels: 1 inch thick x 55 inch high, high density polyethylene polymer. Stainless steel edging strips shall be fastened to the bottom edge of all panels, full length.

C. Pilasters: 1 inch thick, constructed same as doors, of sizes required to suit cubicle width and spacing. Stainless steel edging strips shall be fastened to the bottom edge of all pilasters full length.

D. Pilaster Shoes: Made from polymer resin formed under high pressure and be made of single construction with color throughout.

E. Door, Panels and Pilasters: 1 inch thick and all edges machined to a radius of .250 inches and all exposed edges to be free of saw marks.

F. Urinal Screens: Wall mount with full height panel brace. 18” maximum depth from face of wall finish.

G. All alternate partition manufacturers products shall have a homogeneous color throughout.

H. Furnish units with cutouts and drilled holes to receive partition mounted hardware, accessories, and grab bars as indicated.

I. Accessible Toilet Compartments:

1. Wheelchair accessible compartment shall comply with CBC Section 11B-604.8.1.

2. Toe clearance for at least one side partition of a wheelchair accessible compartment shall comply with CBC Section and Figure 11B-604.8.1.4. It shall be 9" high minimum above the finish floor and 6" deep minimum beyond the compartment side face of the partition, exclusive of partition support members. It shall be 12" high minimum above the finish floor for children's use. Partition components at toe clearances shall be smooth without sharp edges or abrasive surfaces. Toe clearance at the side partition is not required in a compartment greater than 66" wide.

3. An ambulatory accessible compartment shall be provided where there are six or more toilet compartments, or where the combination of urinals and water closets totals six or more per CBC Section 11B-213.3.1. Such compartment shall comply with CBC Section 11B-604.8.2.

4. Door and door hardware for accessible compartments shall be self-closing and shall comply with CBC Section 11B-404 except that pull-side clearance for ambulatory accessible compartments shall be minimum 44" clear, rather than 60". CBC Figure 11B-604.8.2.

5. A door pull complying with CBC Section 11B-404.2.7 shall be placed on both sides of the door near the latch.

6. Doors shall not swing into clear floor space or clearance required for any fixtures .

2.6 FINISHES

A. Plastic Panels: Color shall be selected from manufacturer's full range of standard and custom colors, with a maximum of two colors as selected by Architect.

B. Stainless Steel Surfaces: No. 4 finish.

C. Exposed Steel Surfaces: Satin chrome plated.

D. Aluminum: Anodized to color as selected.

E. Non-ferrous Surfaces: Satin chrome plated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive work.

B. Verify field measurements are as shown on shop drawings.

C. Verify correct location of built-in framing, anchorage, bracing, and plumbing fixtures.

D. Beginning of installation means installer accepts existing conditions.

E. Door at front entry stalls shall have 32" minimum clear width when the door is open 90°.

F. Door at side entry stalls shall have 34" minimum clear width when the door is open 90°.

3.2 ERECTION

A. Erect in accordance with manufacturer's instructions.

B. Install partition components secure, plumb and level.

C. Attached panel brackets securely to walls, ceilings and floors using appropriate anchor devices.

D. Attach panels and pilasters to brackets with through bolts and nuts.

E. Provide 1/2-inch space between wall surface and panels or pilasters.

F. Provide for adjustment of floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

G. Support pilasters from above ceiling framing using two adjustable hanging studs to provide vertical leveling. Conceal ceiling fastenings with pilaster shoes.

H. Equip each toilet stall door with continuous hinge, and door latch.

I. Install door strike keeper in each pilaster in alignment with door latch.

J. Equip each toilet stall door with one bumper.

3.3 ERECTION TOLERANCES

A. Maximum Variation from Plumb or Level: 1/8 inch.

B. Maximum Misplacement from Intended Position: 1/8 inch.

C. Secure panel screens so as not to exceed panel deflection of 1/4" in all locations.

3.4 ADJUSTING

A. Adjust work under provisions of Section 01 70 00.

B. Adjust and align door hardware to uniform clearance at vertical edges of doors. Clearance space not to exceed 3/16 inch.

C. Adjust door hinges so that free movement is attained and will locate in-swing doors in partial open position when unlatched. Return out-swinging doors to closed position.

3.5 CLEANING

A. Clean work under provisions of Section 01 70 00.

B. Remove protective coverings.

C. Clean surfaces and hardware.

END OF SECTION

SECTION 10 28 00

TOILET AND BATH ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes toilet and washroom accessories, framed mirror units, concealed anchor devices and backing plate reinforcements furnished by other Sections; attachment hardware; and utility room accessories.

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry: In-wall framing and plates for support of accessories.
2. Section 10 21 15 - Plastic Toilet Compartments.

1.2 REFERENCES

A. ASTM International:
1. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
4. ASTM A269 – Standard Specifications for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
5. ASTM A366 – Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.
6. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
7. ASTM A666 – Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
8. ASTM B456 – Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
9. ASTM C1036 – Standard Specification for Flat Glass.

B. Federal Specification Unit
1. FS A-A-3002 – Mirrors, Glass.

C. 2019 California Building Code, Chapter 11B.

1.3 REGULATORY REQUIREMENTS

A. Conform to 2019 California Building Code for installing work in conformance with equipment for the disabled.

B. Toilet accessories required to be accessible shall be mounted at heights according to CBC Section 11B-602 to 612.

C. Grab bars in the toilet facilities and bathing facilities shall comply with CBC Section 11B-609. Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges, The space around the grab bars shall be as follows:
   1. 1½" between the grab bar and the wall.
   2. 1½" minimum between the grab bar and projecting objects below and at the ends.
   3. 12" minimum between the grab bar and projecting objects above.

D. Toilet paper and feminine napkin dispensers located on the grab bar side of an accessible toilet room or stall shall not project more than 3" from the finished wall surface nor be located closer than 1-1/2" clear of the tangent point of the grab bar.

1.4 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures: Submittal procedures.

B. Product Data: Provide manufacturer's product data on accessories describing size, finish, details of function, and attachment methods.

C. Samples: Submit one sample, if requested, of each item and model specified, illustrating color and finish. If approved, sample may be incorporated into project.

D. Manufacturer's installation instructions: Submit manufacturer's installation instructions under provisions of Section 01 33 00.

E. Submit maintenance and operation instructions and keys required for each type of equipment and lock.

F. Supply a material list with quantities.

1.5 QUALITY ASSURANCE

A. Manufacturers: Model numbers are for washroom accessories manufactured by Bobrick Washroom Equipment, Inc. and are listed as a standard of quality. Equivalent products of other manufacturers may be acceptable, if, in the judgment of the Architect, they meet the intent of the specification in terms of design, function, materials, and quality of workmanship.

B. Accessories shall be products of a single manufacturer.

1.6 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver items in manufacturer's original unopened protective packaging.

B. Store material in original protective packaging to prevent soiling, physical damage, or wetting.

C. Handle so as to prevent damage to finished surfaces.

D. Maintain protective covers on units until installation is complete. Remove covers at final cleanup of installation.

1.8 GUARANTEE

A. Mirrors shall be guaranteed 15 years against silver spoilage. Accessories shall be guaranteed to be free from defects in workmanship and material for a period of one year from Certificate of Completion.

PART 2 PRODUCTS

2.1 TOILET AND BATH ACCESSORIES

A. Manufacturers:
   1. Bobrick Washroom Equipment, Inc. (818) 764-1000.
   2. Bradley Corporation, (714) 770-1001.
   3. McKinney/Parker, (213) 945-1431.
   4. Substitutions: Under provisions of Section 01 60 00.

2.2 COMPONENTS

A. Accessories – General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Furnish two keys for each accessory to Owner, master key all accessories, with exception of coin receiving boxes on vending equipment.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269, stainless steel.

E. Galvanized Sheet Steel: ASTM A653, G90 zinc coating.

F. Mirror Glass: Float glass, Type I, Class I, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with FS A-A-3002.

G. Adhesive: Two component epoxy type, water proof.

H. Fasteners, Screws and Bolts: Hot dip galvanized, tamperproof.

I. Expansion Shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate.

2.3 TOILET ROOM ACCESSORIES

A. Recessed Sanitary Napkin Disposal (Women & Unisex)
   1. Product: See Drawings.

B. Partition mounted Sanitary Napkin Disposal (Women)
   1. Product: See Drawings.

C. Toilet Paper Dispenser:
   1. At non-accessible stalls, dispensers are supplied by District, to be picked up and installed by Contractor.

2. At accessible stalls, dispenser shall be provided and installed by Contractor:
   a. Product: See Drawings

D. Surface Mounted Soap Dispenser:
   1. Product: See Drawings.

E. Seat Cover Dispenser:
   1. At non-accessible stalls, dispensers are supplied by District, to be picked up and installed by Contractor.

   2. At accessible stalls, dispensers:
      a. Product: See Drawings.

F. Grab Bars: Stainless steel, 1-1/2 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting with snap flange cover; 1-1/2 inches clearance between wall and inside of grab bar.
   1. Product: See Drawings

G. Paper Towel & Waste Receptacle:
   1. Product: See Drawings.

H. Sanitary Napkin Dispenser:
   1. Product: See Drawings.

I. Mirrors:
   1. Product: See Drawings

J. Electric Hand Dryers:
   1. Unit to have 4" maximum projection from face of wall finish.
   2. Product: See Drawings

2.4 FACTORY FINISHING

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, Type SC2, satin finish, unless otherwise noted.

C. Baked Enamel: Pre-treat to clean condition, apply one coat primer and minimum two coats electrostatic baked enamel.

D. Galvanizing for Items other than Sheet: ASTM A123/A123M; minimum 1.25 oz/sq. ft. coating thickness; galvanize after fabrication.

E. Galvanizing for Nuts, Bolts and Washers: ASTM A153/A153M.

F. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.

G. Back paint components where contact is made with building finishes to prevent electrolysis.

2.5 FABRICATION

A. Weld and grind smooth joints of fabricated components.

B. Form exposed surfaces from single sheet of stock, free of joints.

C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

D. Shop-assemble components and package complete with anchors and fittings.

E. Provide steel anchor plates, adapters and anchor components for installation.

F. Hot-dip galvanize exposed and painted ferrous metal and fastening devices.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.

B. Verify exact location of accessories for installation.

C. Verify that site conditions are ready to receive work and dimensions are as instructed by the manufacturer.

D. Check walls for correct dimensions, plumbness of blocking or frames, recess size in masonry, and other preparation that would affect installation of accessories.

E. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

F. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

C. Verify exact location and quantity of accessories for installation.

3.3 INSTALLATION

A. Toilet accessories required to be accessible shall be mounted at heights according to CBC Section 11B-602 to 612.

B. Toilet paper and feminine napkin dispensers located on the grab bar side of an accessible toilet room or stall shall not project more than 3” from the finished wall surface nor be located closer than 1-1/2” clear of the tangent point of the grab bar.

C. Install fixtures, accessories and items in accordance with manufacturer's instructions.

D. Install plumb and level, securely and rigidly anchored to substrate.

E. Conceal evidence of drilling, cutting, and fitting on adjacent finishes.

F. Fit flanges of accessories snug to wall surfaces. Provide for caulking in gaps between 90-degree return flanges and finish wall surface after accessories are installed.

G. Install anchor system per contract drawings for grab bars.

H. Install toilet accessories where indicated on Drawings.

3.4 ADJUSTING

A. Adjust accessories for proper operation.

3.5 CLEANING

A. Clean and polish exposed surfaces prior to final inspection.

END OF SECTION

SECTION 22 00 00

PLUMBING

1. PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

1.2 QUALITY ASSURANCE

A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
   1. C.C.R., Title 24, Part 5 (2019 CPC).
   2. 2019 California Plumbing Code.
   3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
   4. National Fire Protection Association.
   5. California Division of the State Architect.
   6. California State Division of Industrial Safety.
   7. County Health Department.
   8. Any other legally constituted body-having jurisdiction thereof.

B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

1.3 DRAWINGS

A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.

B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.

C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.

D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

1.4 PERMITS, INSPECTIONS AND LICENSES

A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

1.5 UTILITIES

A. See Drawings for Points of Connection.

B. Certain site utilities are to be connected to and extended. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact location and depth of lines to which he is to connect. In event depth of lines is not sufficient to permit connection in manner indicated, Contractor shall obtain direction from the Owner's representative before proceeding with this work.

C. Verify that utility companies size their services and meters to suit ultimate demand indicated on the drawings.

D. Sanitary Sewer: The Contractor shall be responsible for the soil and waste piping outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite sewer system for coordination.

E. Domestic Water: The Contractor shall be responsible for the domestic water service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite domestic water system and coordination.

F. Storm Drain: The Contractor shall be responsible for the storm drain service outside of the building within five feet (5') of the foundation, and within the building itself. See Civil Engineer's plans for onsite storm drain system for coordination.

1.6 EXAMINATION OF PREMISES

A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

1.7 PROTECTION

A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

1.8 LOCATIONS

A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.

B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.

C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

1.9 SUBMITTAL DATA (Also see General Conditions)

A. Submittal Requirements:

1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
    a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or

incomplete shall be accomplished within this time limit.

b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.

c. Include all pertinent construction, installation, performance and technical data.

d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.

i. Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.

ii. Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.

e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.

a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.

i. In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled “SPECIFIED ITEM, NOT SUBMITTED”. Product data sheets for the corresponding proposed substitution item shall be clearly labeled “PROPOSED SUBSTITUTION”.

b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.

3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.

4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.

5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.

6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 UNINSPECTED WORK

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne

by the Contractor.

1.11 RECORD DRAWINGS (Also see General Conditions)

A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

1.12 GUARANTEES (Also see General Conditions)

A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.

B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.

C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT (See Schedules on Drawings)

A. General: All materials, as specified or required in the work, shall be new, free from defects and imperfections. All manufactured shall comply with California Assembly Bill 1953.

B. Pipe and Fittings:

1. Soil and Waste Piping:

a. Soil and waste piping within the building itself and outside within five feet (5') of the foundation, shall be no-hub cast iron pipe and fittings, asphaltum coated, free from defects, and shall comply with CISPI. Standard 301-07, ASTM A-888-07 or ASTM A-74-07. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Fittings shall be made up with "Husky" SD 4000 series or “Clamp All” HI-TORQ 125 series stainless steel type 304 couplings and shall conform to ASTM C1540 & ASTM C564 except all above ground vent pipe fittings may be made with "Anaco" or "Tyler" stainless steel two band couplings conforming to CISPI Standard 310-07.

2. Vent Piping:

a. Concealed or underground vent piping shall be cast iron pipe and fittings as specified for soil and waste piping.

b. Exposed vent piping shall be Schedule 40 galvanized steel pipe, ASTM A53, with black cast iron recessed drainage fittings.

i. All vents through roof shall terminate with vandal proof caps (Refer to “Roof Flashing” herein).

3. Domestic Water Piping:

a. Piping within the building and above grade shall be Type "L" ASTM B88, hard drawn copper tubing with wrought copper sweat fittings ANSI B16.18 and B16.22.

b. Outdoor underground piping in sizes 2-1/2" and 3" shall be Type "L" ASTM B88, hard drawn copper as specified for water piping within the building. Piping 2" and smaller shall be Type "K" ASTM B88, hard drawn copper with wrought copper sweat fittings ANSI B16.18 and B16.22.

c. Piping below the building floor shall be Type "K" soft annealed copper tubing with no fittings below the slab.

4. Storm Drain Piping:

a. Concealed storm drain piping within the building itself and outside within five feet (5') of the foundation, shall be no-hub cast iron pipe and fittings, asphaltum coated, free from defects, and shall comply with CISPI. Standard 301-07, ASTM A-888-07 or ASTM A-74-07. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute. Fittings shall be

made up with "Husky" SD 4000 series or “Clamp All” HI-TORQ 125 series stainless steel type 304 couplings and shall conform to ASTM C 1540 & ASTM C564.

b. Exposed storm drain piping shall be Schedule 40 galvanized steel pipe, ASTM A53, with black cast iron recessed drainage fittings.

5. Sub-soil Drainage System:
   a. Piping: PVC, SDR-35 perforated pipe with solid wall fittings and solvent-cemented joints. Perforations shall be 1/4" diameter on 3" centers, 120 degrees between two rows parallel to pipe axis. Install per pipe manufacturer's directions.
6. Air Conditioning Condensate Drain Piping.
   a. With district approval use schedule 40 CPVC pipe with UV protection paint
   b. Shall be Type "M" copper as specified for water piping.
7. All exposed piping at plumbing fixtures shall be chrome plated yellow brass except exposed pipes in shop or utility areas.
8. Unions or flanges shall be furnished and installed at each threaded connection to all equipment or valves. The unions or flanges shall be located so that the piping can be easily disconnected for removal of the equipment, tank, or valve, and shall be of the type specified in the following schedule.
   a. Unions:
      i. Black Steel Pipe: 250 pound screwed black malleable iron, ground joint, brass to iron seat.
      ii. Galvanized Steel Pipe: 250 pound screwed galvanized malleable iron, ground joint, brass to iron seat.
      iii. Copper or Brass Tubing: 150 pound cast bronze or copper, ground joint, nonferrous seat with ends, by Walseal, Nibco or Mueller.
   b. Flanges: Tube Turn or approved equal, raised face 150 pound class forged steel, weld, neck or slip-on type conforming to ASA B16.5 and ASTM A181. For copper piping systems, provide flanges conforming to ANSI B16.24. The faces of the flanges being connected to be alike in all cases. Locate flanges so that the piping can be easily disconnected for removal of the equipment or valve. Gasket material shall be of material suiting the service of the opening system in which installed and which conforms to its respective ANSI Standard (A21.11. B16.21). Provide materials that will not be detrimentally affected by the chemical and thermal conditions of the fluid being carried.
9. All piping on roof shall be supported by pipe supports as manufactured by MAPA Products. Products by Miro Industries and Erico shall be accepted for submittal review.
   a. Pressurized Piping:
      i. For pipe sizes 1” and less: MS-1 single post, adjustable height pipe support.
      ii. For pipe sizes 2 ½” and less: MS-4 adjustable, roller pipe support.
      iii. For pipe sizes 4” and less: MS-5 adjustable, roller pipe support.
   b. Gravity System Piping 2” and Less: MS-1 single post, adjustable height pipe support.
10. All underground non-metallic piping shall have 14 gauge copper "Tracer Wire" continuous for entire length.

C. Valves:
1. General:
   a. Piping systems shall be supplied with valves arranged so as to give complete and regulating control of each building and piping systems throughout the building, and located so all parts are easily accessible and maintained.
      i. Valve Design: Rising stem or outside screw and yoke stems. Non-rising stem valves may be used where space conditions prevent full extension of rising stems.
      ii. Sizes: Same size as upstream pipe, unless otherwise indicated.
      iii. Operators:
         1. Hand wheels fastened to valve stem for all valves other than quarter turn.
         2. Lever handles on quarter-turn valves, 6 inch and 8 inch and larger gear operated, except for plug valves. Provide plug valves with square heads and operating wrench.

3. Provide gear operator for valves 8 inch or larger.

iv. Extended stems: Where piping insulation is indicated or specified, valves shall be equipped with 2" extended handles of non-thermal conductive material. Also provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Supply with memory stops, which are fully adjustable after insulation is applied.

v. End Connection: 2 inch and under shall be threaded, 2-1/2 inches and larger shall be flanged or full lug style.

b. Valves for Potable Water must comply with California Lead Free Law, effective January 1, 2010.

i. "Lead Free" refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤ 0.25%. Source: California Health & Safety Code (116875).

ii. All valves must be 3rd party certified.

iii. Bronze valves shall be made with dezincification-resistant material.

c. Where possible, valves of one manufacturer shall be used.

d. Provide Class 150 valves meeting the valve specifications where Class 125 valves are specified but are not available.

2. Approved Manufacturers. The following manufacturers (or equal) shall be accepted for submittal review provided that all features and options are equivalent to the corresponding items as specified.

a. General valves.

i. NIBCO

ii. Hammond

iii. Milwaukee

b. Below grade domestic water shut-off valves (gate valves) 2" and larger.

i. NIBCO.

ii. Clow.

iii. Mueller.

c. Butterfly Valves.

i. NIBCO.

ii. Demco.

iii. Dezuric.

d. Plug Valves.

i. Hammond.

ii. Milwaukee.

e. Check valves, lift type.

i. Hammond.

f. Milwaukee. Below grade backwater valve isolation valves.

i. NIBCO.

ii. Clow.

iii. Mueller.

3. Valves and cocks shall be installed in locations as indicated on plans per the following usage criteria:

a. Below grade domestic water shut-off valves 1-1/2" and smaller.

i. Gate valve.

b. Below grade domestic water shut-off valves 2" and larger.

i. Resilient seated gate valve.

c. Above grade domestic water shut-off valves 2" and smaller.

i. Ball valve.

d. Above grade domestic water shut-off valves 2-1/2" and greater.

i. Butterfly valve.

e. Hot water return balancing valves.
   i. Manual circuit balancing valve.
f. Below grade gas shut-off cocks.
   i. Polyethylene ball valve (for gas service).
g. Check valves, general, horizontal.
   i. Check valve, swing type.
h. Check valves, general, vertical, 2" and smaller.
   i. Check valve, lift type.
i. Check valves, general, vertical, 2-1/2" and larger.
   i. Check valves, wafer-style spring actuated.

4. Gate Valves.
   a. Gate Valves, 1-1/2-Inch and Smaller.
      i. Rising Stem: Valves shall be Class 125 and 200 PSI CWP, rising stem, union bonnet, solid wedge and manufactured in accordance with MSS-SP 80. Body, bonnet and wedge shall be of bronze ASTM B-62. Stems shall be of dezincification-resistant silicon bronze ASTM B-371 or low-zinc alloy B-99, non-asbestos packing and malleable or ductile iron hand wheel. Valve ends shall be threaded.
         1. Acceptable Valves: NIBCO T124 (threaded), or approved equal.
      ii. Non-Rising Stem: Valves shall be Class 125 and 200 PSI CWP, non-rising stem, screw-in bonnet, solid wedge and manufactured in accordance with MSS-SP-80 and NSF-61-G. Body, bonnet, external stuffing box and wedge shall be of bronze ASTM B-584 C87850. Stems shall be of dezincification-resistant silicon bronze ASTM B-371 C69400 or ASTM B-99 C65100, Aramid Fibers with graphite packing and malleable iron hand wheel. Valve ends shall be threaded.
         1. Acceptable Valves: NIBCO T113-LF (threaded), or approved equal.
   b. Resilient Seated Gate Valves, 2-Inch and Larger.
      i. Valves shall conform to AWWA C-509 and C515, fusion-bonded epoxy coating inside and out, meets or exceeds AWWA C-550, ductile iron body, rubber encapsulated D.I. wedge, rubber bonnet gasket, low torque operation, full diameter waterway, flanged, mechanical joint or ring-tite, UL/FM listed and approved. Provide complete with traffic weight cast iron valve box with cast iron cover and operating wrench.
         1. Acceptable Valves: NIBCO F-607-RW OS&Y or F-609-RW NRS or M-609-RW, or approved equal by Clow or Mueller.

5. Ball Valves, 2 Inches and Smaller.
   a. Valves shall be rated 250°F: 330 psig600 PSI CWP, shall have 2-piece full port lead free dezincification resistant bronze bodies with TFE seats and seals, stainless steel stem, separate packing nut with blow-out proof adjustable stem packing, and vented stainless steel ball. Valves shall conform to ASTMB371 C69300, or ASTM B-584 C87850and conform to MSS-SP-110 and NSF-61-G.
      1. Acceptable Valves: NIBCO T-68580-LF (threaded), or approved equal.

6. Butterfly Valves, 2-1/2" and Larger.
   a. Valves shall be rated 200 PSI, full lug Ductile Iron Body ASTM A-536, with 2" extended neck for insulation, EPDM liner, 416 Stainless Steel Stem, and Aluminum Bronze disc. All Butterfly Valves shall be suitable for bi-directional dead end service at valves rated pressure without the need for a down stream flange. Valves 6" and smaller shall be supplied with 10 position lever locking handle. Valves 8" and larger shall have enclosed weatherproof gear operators and conform to MSS-SP 67.
      i. Acceptable Valves: NIBCO LD 2000, or approved equal.

7. Manual Circuit Balancing Valves, 2" and Smaller.
   a. Valves shall be globe style valves for precise regulation and control, rated 240 PSI at 250°F, and shall be constructed of dezincification resistant brass (DZR) or bronze alloy. Each valve shall have two metering / test ports with internal check valves and protective caps. All valves shall be equipped with visual position readout and concealed memory stops for repeatable

regulation and control.

i. Acceptable Valves: NIBCO T1710 or S1710, or approved equal.

8. Manual Circuit Balancing Valves, 2-1/2" and Larger.
   a. Valves shall be globe style valves for precise regulation and control, rated 175 PSI and shall be constructed of iron with ANSI Class 125/150 flanged or grooved ends. Each valve shall have two metering / test ports with internal check valves and protective caps. All valves shall be equipped with visual position readout and concealed memory stops for repeatable regulation and control.
      i. Acceptable Valves: NIBCO F737 or G737, or approved equal.
9. Check Valves, Swing-Type, 2" and Smaller.
   a. Valves shall be Y-pattern swing-type manufactured in accordance with NSF-61-G and MSS SP-80, Class 125, Lead Free dezincification resistant bronze body ASTM B-584 C87850, with Nonmetallic TFE seat disc. Valve ends shall be threaded.
      i. Acceptable Valves: NIBCO T413-Y-LF (threaded), or approved equal.
10. Check Valves, Swing-Type, 2-1/2" and Larger.
    a. Valves shall be swing-type manufactured in accordance with MSS-SP71, Class 125, flanged ASTM A126 Class B cast iron body with bronze trim, non-asbestos gasket.
       i. Acceptable Valves: NIBCO F918-B, or approved equal.
11. Check Valves, Lift Type, 2" and Smaller.
    a. Valves shall be Lift-Type manufactured in accordance with MSS SP-80 and NSF-61-G, Class 125, Lead Free dezincification resistant bronze body and cap ASTM B 584 C87850, horizontal or angle pattern, with 316 stainless steel spring, 301 stainless steel disc holder with Nonmetallic TFE disc. Provide valves capable of being refitted and ground while the valve remains in the line.
       i. Acceptable Valves: NIBCO T480-Y-LF (threaded), or approved equal.
12. Check Valves, Wafer-Style Spring Actuated, 2-1/2" and Larger.
    a. Valves shall be wafer-style with stainless steel spring, bronze disc plates, rubber seat, body of cast iron ASTM A126 Class B or A48 for use with Class 125/150 flanges.
       i. Acceptable Valves: NIBCO W920-W or KW900-W or W910-W, or approved equal.
13. Combination Temperature and Pressure Relief Valves: Shall be McDonald, Watts, or approved equal, bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Relief valves shall be factory set for 210 degree F. and 150 p.s.i. pressure. Relief valves shall be type as recommended by water heater manufacturer.

D. For flexible connectors at rooftop mechanical equipment, provide corrosion resistant coated stainless steel gas appliance connector as manufactured by BrassCraft.
   1. Model numbers shall be sized based on the connector flow capacity chart using the I.D. (Inside Diameter) dimension.
      a. Model number CSSL, ¼" inside diameter, 3/8" outside diameter with twenty-four (24") length hose at maximum 40,000 Btu per hour capacity.
      b. Model number CSSC, ½" inside diameter, 5/8" outside diameter with twenty-four (24") length hose at maximum 150,000 Btu per hour capacity.
      c. Model number CSSB, ¾" inside diameter, 7/8" outside diameter with twenty-four (24") length hose at maximum 290,900 Btu per hour capacity.

E. Traps, Strainers and Tailpieces: Every sanitary fixture, unless otherwise specified, shall be provided with a seventeen (17) gauge chromium tailpiece, a Los Angeles pattern chrome plated cast-brass trap and galvanized nipple trap arm and wall flanges. Trap arm shall be provided with chromium plated brass casing between the trap and wall flanges at each fixture. All sanitary waste system floor drains and floor sinks shall have cast iron "P" traps.

F. Cleanouts: Shall be Jay R. Smith, Zurn or Josam.
   1. General: Provide cast-iron ferrule and countersunk brass clean-out plug with round cast iron access frame and heavy duty secured top cover.
   2. Wall Cleanouts: Jay R. Smith No. 4472 for steel pipe and Jay R. Smith No. 4532 for cast iron pipe.
   3. Floor Cleanouts: Jay R. Smith No. 4023 or 4028, bronze plug and non-skid nickel bronze top.

4. Cleanouts to Grade: Jay R. Smith No. 4258 or Jay R. Smith No. 4253 with X-H bronze plug and X-X-H non-skid cover with lifting device set flush with surface for concrete areas. Asphalt or non-surfaced areas shall be installed with ring of concrete poured around the bottom flange six inches (6") below surface. Use cast iron soil pipe on cleanout risers. For cleanouts in non-traffic areas, terminate cleanout plug in concrete yard box.

G. Access Panels: Wall access panels shall be minimum 12" x 12" for concealed valves and other equipment unless otherwise specified or indicated. Ceiling access panels shall be 18" x 18" minimum. Access panels shall be located and positioned for ready access and service of equipment housed within. Where access panels are specified with keyed cylinder locks, all such locks shall be identically keyed.

1. Wall, Non-Fire Rated: Elmdor/Stoneman DW-SS-CL, drywall, stainless steel finish, cylinder lock.
2. Ceiling, Non-fire Rated: Elmdor/Stoneman DW, drywall, prime coated finish, screwdriver latch.
3. Wall, Fire Rated: Elmdor/Stoneman FR-SS-CL, fire rated, stainless steel finish, cylinder lock.
4. Ceiling, Fire rated: Elmdor/Stoneman FRC, Fire rated, prime coated finish, return latch.

H. Yard Boxes & Vaults: For service shut-off valves on gas and domestic water; for pressure regulator assemblies and for cleanouts, shall be Brooks Products or Fraser Cement Products Co., rectangular concrete type with vandal-proof cast iron cover and name of service clearly marked on cover. Box shall be of size to permit full range of valve operation and to permit easy removal of valve assembly. Vaults shall be sectional type.

I. Roof Flashing:

1. Sanitary vents thru roof and grease vents thru roof: Stoneman No. 1100-5, one (1) piece, seamless, four (4) pound, series with reinforcing steel boot counter-flashed with cast iron flashing sleeve and equipped with vandal-proof hood for all vent piping. Seal joint between flashing and pipe with waterproofing compound per flashing manufacturer's recommendations.
2. Water, condensate drainage and other metallic piping thru roof: Stoneman No. 1100-4, one (1) piece, seamless, four (4) pound, series with reinforcing steel boot counter-flashed with cast iron flashing sleeve. Seal joint between flashing and pipe with waterproofing compound per flashing manufacturer's recommendations

J. Escutcheons: Shall be chrome plated cast brass with setscrew locking device.

K. Water Hammer Arresters: Shall be sized per the manufacturer's recommendations. Install at all quick closing valves, clothes washers and dishwashers behind access panel.

L. Dielectric Union Isolators: Connection between incompatible materials above grade and inside building shall be made with two (2) dielectric unions separated by a twelve-inch (12") section of red brass pipe. Dielectric union isolator for connection piping or non-compatible materials shall be of standard commercial design with threaded connections.

M. Pipe Supports: Unless otherwise indicated on the drawings, shall be as follows:

1. The Contractor shall furnish and install all miscellaneous iron work including angles, channels, etc., required to appropriately support the various piping systems. Hanger spacing and location shall conform to 2007 California Plumbing Code Table 3-2.
2. All horizontal runs of piping within the building to be supported from the structural framing with steel rods and split ring hangers, B-Line, Grinnell Company, Tolco, or approved equal. Steel rods shall be secured to overhead framing with side beam connectors. Where necessary, install angle iron between framing to accommodate hanger rods. Where several pipes are running together, Unistrut, B-Line or Powerstrut channels with clamps may be used in lieu of individual pipe hangers, and supported from structure as herein specified. Submit test data for type of hanger supports to be provided. For support conditions other than specified herein, the Contractor shall submit method of support for approval prior to any installation.
3. Horizontal Piping Hangers and Supports:
    a. General: Provide factory fabricated horizontal hangers and supports complying with one of the following MSS types listed to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
        i. Adjustable Steel Clevis Hangers: (MSS Type 1.) B-Line B 3100
        ii. Adjustable Swivel Pipe Rings: (MSS Type 5) B-Line B3690
4. Vertical-Piping Clamps:

a. General: Provide factory fabricated vertical-piping clamps complying with the following types listed, to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.

b. Two-Bolt Riser Clamps: (MSS Type 8) B-Line B3373

5. Hanger-Rod Attachments:

a. General: Provide factory fabricated hanger-rod attachments B-Line, Tolco or approved equal, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-58 and manufacturer's published product information. Select size of hanger-rod attachment to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.

b. Side beam eye socket, Tolco Fig. #57 for rod sizes 3/8" dia. and Tolco Fig. #25-30-251 for rod sizes 1/2" dia.

6. Building Attachments:

a. General: Provide factory fabricated building attachments, selected by Installer to suit building structural framing conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.

7. Hanger Rods and Spacing shall conform to the following table:

Pipe Sizes	Spacing	Rods
2 Inch and Smaller	6 Feet	3/8 Inch
2-1/2 Inch to 3 Inch	8 Feet	1/2 Inch
4 Inch and larger	8 Feet	5/8 Inch

8. Hangers and Supports shall be adequate to maintain alignment and prevent sagging and shall be placed within 18 inches of joint. Support shall be provided at each horizontal branch connection.

9. Provide lateral bracing as manufactured by B-Line or approved equal for all piping to prevent swaying or movement in accordance with SMACNA "Guidelines for Seismic Restraints of Piping Systems". Piping smaller than indicated in the guidelines shall be provided with bracing as specified for the smallest size indicated. The entire water distribution system shall be properly braced and will not move due to the action of quick closing of valves.

10. Miscellaneous Supports, Wall Brackets, Etc.: Provide where required in accordance with the best standard practices of the trade. Submit shop drawings for all fabricated supports.

11. Isolators. All piping which is not isolated from contact with the building by its insulation shall be installed with a manufactured type isolator. Isolators shall be B-Line vibra clamp and cushion, Super Strut, Stoneman "Trisolator", or approved equal. Piping shall be installed and supported in a manner to provide for expansion without strains. Guides shall be properly installed to ensure this requirement.

12. Shields:

a. General: Provide shields at piping hangers and supports, factory-fabricated, for all insulated piping as manufactured by Pipe shields Incorporated or approved equal. Size shields for exact fit to mate with pipe insulation.

b. Protection Shields: MSS Type 40; provide high density insert of same thickness of insulation or equal 100-psi average compressive strength, waterproofed calcium silicate, encased with a sheet metal shield. Insert and shield shall cover entire circumference of the pipe and shall be of length indicated by manufacturer for pipe size and thickness of insulation.

N. Insulation:

1. Hot Water Pipe Insulation: All hot water supply and return piping, except exposed connections to plumbing fixtures, flanges and unions shall be insulated with ASTM C547, Class I, "Johns-Manville" "Micro-Lock" 850-APT, Owens-Corning Fiberglass Corp., ASJ/SL-11 or approved equal, 1" thick for sizes up to 2" and 1-1/2" thick for sizes 2" and larger with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall be equal in thickness to insulation for piping. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2007 CMC

a. Exposed insulated piping in occupied areas and exposed outside the building shall be covered with Johns-Manville” “Zeston” 30-mil thick white PVC jacketing material per ASTM D1784 with “Johns-Manville” “Zeston” pre-formed insulation inserts for all fittings. Insulation at all fittings shall

be equal in thickness to insulation for piping. Jacketing shall comply with ASTM E84, and shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2007 CMC

b. Hot water piping below slab shall have insulation protected by a 10-mil thick polyethylene plastic sleeve sealed watertight with poly vinyl chloride tape.

2. Condensate Pipe Insulation: All condensate piping within the building shall be insulated with "Imcoa" "Imcolock" ¾" nominal wall thickness closed-cell insulation. Insulation shall have a flame spread of not more than 25 and a smoke density not exceeding 50 per 2007 CMC. All joints shall be mitered and secured with black duct tape.

3. All insulation shall be continuous through supports and hangers.

4. All fixtures complying with the provisions of the Americans with Disabilities Act shall be provided with Prowrap insulation for exposed hot water pipe, tailpiece, and trap as manufactured by McGuire, and secured per manufacturers recommendations. No tape wrapping shall be permitted.

O. Equipment and Fixtures:

1. Fixtures:

a. See schedule on drawings.

b. Accessible plumbing fixtures shall comply with all of the requirements of CBC Section 11B.

2. Acceptable Manufacturers.

a. The following manufacturers (or equal) shall be accepted for submittal review provided that all features and options are equivalent to the corresponding items as specified on plans and in specifications: See Plumbing Fixture Schedule

i. Vitreous China Plumbing Fixtures.

1. American Standard.
2. Kohler.

ii. Flushometer Valves.

1. Sloan.

iii. Toilet Seats.

1. Bemis.
2. Olsonite.
3. American Standard

iv. Wall-Hung Water Closet Carriers.

1. Zurn.
2. J.R. Smith

v. Stainless Steel Sinks.

1. Elkay.
2. Just.

vi. Faucets.

1. Chicago.

vii. Lavatory and Sink Drains.

1. American Standard
2. McGuire.
3. Elkay.

viii. Angle Stops / Supplies.

1. Chicago.

ix. Enameled Cast Iron Service Sinks and Wash Sinks.

1. Ceco.

x. Trap Primers.

1. Mifab.
2. Precision Plumbing Products.

xi. Water Hammer Arrestors.

1. Zurn.
2. Precision Plumbing Products.

xii. Floor Drains.
1. Zurn.
2. Jay. R. Smith.

xiii. Roof Drains and Overflow Drains.
1. Zurn
2. Jay R. Smith.

xiv. Floor Sinks.
1. Zurn.

xv. Drinking Fountains.
1. Haws.
2. Elkay.

xvi. Thermal Expansion Tanks.
1. Wilkins.
2. Watts.
3. Amtrol.

xvii. Hose Bibbs.
1. Acorn.
2. Woodford.

xviii. Recessed Hose Bibbs.
1. Acorn.

xix. Backflow Preventers.
1. Wilkins.
2. Watts.

xx. Instantaneous Electric Water Heaters.
1. Chronomite.

xxi. Gas Storage Tank Type Water Heaters.
1. AO Smith
2. Bradford White.
3. Rheem.

xxii. Hot Water Circulation Pumps.
1. Bell & Gossett
2. Grundfos.

xxiii. Seven-Day Time Clocks.
1. Tork.

3. Furnish complete with necessary trim, including stops. All trim and fittings shall be chrome-plated brass including handles, supply tailpieces, traps and escutcheons.
4. Connections to fixtures shall be in accordance with code requirements except as exceeded herein or on the drawings and in no case less than the supply stop size.
5. All plumbing fixture faucets submitted for review shall have identification label or certification showing compliance with California TITLE 24, PART 5, ARTICLE I, "Energy Conservation Standards". ARTICLE I, T20-1406; ARTICLE 2, T20-1525 and ARTICLE 4, 1604 and 1606.
6. Minimum waste sizes shall be four-inch (4") for water closets and two inch (2") for lavatories.

P. Water Heaters (See Equipment Schedule on Drawings):
1. Gas Storage Tank Type Water Heaters:
a. Gas water heater shall be a glass-lined commercial Gas model of the size and capacity as indicated on the drawings and as manufactured by AO Smith, Rheem or Bradford White. Heater shall be constructed in accordance with ASME code for 160 psi working pressure and shall bear

appropriate symbol and listed with the National Board as required. Heater shall be listed with Underwriters' Laboratories and approved by National Sanitation Foundation. All internal surfaces of the heater exposed to water shall be glass-lined. Tank shall be cathodically protected with adequate extruded magnesium rod. The entire vessel is to be enclosed in a round steel enclosure with baked enamel finish. Control compartment to be hinged and shall house 120 volt control circuit transformer, transformer fusing, magnetic contactor, immersion style operating thermostat, element fusing per N.E.C., and commercial grade incoloy sheathed flange mounted elements with prewired terminal leads. All factory wired temperature controls shall include high temperature cut-off for each element, high and low pressure switches, indicating pilot lights, switch with manual reset. Foam insulation, (R-16), shall exceed latest requirements of ASHRAE 90.1b-1990 for heat loss efficiency. Heater shall include ASME T & P relief valve and drain valve.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.

B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.

C. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected, tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

D. Before laying of any pipe or digging of any trenches, Contractor shall determine by actual excavation and measurement exact locations and depth of existing utility and service lines to which he is going to connect. In event depth of existing sewer main or storm drain is not sufficient to permit installation of piping as detailed on drawings or to make connection in manner indicated, Contractor shall confer with the Architect, Owner's representative and Engineer for Direction.

E. Excavation, Trenching and Backfill: Perform all necessary trench excavation, shoring, backfilling and compaction required for the proper laying of the pipe lines.

1. The Contractor shall coordinate the layout of all below grade piping and components with the General Contractor prior to bid to determine the extent of required sawcutting, excavation, alterations, and subsequent repair/restoration of all affected hardscape and softscape surfaces. All such items shall be included in bid.
2. Backfill shall be clean soil free from rocks and debris. Compact to ninety percent (90%) of surrounding soil. All piping shall be installed in a minimum 6" sand bed and covered with 6" of sand prior to backfill. Continue backfill with materials free of rocks and debris, properly moistened and mechanically tapered and compacted to 90% of surrounding soil.
3. Water, soil and waste piping shall have twenty-four (24") of cover minimum, except all PVC pipe material and all gas piping shall have eighteen (18") of cover minimum. All other pipe shall have not less than eighteen inches (18") of cover, unless otherwise noted on the drawings. Offset gas and water piping as required to permit crossover of underground piping systems, and electrical conduit systems.
4. Bottoms of Trenches: Cut to grade and excavate bell holes to ensure the pipes bearing for their entire length upon the outside periphery of the lower third of the pipe.
5. Trees: When it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and roots. Where a ditching machine is run close to trees having roots smaller than 2" in diameter, the wall of the trench adjacent to the trees shall be hand trimmed making clean cuts through the roots. All cuts through roots 1/2" and larger in diameter shall be painted with "Tree-Seal", or equal. Trenches adjacent to trees should be filled within 24 hours after excavation, but where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas. Stockpiling of earth or building materials within the drip line of trees is prohibited. Where any roots 2" and larger are encountered, the Contractor shall hand tunnel under root and protect it by burlap wrapping.
6. Water piping shall not be run in the same trench with sewer or drainage piping unless separated as required by the CPC.

7. All horizontal soil and waste piping 3” and smaller shall be installed to a uniform grade of not less than one-fourth inch (1/4") per foot. All horizontal soil and waste piping 4” and larger shall be installed to a uniform grade of not less than one-eighth inch (1/8") per foot, unless otherwise indicated or directed.

F. Piping Installation:

1. All piping shall be concealed in finished portion of the building except where otherwise indicated or directed at the time the work is done. All piping shall be installed to clear all framing members and beams, even if drawings do not indicate same. Contractor shall constantly check the work of other trades so as to prevent any interference with the installation of this work.
2. All piping into stem walls and footings shall be double half lap wrapped with 1/8" thick "Armaflex" insulation. The Contractor shall also provide blocked out areas in stem wall and footing as required for the installation of the piping. All piping shall avoid the lower 9" of the footing and the Contractor shall coordinate and provide dropped footings as required for the installation of the underground piping.
3. Unions shall be installed on one side of all screwed shut-off valves, at both sides of screwed automatic valves and on all by-passes, at all equipment connections and elsewhere as indicated or required for ease of installation and dismantling.
4. Connections between copper tubing and equipment shall be with Mueller Brass Company, or approved equal, brass stream line copper to P.P.S. ground joint unions.
5. Hot and cold water supplies to lavatories and sinks shall be provided with ninety degree (90°) drop-ear copper to pipe thread elbows. Cold water supplies to water closets and urinals shall be provided with ninety-degree (90°) drop-ear copper to pipe thread elbows. Bolt securely to backing plates located between wall studs to provide a rigid anchor for exposed supply pipes and stops.
6. Corrosion Protection:
   a. General.
      i. Corrosion protection shall be provided for all below grade cast iron and copper piping and associated valves and fittings. Such piping shall be protected from corrosion by encasement in a polyethylene protective wrapping, referred to hereafter as polywrap. Although not intended to be a completely air and water tight enclosure, the polywrap shall provide a continuous barrier between the pipe and surrounding bedding and backfill.
   b. Materials.
      i. Cast iron piping encasement.
         1. The polywrap shall be minimum 8 mil. in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall meet or exceed the requirements of AWWA C105, ANSI A21.5 and ASTM A674.
         2. The polywrap shall be as manufactured by Northtown Company or approved equal.
      ii. Copper piping encasement.
         1. The polywrap shall be minimum 6 mil. in thickness, group 2, linear low density, flat tube, natural (clear) virgin polyethylene film formed into tubes or sheets as required. Material shall conform to the requirements of ASTM D1248.
         2. The polywrap shall be as manufactured by Northtown Company or approved equal.
      iii. The minimum Polywrap flat tube width for each pipe diameter shall be as follows:

Pipe Size / Type	Polywrap Flat Tube Width
½” to ¾” copper	2”
1” to 1-½ copper	3”
2” copper	4”
2-1/2” copper	5”
3” copper	6”
2” to 3” cast iron	14”
4” cast iron	16”
6” cast iron	20”
8” cast iron	24”

10” cast iron	27”
12” cast iron	30”
15” cast iron	37”

iv. The polywrap shall be secured as specified with 2-inch wide pressure sensitive plastic tape not less than 10 mils thick.

1. Tape shall be Scotchwrap No. 50, Polyken No. 900, Tapecoat CT, Johns-Manville No. V-10 Trantex or approved equal.

c. Installation.

i. The polyethylene tubing shall be cut into lengths approximately 2 feet longer than the pipe sections. Slip the tube around the pipe, centering it to provide a 1-ft overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at each joint to facilitate installation of the polywrap. The bunched-up polywrap shall be pulled from the preceding length of pipe, slipped over the end of the new length of pipe, and secured in place with one circumferential turn of tape plus enough overlap to assure firm adhesion. The end of the polywrap shall be slipped from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe and tape it in place. The loose wrapping on the barrel of the pipe shall be pulled snugly around the barrel of the pipe and excess material folded over the top of the pipe and the folds held in place by means of short strips of adhesive tape, at about 3-foot intervals along the pipe.

ii. Rips, punctures or other damage to the tube shall be repaired with the adhesive tape or pieces of tube material secured with tape. Bends and reducers in the line shall be covered with polyethylene in the same manner as pipe.

iii. Valves, tees, crosses and outlets shall be wrapped with flat sheets of the same material. The sheets shall be passed under valves and brought up around the body to the stem. Edges shall be brought together, folded twice and secured with the adhesive tape.

G. Sleeves: Shall be plastic or galvanized steel where pipes pass through concrete walls or floor slabs.

1. Isolate pipes through ground floor slabs with Kraft paper, plastic tape or similar materials unless conduit is specified or indicated.

2. Sleeves for pipes through exterior walls shall be non-metallic with minimum 2” weep ring as manufactured by Link Seal. Pipe shall be sealed with Link Seal modular seal with EPDM seal elements.

3. Sleeves in or through fire rated walls shall be per U.L. Fire Resistance System No. WL1146 for drywall construction, and U.L. Fire Resistance System No. CAJ1044 for concrete construction. See architectural plans for all locations of rated walls.

4. Below-grade piping through exterior walls shall be sealed using Link Seal modular seal with nitrile seal elements and stainless steel bolts and sleeves as manufactured by Century Line.

H. Contraction and Expansion: Install all work in such a manner that its contraction and expansion will not do any damage to the pipes, the connected equipment, or the building. Install offsets, swing joints, expansion joints, seismic joints, anchors, etc., as required to prevent excessive strains in the pipe work. All supports shall be installed to permit the materials to contract and expand freely without putting any strain or stress on any part of the system. Provide anchors as necessary.

I. Pipe Joints and Connections:

1. Copper Tubing and Brass Pipe with Threadless Fittings:

a. Solder joints for copper shall be made with 95/5 lead free solder in accordance with manufacturer's recommendations for the service intended.

b. Use threaded adapters on copper tubing where threaded connections are required.

2. Welded Joints: All welding to be performed by welders certified as passing ASME Boiler and Pressure Code (Section IX) and shall comply with ANSI Std. B31.1.0 and the American Welding Society, Welding Handbook.

J. All closet bends shall be adequately blocked and secured. Trap arms and similar connections installed below the floor level or under concrete slabs shall be adequately supported and anchored to prevent motion in any direction. All piping installed above grade within buildings shall be secured to structural framing with Unistrut or pipe clamps to provide a rigid installation. Piping utilizing gaskets as a seal shall

be given prime consideration to providing adequate stability through proper supports and anchors because of its flexible nature.

K. Flexible piping of any kind will not be permitted except when indicated on drawings. Provide Hose Master Inc., flexible pipe appliance connector model UNP, female union, male nipple and plastic cover, AGA approved for kitchen equipment only.

L. Each pipe penetration of the roof shall be separated from other piping and any roof equipment by a minimum of 18" to insure a proper pipe flashing installation.

M. Floor, Wall and Ceiling Plates: Where pipes pierce finished surfaces, C.P. brass split flanges with setscrew lock shall be provided.

N. Roof Flashings: Extend pipe a minimum of seven inches (7") above finished roof line, except where a vandal proof hood is required in which case pipe shall extend to a height required to receive the hood and also where specifically required to exceed this dimension by the local authority due to snow conditions.

O. Installation of Plumbing Fixtures:

1. Install each fixture at the exact height and location shown on the Architectural Drawings.
2. Set fixtures, supplies, trap and trap outlet square with the wall, in line with fixture outlets without any offsets, angles, or bends.
3. Grout joint between the fixtures and the walls or floors with polysulfide or silicone sealant to be smooth, even and watertight.

P. Completion of Installation:

1. Cleaning and Flushing: Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.
2. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.
3. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

3.2 TESTING

A. No piping work shall be concealed or covered until piping has been tested, inspected and approved by the Inspector. All piping for plumbing systems shall be completely installed and tested as required by the Uniform Plumbing Code. Test pressures and times indicated are a minimum only. All tests shall be as required by the governing authority as well.

Schedule of Test Pressures:

System Tested	Gauge	Test	Duration
Water	100 PSI	Water	4 Hours
Gas	60 PSI	Air	4 Hours

Waste, Vent and Storm Drain: Per California Plumbing Code (Minimum 10 Feet of Head)

3.3 OPERATION INSTRUCTION

A. Prior to occupancy or prior to the date of final inspection, whichever may occur first, the Contractor shall prepare two (2) sets of typewritten instructions for the operation of all equipment, valves, etc., specified and furnished as a part of the work under this section, and shall assign a competent person, thoroughly familiar with the job, to demonstrate and instruct a representative of the Owner in the operation of the equipment. The time of said demonstration and instructions shall be arranged with the Owner's representative approximately one (1) week in advance. Verbal instructions shall include shut-off location of gas and water. The Contractor shall assemble all operation and maintenance data supplied by the manufacturers of the various pieces of equipment, all keys and special wrenches required to operate and service the equipment (including keys for yard boxes, gas stops and fixture stops), and all equipment warranties and deliver same to the representative of the Owner on date of said instructions.

3.4 PIPE AND EQUIPMENT IDENTIFICATION

A. Each operating and service line shut-off valve shall be identified by a 19 ga. brass tag with stamped, engraved type of service identified and area served, complete with hole and brass chain mounted on valve stem or handle. Tag shall be a minimum of one and one-half inch (1-1/2") in diameter.

B. All piping systems shall be readily identifiable by appropriate labeling with the name of the piping contained. Such labeling shall be by means of metal tags, stenciling, stamping, or with adhesive markers, in a manner that is not readily removable. Labeling shall appear on the piping at intervals of not more than 20 ft and at least once in each room and each story traversed by the piping system.

C. Provide on exterior wall of each building opposite the building's main gas service a sign reading "Gas Shut Off". Sign shall be metal with minimum 1-1/2" high-embossed letters.

D. All equipment shall be provided with name plate indicating all pertinent information on it.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Section 11B-213.3.

B. Effective March 1, 2017, all single-user toilet facilities shall be identified as Gender Neutral facilities by a door symbol that complies with CBC Sections 11B-216.8 and 11B-703.2.6.3. No pictogram, text or braille is required on the symbol. If tactile jamb signage is provided, the signage shall comply with the appropriate technical requirements of CBC Section 11B-703. Examples of appropriate designations are “ALL-GENDER RESTROOM”, “RESTROOM” or “UNISEX RESTROOM”. DSA BU 17-01.

C. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.

D. Clearance around accessible water closets and in toilet compartments shall be 60 inches minimum measured perpendicular from the side wall and 56 inches minimum measured perpendicular from the rear wall per CBC Section 11B-604.3.1.

E. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 though 11B-612.

F. Accessible fixture controls shall comply with CBC Sections 11B-602.3 for drinking fountains, 11B-604.6 for water closets, 11B-604.9.5 for children’s water closets, 11B-605.4 for urinals, 11B-606.4 for lavatories and sinks, 11B-607.5 for bathtubs, 11B-608.5 for showers, and 11B-611.3 for washing machines and clothes dryers.

G. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34” maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Sections 11B-606.3 and 11B-606.7.

H. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contract. There shall be no sharp or abrasive surface under accessible lavatories and sinks. CBC Section 11B-606.5.

END OF SECTION

SECTION 22 49 00

NATURAL GAS PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Pipes, tubes and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Service meters.
7. Mechanical sleeve seals.
8. Grout.

1.3. DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4. PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Minimum Operating Pressure of Service Meter: 5 psig.

1.5. SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Dielectric fittings.
6. Mechanical sleeve seals.
7. Escutcheons.

1.6. QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel".

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage and handling to prevent pipe end damage and to prevent entrance of dirt, debris and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.8. COORDINATION

A. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1. PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Viega MegaPressG with an HNBR seal, or equal. ASME B31
3. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
4. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint and threaded ends.
5. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts and gaskets of the following material group, end connections and facings:

a. Material Group: 1.1.
b. End Connections: Threaded or butt welding to match pipe.
c. Lapped Face: Not permitted underground.
d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum O-rings and spiral-wound metal gaskets.
e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless-steel underground.

6. Viega MegaPressG fittings.
7. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive and PE.

2.2. PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig to 15 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross sectional area of connecting pipe and threaded-end connection.

2.3. UNDERGROUND GAS PIPING

A. Underground gas piping to use Polyethylene ASTM D2513.

2.4. JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5. MANUAL GAS SHUT-OFF VALVES

A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dry-seal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1-inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

B. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shut-off Valve Schedule" and "Above-ground Manual Gas Shutoff Valve Schedule" articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

C. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Homestead Valve; a division of Olson Technologies, Inc.
b. Mueller Co.; Gas Products Div.
c. Or Equal.
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast-iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.6. EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product name or designation or comparable product by one of the following:
a. Vanguard Valves, Inc.
b. Pacific Seismic Earthquake Valve
c. Or Equal.
3. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
4. Maximum Operating Pressure: 5 psig to 17 psig.
5. Cast-aluminum body with nickel-plated chrome steel internal parts.
6. Nitrile-rubber valve washer.
7. Sight windows for visual indication of valve position.
8. Threaded end connections complying with ASME B1.20.1.
9. Wall mounting bracket with bubble level indicator.

2.7. PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.

4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150% of design discharge pressure at shut-off.
10. Atmospheric Vent: Factory or field-installed, stainless-steel screen in opening if not connected to vent piping.
11. Maximum Inlet Pressure: 5 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

2.8. DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
f. Wilkins; Zurn Plumbing Products Group.
2. Minimum Operating Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain or welded end connections that match piping system materials.

2.9. SLEEVES

A. Metal Pipe Sleeves: unless otherwise indicated.

2.10. LABORATORY NATURAL GAS PIPING

A. Laboratory gas piping will be Tracpipe Counterstrike – CSST, or equal.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.3. INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and

calculate friction loss, expansion and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install escutcheons at penetrations of interior walls:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep-pattern type.
2. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
3. Piping at interior foundation wall penetrations in exposed locations and within cabinets and millwork: One piece, cast brass type with polished chrome plated finish.
4. Piping in Unfinished Service Spaces: One-piece, cast brass type with polished chrome-plated finish.
5. Piping in Equipment Rooms: One-piece, cast-brass type.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping".

L. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. Extend relief vent connections for service regulators, line regulators and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Natural-gas piping installed under the building shall be installed in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves and regulators may be installed in accessible spaces without containment conduit.
2. Prohibited Locations:

a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

b. Do not install natural-gas piping in solid walls or partitions.

Q. Use Concentric reducer fittings to make reductions in pipe sizes.

R. Install unions in pipes NPS 2 and smaller, at final connection to each piece of equipment. Unions are not required at flanged connections.

S. Do not use natural-gas piping as grounding electrode.

3.4. VALVE INSTALLATION

A. Install manual gas shut-off valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing, as indicated on the drawings.

C. If required by local Authority, install earthquake valves aboveground outside buildings according to listing.

3.5. PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
5. Damaged Threads: Do not use pipe or pipefittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Mega Press Joints: Per Manufacturer Instructions.

3.6. CONNECTIONS

A. Install piping adjacent to appliances to allow service and maintenance of appliances.

B. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment. Install Valve in a place where it make changing out the equipment and piping easy for modifications.

C. Install dirt leg at each equipment connection.

3.7. LABELING AND IDENTIFYING

A. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

END OF SECTION

SECTION 23 00 00

HEATING, VENTILATION AND AIR CONDITIONING

1. PART 1 - GENERAL

1.1 DESCRIPTION

A. Work under this section includes all labor, equipment, material, services, transportation, etc. required for and reasonably incidental to the complete and satisfactory installation of all of the HVAC Systems as indicated on the Drawings or specified herein.

1.2 Work included in This Section:

B. Air Conditioning Units.

C. Exhaust Fans.

D. Diffusers, Registers, and Grilles.

E. Duct Insulation.

F. Vibration Isolation.

G. Test and Balance.

H. Submittals and Shop Drawings.

I. Record Drawings.

J. Operation and Maintenance Manuals.

K. Guarantee.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Electrical supply to units. See Electrical Drawings.

1.4 GENERAL REQUIREMENTS

A. This section of the specification shall be considered as a part of the entire specification and all applicable portions of General Conditions, Special Conditions, and Division 1 shall apply.

B. Before commencement of work this contractor shall determine the exact location, size, elevation, and availability of all utilities relevant to the mechanical work and immediately notify the owner with written notification of any discrepancies. In addition, this Contractor shall contact all involved utility companies, make all necessary arrangements for service, and pay all fees incurred due to connection of services.

C. Erection: The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the erection of the work, together with all necessary journeymen, helpers, and laborers required to properly unload, erect, connect, adjust, start of operate and test the work involved.

1.5 REFERENCES

A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test code for sound rating air-moving devices.

D. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation System.

E. ARI 270 - Sound rating of Outdoor Unitary Equipment.

F. ASHRAE 52-76 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

G. ASTM A90 - Weight of Coating on Zinc - Coated (Galvanized) Iron or Steel Articles.

H. ASTM A120 - Black and Galvanized Steel Pipe.

I. ASTM B88 - Seamless Copper Water Tube.

J. ASTM C518 - Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

K. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

L. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

M. ASTM E84 - Surface Burning Characteristics of Building Materials.

N. ASTM E96 - Water vapor Transmission of Materials.

O. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

P. NFPA 255 - Surface Burning Characteristics of Building Materials.

Q. SMACNA - Low Pressure Duct Construction Standards.

R. UL 181 - Factory Made Air Ducts and Connectors.

S. UL 723 - Surface Burning Characteristics of Building Materials.

T. California Mechanical Code - 2019 Edition.

1.6 SUBMITTALS AND SHOP DRAWINGS

A. Contractor agrees that shop drawings submittals processed by the owner do not become Contract Documents and are not Change Orders; that the purpose of the shop drawing review is to establish a reporting procedure and is intended for the Contractor's convenience in organizing his work and to permit the owner to monitor the Contractor's progress and understanding of the design. The process of review of the Contractor's submittals is not of testing the owner's perception. If deviations, discrepancies or conflicts between shop drawings submittals and the Contract Documents are discovered either prior to or after the shop drawing submittals are processed by the owner, the Contractor agrees that the Contract Documents shall control and shall be followed.

B. Prepare and furnish fully coordinated shop drawings showing ductwork and piping on separate drawings. The drawings shall be minimum 1/4" = 1'-0" scale and shall show dimensioning of piping and ductwork from gridlines, bottom of elevation marks for ductwork and piping and fittings, valves, dampers, devices, etc. with labels. In addition, coordinate with related work and reference on the same drawings major plumbing piping, structural steel, fire protection piping, conduit runs and cable trays. Review and sign these drawings to verify coordination of related equipment. Conflicts, which occur shall be brought to the attention of the owner prior to issuance of the drawings. Refer to Section 01330 of the Specifications for additional requirements.

C. Contractor shall provide detailed shop drawings min. 30 days prior to installation for a complete functional system indicating all equipment, ductwork routing, and etc. including changes in elevation, direction, sway bracing, and etc. Contractor shall indicate all roof curb locations and sizes.

D. Materials and Equipment: As soon as possible and within 14 days after award of the contract, and before their purchase, the Contractor shall submit to the owner seven bound booklets for approval containing a complete list of materials, specialties and equipment he is to furnish for the installation. Literature shall be standard manufacturer's catalog cuts and items to be installed shall be clearly indicated. All submittals shall be made at one time.

E. Each item shall be identified by manufacturer, brand and trade name, number, size, rating and whatever other data is necessary to properly identify and check the materials and equipment. The words: "as specified" will not be considered sufficient identification.

F. Accessories, controls, finish, etc., not submitted or identified with the submitted equipment shall be furnished and installed as specified.

G. Shop drawings shall be approved only to extent of information indicated. Approval of an item of equipment shall not be construed to mean approval for components for that item for which Contractor has provided no information.

H. Approval of shop drawings shall not relieve Contractor of responsibility for providing all controls, wiring, components, etc. which are shown or specified, or all additional controls, wiring, components, etc. required to provide complete and correctly operating mechanical systems.

I. Submit product data for the following manufactured products, assemblies, personnel and testing agencies required for this project.

1. Air Conditioning Units.

2. Exhaust Fans.
3. Diffusers, Registers, and Grilles.
4. Ductwork and Accessories.
5. Insulation Materials.
6. Vibration Isolation.
7. Detailed procedures, agenda, sample report forms, and copy of AABC National Project Performance Guarantee.

1.7 SUBSTITUTIONS

A. Should the Contractor desire to substitute any material, equipment or other items for those specified, he shall submit a complete list, including detailed equipment layouts and performance characteristics within 35 calendar days after the scheduled Start of Construction. Said data shall be submitted in 7 copies, assembled in individual brochures.

B. The entire cost of all changes of any type due to substitution for materials specified shall be born by the Contractor at no extra cost to the owner.

C. Unsolicited and voluntary deducts, on the part of the Contractor for substituting unapproved systems and/or equipment, shall not be considered for the purpose of awarding the Contract.

D. The contractor shall submit the amount of cost credit to the Contract in the event the proposed substitution is accepted.

E. In all cases where substitutions are proposed after bids are received, the Contractor shall bear the cost of evaluation on the basis of 2-1/2 times technical salaries of engineering personnel involved.

1.8 AVAILABILITY OF SPECIFIED EQUIPMENT

A. Verify prior to bidding that all specified equipment is available and can be obtained in time for installation during orderly and timely progress of the work.

B. In the event that specified items will not be so available, notify the owner prior to receipt of bids.

C. Costs of delays because of non-availability of specified items, when such delays could have been avoided by proper investigation on the part of the Contractor, will be back-charged as necessary and shall not be born by the owner.

1.9 RECORD DRAWINGS

A. The contractor shall arrange and pay for one set of white prints of the HVAC drawings, which he shall alter in red to show all changes made to the original layout. These drawings shall be kept current.

B. The contractor shall deliver these completed to the owner when the job is finished and accepted prior to final payment.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit prior to final inspection in electronic format. Prepare file covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", and title of project. Internally subdivide the file contents with page dividers, logically organized as described below;

B. Contents: Prepare a Table of Contents with each Product or system description identified.

1. Part 1: Directory listing names, addresses, and telephone numbers of owner, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system. Identify the following:
    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.

f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

C. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with owner comments. Revise content of documents as required prior to final submittal.

D. Submit final volumes (revised) within ten days after final inspection.

1.11 GUARANTEES

A. The Contractor, in accepting this contract, binds himself to replace or repair at his own expense any defect in workmanship or material which may appear within a period of one year from the date of the final acceptance of the building, and to pay for all resulting damage which shall appear within the said period; provided always that the Contractor shall not be liable for anything attributable to acts of the agents of the owner, or for ordinary wear. Also, given date of work performed by the Contractor be accepted as complete, he shall agree to correct any deficiencies or omissions in respect to the plans or specifications which may appear in the afore-mentioned twenty-four month period.

B. The Contractor guarantees that all piping as provided in this specification will be free from all obstructions, and that all piping will be tight and drip free.

C. All refrigerant compressors shall carry a five-year manufacturer's warranty.

1.12 LOCAL CONDITIONS

A. The Contractor and trade submitting tenders on this work shall visit and will be deemed to have visited the site to ensure that they are familiar with all conditions relating to the work. Failure to visit the site will in no way relieve the successful Contractor of the necessity of furnishing any material or performing any work that may be required to complete the work in accordance with the drawings and specifications without additional cost to the owner.

1.13 RULES, REGULATIONS AND CODES

A. All work and materials shall be in full accordance with the latest California Mechanical Code, California Plumbing Code, California Building Code and local rules and regulations, State Fire Marshal regulations, the safety orders of the Division of Industrial Safety; the National Electric Code; the standards of the National Fire Protection Association; American Gas Association; Occupation and Safety Act; American National Standards Institute; American Society of Mechanical Engineers; American Society for Testing and Materials; Installation Standards published by the International Association of Plumbing And Mechanical officials (IAPMO) and other applicable laws, codes, or regulations. Nothing in these specifications shall be construed to permit work not conforming to these codes.

B. Electrical Work: Motors, electrical apparatus and wiring specified in this section shall conform to the National Electrical Manufacturer's Standards and the National Electric Code and bear the Underwriter's label of approval.

C. The Contractor shall furnish, without extra charge, any additional material and labor when and where required to comply with these rules and regulations, though the work be not mentioned in these Specifications or shown on the Drawings. When these Specifications or Drawings call for or describe materials or construction of a better quality or larger sizes than required by the above mentioned rules and regulations, the provisions of these specifications and accompanying drawings shall take precedence.

1.14 FEES AND PERMITS

A. The Contractor must obtain and pay all fees for permits, licenses, inspections, etc., which are required by any legally constituted authority. Coordinate exact requirements with the owner prior to bid.

1.15 COORDINATION

A. Following the general arrangement indicated on the Drawings as closely as possible, the Contractor shall coordinate with the architectural, structural, plumbing, electrical and all other trades prior to installation of the materials and equipment to verify adequate space available for installation of the work shown. The owner shall be immediately notified if an area of conflict occurs between trades.

B. The Contractor shall bear all costs incurred for work that must be relocated due to conflicts between

trades.

C. The Mechanical Contractor shall coordinate all requirements for all points of connection with the General Contractor and other trades prior to bid.

1.16 DRAWINGS

A. The work shall be installed as indicated on Drawings, however, changes to accommodate installation of this work with other work, or in order to meet Architectural or structural conditions, shall be made without additional cost to the owner.

B. For the purpose of clarity and legibility, the Drawings are essentially diagrammatic to the extent that many offsets, bonds, unions, special fittings and exact locations are not indicated. The Contractor shall make use of all data in all of the Contract Documents, and shall verify this information at the site.

1.17 INSPECTION

A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.

B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.18 DELIVERY, STORAGE AND PROTECTION OF PROPERTY

A. Place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet construction schedule, together with any special handling charges, shall be borne by the contractor.

B. Materials shall be delivered in ample quantities from time to time as may be necessary for the uninterrupted progress of the work. They shall be stored as to cause the least obstruction to the premises and distributed so as to prevent overloading to any portion of the structure.

C. The Contractor shall provide temporary storage and shop areas that are required at the site for the safe and proper storage of materials, tools, and other items used in the performance of this work. These areas shall be constructed only in approved locations and shall not interfere with the work of any other Contractor.

D. All work, equipment and materials shall be protected at all times. The Contractor shall make good all damage caused either directly or indirectly by his own workmen. The Contractor shall also protect his own work from damage. He shall close all pipe and duct openings with caps or plugs during installation. He shall protect all of his equipment and materials against dirt, water, chemical, and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.

1.19 DAMAGE BY LEAKS, ETC.

A. The Contractor shall be responsible for all damage to any part of the premises or work of other Contractors, caused by leaks or breaks in the piping or equipment furnished and/or installed under this section, during the construction and guarantee period.

1.20 ACCESS TO EQUIPMENT FOR MAINTENANCE

A. Install all equipment, piping, etc. to permit access for normal maintenance. Maintain easy access to filters, motors, etc. Install all such equipment and accessories to facilitate maintenance. Perform any relocation of pipes, etc. required to permit access at request of owner at no additional cost to owner.

B. Furnish and install access doors or panels in walls, floors, and ceilings to permit access to equipment, dampers, and all other items requiring service. Coordinate location of access doors with other trades as required.

C. Size access panels to allow inspection and removal of all items served.

D. Use Milcor style as required for material in which door is installed. Where door is installed in fire rated construction, provide door bearing UL label required for condition.

2. PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment shall be new and of the best of their respective grades, free from all defects and of the make, brand or quality herein specified or as accepted by the owner.

B. All materials and equipment shall be identified by manufacturer's name or nameplate data. Unidentified material or equipment shall be removed from the site.

C. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in the catalog as standard with the equipment. Optional or additional accessories shall be furnished as specified.

D. Where no specific make of material or equipment is mentioned, any first class product of a reputable manufacturer may be used, provided it conforms to the requirements of the system and meets with the approval of the owner.

E. Equipment and materials damaged during transportation, installation and operation shall be considered as "totally damaged" and shall be replaced with new. Any variance from this clause shall be made only with written approval of the owner.

2.2 MANUFACTURER

A. Air Conditioning Units:

1. Carrier.
2. Approved Equal.

B. Exhaust Fans:

1. Greenheck.
2. Cook.
3. Twin City.

C. Diffusers, Registers, and Grilles:

1 Krueger.
2 Titus.
3 Price.
4 Approved Equal.

D. Controls

1. Carrier. EMS
2. Approved Equal.

E. Vibration Isolation:

1. M.W. Sausse.
2. Mason.
3. Approved Equal.

2.3 ROOFTOP PACKAGE AIR CONDITIONING UNITS (48GC – 3 Ton to 5 Ton)

A. General:

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.
2. Factory assembled, single-piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.

3. Unit shall use Puron® (R-410A) refrigerant.
4. Unit shall be installed in accordance with the manufacturer's instructions.
5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. Quality Assurance:

1. Unit meets ASHRAE 90.1 minimum efficiency requirements.
2. Unit shall be rated in accordance with AHRI Standards 210/240.
3. Unit shall be designed to conform to ASHRAE 15.
4. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL-listed and certified under Canadian standards as a total package for safety requirements.
5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
6. Unit casing shall be capable of withstanding 500 hour salt spray exposure per ASTM B117 (scribed specimen).
7. Unit shall be designed in accordance with ISO 9001, and shall be manufactured in a facility registered by ISO 9001:2015.
8. Roof curb shall be designed to conform to NRCA Standards.
9. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
10. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
11. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
12. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.

C. Operating Characteristics:

1. Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 at ±10% voltage.
2. Compressor with standard controls shall be capable of operation down to 40°F (4°C), ambient outdoor temperatures. Accessory winter start kit is necessary if mechanically cooling at ambient temperatures down to 25°F (–4°C).

D. Unit Cabinet:

1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a prepainted baked enamel finish on all externally exposed surfaces.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F/16°C): 60, Hardness: H-2H Pencil hardness.
3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 210/240 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum $^{1}/_{2}$-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the gas heat compartment.
4. Base of unit shall have a minimum of four locations for thru-the-base gas and electrical connections (factory-installed or field-installed), standard.
5. Base Rail:
    a. Unit shall have base rails on a minimum of 2 sides.
    b. Base rail shall be a minimum of 16 gage thickness.
6. Condensate pan and connections:
    a. Shall be a sloped condensate drain pan made of a corrosion resistant material.
    b. Shall comply with ASHRAE Standard 62.

c. Shall use a $^{3}/_{4}$-in. 14 NPT drain connection, possible either through the bottom or side of the drain pan. Connection shall be made per manufacturer's recommendations.

7. Top panel:
   a. Shall be a single piece top panel on all sizes.
8. Gas Connections:
   a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
   b. Thru-the-base capability
      i. Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
      ii. Optional, factory approved, water-tight connection method must be used for thru-the-base gas connections.
      iii. No basepan penetration, other than those authorized by the manufacturer, is permitted.
9. Electrical Connections:
   a. All unit power wiring shall enter unit cabinet at a single, factory prepared, knockout location.
   b. Thru-the-base capability.
      i. Standard unit shall have a thru-the-base electrical location(s) using a raised, embossed portion of the unit basepan.
      ii. Optional, factory approved, water-tight connection method must be used for thru-the-base electrical connections.
      iii. No basepan penetration, other than those authorized by the manufacturer, is permitted.
10. Component access panels (standard):
   a. Cabinet panels shall be easily removable for servicing.
   b. Unit shall have one factory installed, tool-less, removable, filter access panel.
   c. Panels covering control box, indoor fan, indoor fan motor, gas components (where applicable), and compressors shall have molded composite handles.
   d. Handles shall be UV modified, composite. They shall be permanently attached, and recessed into the panel.
   e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.
   f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

E. Gas Heat:
1. General:
   a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
   b. Shall incorporate a direct-spark ignition system and redundant main gas valve.
   c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
2. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.
   a. IGC board shall notify users of fault using an LED (light-emitting diode).
   b. The LED shall be visible without removing the control box access panel.
   c. IGC board shall contain algorithms that modify evaporator fan operation to prevent future cycling on high temperature limit switch.
   d. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall

be made using an LED.

3. Standard Stainless Steel Heat Exchanger construction – Ultra Low NOx Burner Box:
    a. Burners shall be of premixed type constructed of stainless steel.
    b. Use a redundant main gas valve.
    c. Burners shall be of the in-shot type constructed of aluminum-coated steel.
    d. All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).
    e. The stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gage type 409 stainless steel.
    f. Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.
    g. Stainless Steel natural gas burner box and heat exchanger assembly shall provide Ultra Low NOx gas emissions of 14 nanograms/joule (ng/j).
4. Induced draft combustion motor and blower
    a. Shall be a multi speed direct-drive, single inlet, forward-curved centrifugal type.
    b. Shall be made from steel with a corrosion resistant finish.
    c. Shall have permanently lubricated sealed bearings.
    d. Shall have inherent thermal overload protection.
    e. Shall have an automatic reset feature.

F. Coils:
1. Standard Aluminum Fin-Copper Tube Coils:
    a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
    b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.
    c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

G. Refrigerant Components:
1. Refrigerant circuit shall include the following control, safety, and maintenance features:
    a. Fixed orifice metering system shall include a multiple feed distribution system that optimizes coil performance.
    b. Refrigerant filter drier - Solid core design.
    c. Service gage connections on suction and discharge lines.
    d. Pressure gage access through a specially designed access port in the top panel of the unit.
2. There shall be gage line access port in the skin of the rooftop, covered by a black, removable plug.
    a. The plug shall be easy to remove and replace.
    b. When the plug is removed, the gage access port shall enable maintenance personnel to route their pressure gage lines.
    c. This gage access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.
    d. The plug shall be made of a leak proof, UV-resistant, composite material.
3. Compressors:
    a. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
    b. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
    c. Compressors shall be internally protected from high discharge temperature conditions.

d. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.

e. Compressor shall be factory mounted on rubber grommets.

f. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

g. Crankcase heaters shall not be required for normal operating range, unless required by compressor manufacturer due to refrigerant charge limits.

h. Compressor shall be of a two stage cooling capacity design.

H. Filter Section:

1. Shall consist of factory installed, low velocity, throw-away 2-in. thick fiberglass filters.

2. Filters shall be standard, commercially available sizes.

I. Evaporator Fan and Motor with EcoBlue™ Technology:

1. Direct Drive Evaporator fan motor:

a. Shall be a ECM motor design.

b. Shall have permanently lubricated bearings.

c. Shall have inherent automatic-reset thermal overload protection.

d. Shall have slow ramp up to speed capabilities.

e. Shall require no fan/motor belts for operation, adjustments and or initial fan speed set up.

f. Fan DC voltage set up on Unit Control Board can eliminate the need of removal of blower access door, required on conventional belt drive systems.

g. Shall be internally protected from electrical phase reversal and loss.

2. Evaporator Fan:

a. Shall be easily set with dedicated selection switch and adjustment pot on unit control board or through SystemVu™ controller.

b. Size 04-06 units provide multi speed indoor fan operation.

c. Blower fan shall be a Vane Axial fan design with 75% less moving parts than a conventional belt drive system.

d. Shall be constructed of a cast aluminum stator and high impact composite material on rotor and air inlet casing.

e. Shall be a patented / pending design with a corrosion resistant material and dynamically balanced.

f. Shall have slow ramp up to speed capabilities to help reduce sound and comfort issues typically associated with single speed belt drive systems.

g. Shall be a slide out design with two screw removal.

h. Shall provide up to 2 inches static pressure to the unit cabinet.

3. Shall include an easily accessible unit Control Board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches. Controller shall also provide an intuitive means to adjust the indoor fan speed through a simple switch and pot adjustment design.

J. Condenser Fans and Motors:

1. Condenser fan motors:

a. Shall be a totally enclosed motor.

b. Shall use permanently lubricated bearings.

c. Shall have inherent thermal overload protection with an automatic reset feature.

d. Shall use a shaft-down design on all sizes.

2. Condenser Fans:

a. Shall be a direct-driven propeller type fan constructed of high impact composite mate-rial.

b. Shall have high impact composite blades completely formed into one piece without blade fasteners or connectors and shall be dynamically balanced.

K. Special Features Options and Accessories:

1. Integrated EconoMi$er®2, and EconoMi$er X Ultra Low Leak rate models. (Factory-installed on 3 phase models only. Field-installed on all 3 and 1 phase models.)

a. Ultra Low Leak design meets California Title 24 section 140.4 and ASHRAE 90.1 requirements for 4 cfm per sq.ft on the outside air dampers and 10 cfm per sq. ft on the return dampers.

2. Condenser Coil Hail Guard Assembly (Factory-installed on 3 Phase Models Only. Field-installed on all 3 and 1 Phase Models.)

a. Shall protect against damage from hail.

b. Shall be either hood style or louvered.

2.4 ROOFTOP PACKAGE AIR CONDITIONING UNITS (48HC - 6 Ton to 10 Ton)

A. General:

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.

2. Factory assembled, single piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.

3. Unit shall use Puron® refrigerant.

4. Unit shall be installed in accordance with the manufacturer's instructions.

5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. Quality Assurance:

1. Unit meets ASHRAE 90.1-2016 and IECC-2015 minimum efficiency requirements.

2. 3-phase units are ENERGY STAR[1] qualified.

3. Unit shall be rated in accordance with AHRI Standards 210/240 and 340/360.

4. Unit shall be designed to conform to ASHRAE 15.

5. Unit shall be UL-tested and certified in accordance with ANSI Z21.47 Standards and UL or ETL-listed and certified under Canadian standards as a total package for safety requirements.

6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

7. Unit internal insulation linings shall be resistant to mold growth in accordance with "mold growth and humidity" test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the "Erosion Test" in UL 181, as part of ASTM C1071.

8. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).

9. Roof curb shall be designed to conform to NRCA Standards.

10. Unit shall be subjected to a completely automated run test on the assembly line. The data for each

[1]ENERGY STAR is a registered trademark of the U.S. Environmental Protection Agency.

unit will be stored at the factory, and must be available upon request.

11. Unit shall be designed in accordance with UL Standard 1995, including tested to withstand rain.
12. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
13. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
14. High Efficiency Motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007).

C. Operating Characteristics:

1. Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 340/360 at ± 10% voltage.
2. Compressor with standard controls shall be capable of operation from 35°F (2°C), ambient outdoor temperatures. Accessory kits are necessary if mechanically cooling at ambient temperatures below 35°F (2°C).
3. Unit shall discharge supply air vertically as shown on contract drawings.
4. Unit shall be factory configured and ordered for vertical supply and return configurations.
5. Unit shall be factory furnished in vertical configurations.
6. Unit shall be capable of mixed operation: vertical supply with horizontal return or horizontal supply with vertical return.

D. Electrical Requirements

1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.
2. Control Panel SCCR (short circuit current rating): 5kA RMS at Rated Symmetrical Voltage.

E. Unit Cabinet:

1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°): 60, Hardness: H-2H Pencil hardness.
3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum $^{1}/_{2}$-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.
4. Unit internal insulation linings shall be resistant to mold growth in accordance with “mold growth and humidity” test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the “Erosion Test” in UL 181, as part of ASTM C1071.
5. Base of unit shall have a minimum of four locations for factory thru-the-base gas and electrical connections (factory-installed or field-installed) standard. Connections shall be internal to the cabinet to protect from environmental issues.
6. Base Rail:
    a. Unit shall have base rails on a minimum of 2 sides.
    b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
    c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
    d. Base rail shall be a minimum of 16 gauge thickness.
7. Condensate Pan and Connections:
    a. Shall be a sloped condensate drain pan made of a non-corrosive material.
    b. Shall comply with ASHRAE Standard 62.

c. Shall use a $^{3}/_{4}$-in. 14 NPT drain connection at the end of the drain pan. Connection shall be made per manufacturer's recommendations.

8. Top Panel:
   a. Shall be a multi-piece top panel linked with water tight flanges and interlocking systems.
9. Gas Connections:
   a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
   b. Thru-the-base capability
      i. Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
      ii. Optional, factory-approved, water-tight connection method must be used for thru-the-base gas connections.
      iii. No basepan penetration, other than those authorized by the manufacturer, is permitted.
10. Electrical Connections:
   a. All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location.
   b. Thru-the-base capability
      i. Standard unit shall have a thru-the-base electrical location(s) using a raised, embossed portion of the unit basepan.
      ii. Optional, factory-approved, water-tight connection method must be used for thru-the-base electrical connections.
      iii. No basepan penetration, other than those authorized by the manufacturer, is permitted.
11. Component Access Panels (standard):
   a. Cabinet panels shall be easily removable for servicing.
   b. Unit shall have one factory installed, tool-less, removable, filter access panel.
   c. Panels covering control box and filters shall have molded composite handles while the blower access door shall have an integrated flange for easy removal.
   d. Handles shall be UV modified, composite. permanently attached, and recessed into the panel.
   e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.
   f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

F. Gas Heat:
1. General:
   a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
   b. Shall incorporate a direct-spark ignition system and redundant main gas valve.
   c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer
2. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.
   a. IGC board shall notify users of fault using an LED (light-emitting diode).
   b. The LED shall be visible without removing the control box access panel.
   c. IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high temperature limit switch.
   d. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame roll-out switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED.

3. Stainless Steel Heat Exchanger Construction:
    a. Use energy saving, direct-spark ignition system.
    b. Use a redundant main gas valve.
    c. Burners shall be of the in-shot type constructed of aluminum-coated steel.
    d. All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).
    e. The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gauge type 409 stainless steel.
    f. Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.
    g. Complete stainless steel heat exchanger allows for greater application flexibility.
4. Induced draft combustion motor and blower
    a. Shall be a multi speed direct-drive, single inlet, forward-curved centrifugal type.
    b. Shall be made from steel with a corrosion resistant finish.
    c. Shall have permanently lubricated sealed bearings.
    d. Shall have inherent thermal overload protection.
    e. Shall have an automatic reset feature.

G. Coils:
1. Standard Aluminum Fin-Copper Tube Coils:
    a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
    b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.
    c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

H. Refrigerant Components:
1. Refrigerant circuit shall include the following control, safety, and maintenance features:
    a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
    b. Refrigerant filter drier.
    c. Service gauge connections on suction and discharge lines.
    d. Pressure gauge access through a specially designed access port in the top panel of the unit.
2. There shall be gauge line access port in the skin of the rooftop, covered by a black, removable plug.
    a. The plug shall be easy to remove and replace.
    b. When the plug is removed, the gauge access port shall enable maintenance personnel to route their pressure gauge lines.
    c. This gauge access port shall facilitate correct and accurate condenser pressure readings by enabling the reading with the compressor access panel on.
    d. The plug shall be made of a leak proof, UV-resistant, composite material.
3. Compressors:
    a. Unit shall use one fully hermetic, scroll compressor for each independent refrigeration circuit.
    b. Models shall be available with single compressor/single stage cooling designs on 04-07 models, single compressor/2-stage cooling on 07 size, and 2 compressor/2-stage cooling models on 08-12 sizes.
    c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.

d. Compressors shall be internally protected from high discharge temperature conditions.

e. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.

f. Compressor shall be factory mounted on rubber grommets.

g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

h. Crankcase heaters shall be utilized on all models to protect compressor with specific refrigerant charge.

I. Filter Section:

1. Filters access is specified in the unit cabinet section of this specification.
2. Filters shall be held in place by a preformed slide out filter tray, facilitating easy removal and installation.
3. Shall consist of factory-installed, low velocity, throw-away 2-in. thick fiberglass filters.
4. Filters shall be standard, commercially available sizes.
5. Only one size filter per unit is allowed.

J. Evaporator Fan and Motor

1. Evaporator fan motor:
   a. Shall have permanently lubricated bearings.
   b. Shall have inherent automatic-reset thermal overload protection or circuit breaker.
   c. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.
2. Belt-driven evaporator fan:
   a. Belt drive shall include an adjustable-pitch motor pulley and belt break protection system.
   b. Shall use rigid pillow block bearing system with lubricate fittings at are accessible or lubrication line.
   c. Blower fan shall be double-inlet type with forward-curved blades.
   d. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

K. Condenser Fans and Motors:

1. Condenser fan motors:
   a. Shall be a totally enclosed motor.
   b. Shall use permanently lubricated bearings.
   c. Shall have inherent thermal overload protection with an automatic reset feature.
   d. Shall use a shaft down design on all sizes.
2. Condenser Fans:
   a. Shall be a direct driven propeller type fan.
   b. Shall have aluminum blades riveted to corrosion resistant steel spiders and shall be dynamically balanced.

L. Special Features Options and Accessories:

1. Variable Frequency Drive (VFD). Only available on 2-speed indoor fan motor option (SAV):
   a. Factory-supplied VFDs qualify, through ABB for a 12-month warranty from date of commissioning or 18 months from date of sale, whichever occurs first.
   b. Shall be installed inside the unit cabinet, mounted, wired and tested.
   c. Shall contain Electromagnetic Interference (EMI) frequency protection.

d. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.

e. Self diagnostics with fault and power code LED indicator. Field accessory Display Kit available for further diagnostics and special setup applications.

f. RS485 capability standard.

g. Electronic thermal overload protection.

h. 5% swinging chokes for harmonic reduction and improved power factor.

i. All printed circuit boards shall be conformal coated.

2. Integrated EconoMi$er2, and EconoMi$er X Ultra Low Leak Rate Models. (Factory-installed on 3 phase models only. Field-installed on all 3 and 1 phase models)

3. Condenser Coil Hail Guard Assembly (Factory-installed option on 3-phase models. Field-installed on all 3 and 1 phase models):

a. Shall protect against damage from hail.

b. Shall be of louvered style.

4. Flue Discharge Deflector:

a. Flue discharge deflector shall direct unit exhaust vertically instead of horizontally.

b. Deflector shall be defined as a “natural draft” device by the National Fuel and Gas (NFG) code.

2.5 ROOFTOP PACKAGE AIR CONDITIONING UNITS (48HC - 15 Ton to 25 Ton)

A. General:

1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing hermetic scroll compressor(s) for cooling duty and gas combustion for heating duty.

2. Factory assembled, single piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start-up.

3. Unit shall use Puron® R-410A refrigerant.

4. Unit shall be installed in accordance with the manufacturer’s instructions.

5. Unit must be selected and installed in compliance with local, state, and federal codes.

B. Quality Assurance:

1. Unit meets ASHRAE 90.1-2016 and IECC[2]-2015 minimum efficiency requirements.

2. Units are ENERGY STAR[3] certified where sizes are required.

3. Unit shall be rated in accordance with AHRI Standard 340/360.

4. Unit shall be designed to conform to ASHRAE 15.

5. Unit shall be ETL-tested and certified in accordance with ANSI Z21.47 Standards and ETL-listed and certified under Canadian standards as a total package for safety requirements.

6. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

7. Unit internal insulation linings shall be resistant to mold growth in accordance with “mold growth and humidity” test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the “Erosion Test” in UL 181, as part of ASTM C1071.

[2]IECC is a registered trademark of the International Code Council, Inc.

[3]Energy Star is registered trademark of the United States Department of Energy.

8. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).
9. Roof curb shall be designed to conform to NRCA Standards.
10. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
11. Unit shall be designed in accordance with UL Standard 1995, ETL listed including tested to withstand rain.
12. Unit shall be constructed to prevent intrusion of snow and tested to prevent snow intrusion into the control box up to 40 mph.
13. Unit shake tested to assurance level 1, ASTM D4169 to ensure shipping reliability.
14. High-Efficiency Motors listed shall meet section 313 of the Energy Independence and Security Act of 2007 (EISA 2007).

C. Operating Characteristics:

1. Unit shall be capable of starting and running at 125°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 340/360 at ± 10% voltage.
2. Compressor with standard controls shall be capable of operation from 35°F (2°C), ambient outdoor temperatures. Accessory kits are necessary if mechanically cooling at ambient temperatures below 35°F (2°C).
3. Unit shall discharge supply air vertically as shown on contract drawings.
4. Unit shall be factory configured and ordered for vertical supply and return configurations.
5. Unit shall be factory furnished for either vertical or horizontal configuration without the use of special conversion kits. No field conversion is possible.

D. Electrical Requirements

1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.

E. Unit Cabinet:

1. Unit cabinet shall be constructed of galvanized steel, and shall be bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces.
2. Unit cabinet exterior paint shall be: film thickness, (dry) 0.003 inches minimum, gloss (per ASTM D523, 60°F): 60, Hardness: H-2H Pencil hardness.
3. Evaporator fan compartment interior cabinet insulation shall conform to AHRI Standards 340/360 minimum exterior sweat criteria. Interior surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb density, flexible fiberglass insulation, neoprene coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heat compartment.
4. Unit internal insulation linings shall be resistant to mold growth in accordance with “mold growth and humidity” test in ASTM C1338, G21, and UL 181 or comparable test method. Air stream surfaces shall be evaluated in accordance with the “Erosion Test” in UL 181, as part of ASTM C1071.
5. Base of unit shall have a minimum of four locations for factory thru-the-base gas and electrical connections (factory-installed or field-installed) standard. Connections shall be internal to the cabinet to protect from environmental issues.
6. Base Rail:
    a. Unit shall have base rails on a minimum of 2 sides. Unit shall have base rails on a minimum of 2 sides.
    b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
    c. Holes shall be provided in the base rail for moving the rooftop by fork truck.
    d. Base rail shall be a minimum of 16 gauge thickness.

7. Condensate Pan and Connections:
    a. Shall be a sloped condensate drain pan made of a non-corrosive material.
    b. Shall comply with ASHRAE Standard 62.
    c. Shall use a 3/4-in. 14 NPT drain connection at the end of the drain pan. Connection shall be made per manufacturer's recommendations.
8. Top Panel:
    a. Shall be a multi-piece top panel linked with water tight flanges and interlocking systems.
9. Gas Connections:
    a. All gas piping connecting to unit gas valve shall enter the unit cabinet at a single location on side of unit (horizontal plane).
    b. Thru-the-base capability
        i. Standard unit shall have a thru-the-base gas-line location using a raised, embossed portion of the unit basepan.
        ii. Optional, factory-approved, water-tight connection method must be used for thru-the-base gas connections.
        iii. No basepan penetration, other than those authorized by the manufacturer, is permitted.
10. Electrical Connections:
    a. All unit All unit power wiring shall enter unit cabinet at a single, factory-prepared, knockout location.
    b. Thru-the-base capability
        i. Thru-the-base provisions/connections are available as standard with every unit. When bottom connections are required, field furnished couplings are required.
        ii. No basepan penetration, other than those authorized by the manufacturer, is permitted.
11. Component Access Panels (standard):
    a. Cabinet panels shall be easily removable for servicing.
    b. Unit shall have one factory installed, tool-less, removable, filter access panel.
    c. Panels covering control box and filters shall have molded composite handles while the blower access door shall have an integrated flange for easy removal.
    d. Handles shall be UV modified, composite, permanently attached, and recessed into the panel.
    e. Screws on the vertical portion of all removable access panel shall engage into heat resistant, molded composite collars.
    f. Collars shall be removable and easily replaceable using manufacturer recommended parts.

F. Gas Heat:
1. General:
    a. Heat exchanger shall be an induced draft design. Positive pressure heat exchanger designs shall not be allowed.
    b. Shall incorporate a direct-spark ignition system and redundant main gas valve.
    c. Gas supply pressure at the inlet to the rooftop unit gas valve must match that required by the manufacturer.
2. The heat exchanger shall be controlled by an integrated gas controller (IGC) microprocessor.
    a. IGC board shall notify users of fault using an LED (light-emitting diode).
    b. IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high temperature limit switch.
    c. Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout

switch or 4 continuous short cycles on the high temperature limit switch. Fault indication shall be made using an LED.

3. Stainless Steel Heat Exchanger Construction:
    a. Use energy saving, direct-spark ignition system.
    b. Use a redundant main gas valve.
    c. Burners shall be of the in-shot type constructed of aluminum-coated steel.
    d. All gas piping shall enter the unit cabinet at a single location on side of unit (horizontal plane).
    e. The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gauge type 409 stainless steel.
    f. Type 409 stainless steel shall be used in heat exchanger tubes and vestibule plate.
    g. Complete stainless steel heat exchanger allows for greater application flexibility.
4. Induced draft combustion motor and blower
    a. Shall be a direct-drive, single inlet, forward-curved centrifugal type.
    b. Shall be made from steel with a corrosion-resistant finish.
    c. Shall have permanently lubricated sealed bearings.
    d. Shall have inherent thermal overload protection.
    e. Shall have an automatic reset feature.

G. Coils:
1. Standard Aluminum Fin-Copper Tube Coils:
    a. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
    b. Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.
    c. Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

H. Refrigerant Components:
1. Refrigerant circuit shall include the following control, safety, and maintenance features:
    a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range. Shall contain removable power element to allow change out of power element and bulb without removing the valve body.
    b. Refrigerant filter drier.
    c. Service gauge connections on suction and discharge lines.
    d. Pressure gauge access through a specially designed access screen on the side of the unit.
2. Compressors:
    a. Unit shall use fully hermetic, scroll compressor for each independent refrigeration circuit.
    b. Models shall be available with 2 compressor/2-stage cooling.
    c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
    d. Compressors shall be internally protected from high discharge temperature conditions.
    e. Compressors shall be protected from an over-temperature and over-amperage conditions by an internal, motor overload device.
    f. Compressor shall be factory mounted on rubber grommets.
    g. Compressor motors shall have internal line break thermal, current overload and high pressure differential protection.

h. Crankcase heaters shall not be required for normal operating range, unless provided by the factory.

I. Filter Section:

1. Filters access is specified in the unit cabinet section of this specification.
2. Filters shall be held in place by a preformed slide out filter tray, facilitating easy removal and installation.
3. Shall consist of factory-installed, low velocity, throw-away 2-in. thick fiberglass filters.
4. Filters shall be standard, commercially available sizes.
5. Only one size filter per unit is allowed.

J. Evaporator Fan and Motor

1. Evaporator fan motor:
   a. Shall have inherent automatic-reset thermal overload protection or circuit breaker.
   b. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating shall be required.
2. Belt-driven evaporator fan:
   a. Belt drive shall include an adjustable-pitch motor pulley and belt break protection system.
   b. Shall use rigid pillow block bearing system with lubricate fittings at are accessible or lubrication line.
   c. Blower fan shall be double-inlet type with forward-curved blades.
   d. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.

K. Condenser Fans and Motors:

1. Condenser fan motors:
   a. Shall be a totally enclosed motor.
   b. Shall use permanently lubricated bearings.
   c. Shall have inherent thermal overload protection with an automatic reset feature.
   d. Shall use a shaft down design on all sizes.
2. Condenser Fans:
   a. Shall be a direct driven propeller type fan.
   b. Shall have aluminum blades riveted to corrosion resistant steel spiders and shall be dynamically balanced.

L. Special Features Options and Accessories:

1. Staged Air Volume System (SAV™) for 2-stage cooling models only:
   a. Evaporator Fan Motos:
      i. Shall have permanently lubricated bearings.
      ii. Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
      iii. Shall be Variable Frequency duty and 2-speed control.
      iv. Shall contain motor shaft grounding ring to prevent electrical bearing fluting damage by safely diverting harmful shaft voltages and bearing currents to ground.
2. Variable Frequency Drive (VFD). Only available on 2-speed indoor fan motor option (SAV):
   a. Factory-supplied VFDs qualify, through ABB for a 12-month warranty from date of commissioning or 18 months from date of sale, whichever occurs first.
   b. Shall be installed inside the unit cabinet, mounted, wired and tested.

c. Shall contain Electromagnetic Interference (EMI) frequency protection.

d. Insulated Gate Bi-Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform, allowing for quiet motor operation.

e. Self diagnostics with fault and power code LED indicator. Field accessory Display Kit available for further diagnostics and special setup applications.

f. RS485 capability standard.

g. Electronic thermal overload protection.

h. 5% swinging chokes for harmonic reduction and improved power factor.

i. All printed circuit boards shall be conformal coated.

3. Integrated EconoMi$er2, and EconoMi$er X Ultra Low Leak rate models. (Factory-installed on 3-phase models only. Field-installed on all 3 and 1-phase models):

a. Integrated, gear driven opposing modulating blade design type capable of simultaneous economizer and compressor operation.

b. Independent modules for vertical or horizontal return configuration shall be available. Vertical return modules shall be available as a factory-installed option.

c. Damper blades shall be galvanized steel with composite gears. Plastic or composite blades on intake or return shall not be acceptable.

d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below setpoints.

e. Shall be equipped with gear driven dampers for both the outdoor ventilation air and the return air for positive air stream control.

f. Ultra Low Leak design meets California Title 24 section 140.4 and, ASHRAE 90.1-2016 and IECC-2015 requirements for 4 cfm per sq. ft. on the outside air dampers and 10 cfm per sq. ft. on the return dampers.

g. Economizer controller on EconoMi$er X models shall provide:

i. 2-line LCD interface screen for setup, configuration and troubleshooting.

ii. On-board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, per California Title 24.

iii. Sensor failure loss of communication identification.

iv. Automatic sensor detection.

v. Capabilities for use with multiple-speed indoor fan systems.

vi. Utilize digital sensors: Dry bulb and Enthalpy.

h. Economizer controller on EconoMi$er® 2 models with RTU Open controller shall be a 4-20mA design controlled directly by the RTU Open controller. RTU Open controller meets California Title 24 Fault Detection and Diagnostic (FDD) requirements.

i. Shall be capable of introducing up to 100% outdoor air.

j. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1-2016 and IECC-2015 requirements.

k. Shall be designed to close damper(s) during loss-of-power situations with spring return built into motor.

l. Dry bulb outdoor air temperature sensor shall be provided as standard. Enthalpy sensor is also available on factory-installed only. Outdoor air sensor setpoint shall be adjustable and shall range from 40 to 100°F (4 to 38°C). Additional sensor options shall be available as accessories.

m. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.

n. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.

o. Dampers shall be completely closed when the unit is in the unoccupied mode.

p. Economizer controller shall accept a 2-10 Vdc CO_2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.

q. Compressor lockout temperature on W7220 is adjustable from –45°F to 80°F, set at a factory default of 32°F. Others shall open at 35°F (2°C) and closes at 50°F (10°C).

r. Actuator shall be direct coupled to economizer gear. No linkage arms or control rods shall be acceptable.

s. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust.

4. Condenser Coil Hail Guard Assembly:

a. Shall protect against damage from hail.

b. Shall be of louvered style.

5. Flue Discharge Deflector:

a. Flue discharge deflector shall direct unit exhaust vertically instead of horizontally.

b. Deflector shall be defined as a “natural draft” device by the National Fuel and Gas (NFG) code.

2.6 CEILING EXHAUST FANS

A. See the sizes and capacities indicated on the drawings, complete with direct drive blower, motor, grille, housing, mounting frame, backdraft damper, roof or wall cap discharge, U.L. label and shall be tested and rated in accordance with the applicable AMCA Codes.

B. Accessories.

1. See equipment schedule.

2. Provide fan speed control for air balance purposes.

2.7 ROOF-TOP EXHAUST FANS

A. Centrifugal Fan Unit:

B. Accessories.

1. See equipment schedule.

2. Provide fan speed control for air balance purposes.

2.9 FIRE AND SMOKE/FIRE DAMPERS.

A. See mechanical plans.

2.10 DUCTWORK AND ACCESSORIES

A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.

B. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz per sq. ft. for each side in conformance with ASTM A90. Round duct shall be spiral seam construction.

C. Spiral Ducts: Interlocking spiral of galvanized steel or aluminum construction; rated to (2 inches WG positive and 1.5 inches WG negative for low pressure ducts) (and 15 inches WG positive or negative for medium high pressure ducts.)

D. Insulated Flexible Ducts: Flexible duct wrapped with flexible glass fiber insulation, enclosed by Pressure Ductwork: seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F w/metal connectors.

E. All flex ducts shall not exceed 5'-0" in length to respective diffusers, registers, and etc.

F. Fasteners: Rivets, bolts, or sheet metal screws.

G. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

H. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

I. Low Pressure Ducts:

1. Fabricate and support in accordance with 2019 CMC, SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Gages for galvanized steel ducts for low pressure systems where velocities do not exceed 2000 FPM shall be as follows:

RECTANGULAR DUCT		ROUND DUCT	
Dimension of Largest Side (L) in Inches	Gage	Diameter (D) in Inches	Ga.
L≤12	26	D<9	26
12≤L≤30	24	9≤D<14	24
30<L≤54	22	14≤D<23	22
54<L≤84	20	23≤D<37	20
84<L	18	37≤D<51	18
		51≤D<61	16
		61≤D<84	14

2. All joint and seam constructions as indicated in the CMC are acceptable.

3. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

4. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes.

5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

6. Use double nuts and lock washers on threaded rod supports.

J. Volume Control Dampers:

1. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

2. Opposed blade dampers shall have factory-fabricated blades, with factory assembled linkages, mounted in frames. Blades shall have interlocking edges and ends. Rectangular dampers 6" or more wide, shall be the multi-blade type. Blades on multi-blade type dampers must not be over 6" wide. Dampers shall be of the opposed blade type. Dampers shall have bar or channel frames and corner bracing. All blade and linkage bearings shall be self lubricating plastic. Damper assembly leakage not to exceed 1% with 4.0 W.C. static pressure.

3. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

4. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

K. Duct Test Holes:

1. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.11 REFRIGERANT PIPING

A. Insulation and covering on all pipe and tubing shall have flame spread rating not to exceed 25 and a smoke density not to exceed 50 when tested in accordance with CMC.

B. Support in accordance with SMACNA Pipe Bracing Requirements.

C. Refrigeration Piping: Type 'L' hard temper copper tubing with wrought copper fittings, silver brazed, suitable for 400 psi working pressure.

2.12 DIFFUSERS, REGISTERS, AND GRILLES:

A. Fabricate of steel with steel or aluminum frame and baked enamel off-white finish.

B. Provide opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face as indicated on the drawings.

C. Ceiling Diffusers (CD): Krueger Model 124O, 4-way throw, with balancing damper, or approved equal.

D. Supply Register (SR) and Exhaust Register (EG): Krueger Type 88OH and S8OH, steel with opposed blade damper, or approved equal.

E. Accessories: See equipment schedule.

2.13 THERMOSTATS

A. EMS system.

1. Carrier.
2. Approved Equal

2.14 CONTROLS

A. The Mechanical Contractor shall be responsible for the proper coordination of all control work and electrical work in connection therewith. He shall also be responsible for the proper operation of the entire system.

B. The Electrical Contractor shall furnish and install all line voltage control wiring, and in all conduit. Wire sizing and length of run shall be coordinated with the manufacturer and Electrical Engineer. The Mechanical Contractor shall furnish and install all low voltage control wiring, and in conduit.

C. Electrical Work: All electric relays, hand-off automatic switches and all electrical wiring and all conduit will be provided under the Electrical Section, except as otherwise specified. Furnish and install additional conduit, wiring, relays, hand-off automatic switches made necessary by the use of approved substituted equipment under this Section with no additional cost to the owner.

D. Refer to drawings for control diagrams and additional requirements.

E. Calibration of Controls: The Mechanical Contractor shall carefully calibrate and adjust all controls as required to maintain comfort conditions and maximum energy conservation.

2.15 INSULATION

A. General:

1. All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire smoke hazard ratings as tested by procedure ASTM E84, NFPA 255 and UL 723 not exceeding:

Flame Spread: 25

Smoke Developed: 50

2. All products or their shipping cartons shall bear a label indicating that flame and smoke ratings do not exceed above requirements. Any treatment of jackets or facings to impart flame and smoke safety shall meet the above requirements.

3. The Contractor shall certify that all products used have met the above criteria.

4. The insulation values shown are a minimum. If the requirements of Title 24 exceed these values,

the amount of and/or type must be increased to meet the Title 24 requirements.

B. Duct Insulation:

1. Fiberglass Duct Wrap:

a. Insulation: ASTM C553; flexible, noncombustible blanket.

1) 'K' value: ASTM C518, 0.48 at 75 degrees F.

2) Maximum service temperature: 250 degrees F.

3) Density: 0.75 lb/ ft^3.

b. Vapor Barrier Jacket:

1) Kraft paper reinforced with glass fiber yarn and bonded to aluminized film vinyl.

2) Moisture vapor transmission: ASTM E96; 0.5 perm.

3) Secure with pressure sensitive tape.

c. Vapor Barrier Tape: Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

d. Tile Wire: Annealed steel, 16 gage.

2. Glass Fiber Duct Liner, Flexible:

a. Insulation: ASTM C553; flexible, noncombustible blanket.

1) 'K' value: ASTM C518, 0.24 at 75 degrees F.

2) Maximum service temperature: 250 degrees F.

3) Density: 1.5 to 3.0 lb/ft3.

4) Maximum Velocity on Coated Air Side: 4,000 ft/min.

b. Adhesive: Waterproof (fire-retardant) type.

c. Liner Fasteners: Galvanized steel, self-adhesive pad.

3. Glass Fiber Duct Liner, Rigid:

a. Insulation: ASTM C612; semi-rigid, noncombustible.

1) 'K' value: ASTM C518, 0.24 at 75 degrees F.

2) Maximum service temperature: 250 degrees F.

3) Density: 1.5 to 3.0 lb/cu ft.

4) Maximum Velocity on Coated Air Side: 4,000.

b. Adhesive: Waterproof (fire-retardant) type.

3. PART 3 - EXECUTION

3.1 GENERAL

A. Install all equipment in locations indicated on the Drawings. Contractor will be responsible to verify with the owner, if suitability is doubted. Contractor shall notify the owner before installation into any apparent improper locations of interference with other work such as electrical outlets, windows, cabinetwork or other features.

3.2 INSTALLATION

A. Rooftop Package Unit Air Conditioner: Install in accordance with manufacturer's instructions. Mount units on factory built roof-mounting frame providing watertight enclosure to protect ductwork and utility services, or on platforms. Install roof mounting frame level.

B. Ductwork and Accessories:

1. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
2. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
3. Install accessories in accordance with manufacturer's instructions and to meet the provisions of “Seismic Restraint Manual: Guidelines For Mechanical Systems,” Latest SMACNA guidelines.
4. Provide balancing dampers at points on low-pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.
5. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
6. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 12x 12 inch size for hand access, 30 x 30 inch size for shoulder access, and as indicated.
7. Provide duct test holes where indicated and required for testing and balancing purposes.
8. Check location of outlets and inlets and make necessary adjustments in position to conform to Architectural features, symmetry, and lighting arrangement.
9. Install diffusers to ductwork with airtight connection.
10. Provide balancing dampers on duct take-off to diffusers and registers, regardless of whether dampers are specified as part of the diffuser, or register assembly.
11. Paint ductwork visible behind air outlets and inlets matte black.

C. Thermostats and over-ride switches: Install at 48" above finished floor unless otherwise stated. Coordinate with other trades. Contractor shall be responsible for verifying, furnishing all controls and wiring for thermostats and shall co-ordinate all requirements with other trades including notifying electrical contractor of necessary conduit and power requirements. All costs for scope of work shall be submitted for final bid.

D. Insulation:

1. Duct Insulation:
    a. Unless specifically indicated on the drawings the Contractor may line or wrap ductwork to meet insulation requirements.
    b. Fiberglass duct wrap:
        1) Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
        2) Secure insulation without vapor barrier with staples, tape, or wires.
        3) Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
        4) Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
        5) Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
    c. Duct (and Plenum) liner Application:
        1) Install as indicated (sound lining) on the drawings.
        2) Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing. Seal and smooth joints. Seal liner surface penetrations with adhesive.
        3) Duct dimensions indicated are net inside dimensions required for airflow. Increase

duct size to allow for insulation thickness.

E. Install Spring Curb Rail vibration isolation system per manufacturer's recommendations. Provide seismic clips (each end of each side –8 total) from A/C unit to roof curb, and z straps from A/C unit to equipment curb per manufacturer's recommendations. Submit shop drawings for location of points of attachment, and methods and materials.

3.3 CLEANING:

A. See duct cleaning specification section 23 01 30.51.

B. All filters shall be replaced one week prior to occupancy of owner.

C. Coordinate schedule with Architect & District.

3.4 AIR SYSTEM TEST AND BALANCE

A. See specification 23 05 93 for TESTING, ADJUSTING, AND BALANCING .

3.5 SOUND AND VIBRATION ISOLATION

A. All vibrating equipment shall be sound isolated from the structure.

B. The Contractor shall submit all necessary data for each vibration isolator, including static deflection and weight loading, for equipment in operation.

C. All vibrating equipment shall be provided with flexible connections. Submit for approval prior to installation.

3.6 Job Completion

A. Equipment Identification:

1. All equipment furnished under this section shall be provided with the manufacturer's metal identification labels securely attached and showing all pertinent data, including performance characteristics, size, model, and serial number. Labels shall not be obscured in any manner.

2. Identification name plates shall be provided on all equipment and control components, including room thermostat numbers coded to their respective automatic zone damper, valve, or air conditioning unit. Name plates shall be constructed of black bakelite with white center engraved letters three-sixteenth inch (3/16") high and shall be cemented to equipment with an epoxy resin. The Contractor shall submit to the Architect, a complete list of name plate titles for approval prior to installation.

B. Final Operation: Upon completion of the installation of the equipment and after all systems have been tested, cleaned, the Contractor shall place a competent person in charge who shall operate the equipment for a period of three eight-hour days. During this period of operation, all safety and operating controls shall be actuated to demonstrate proper operation. During this operating period, the Owner's representative shall be instructed in all details of operation and maintenance. All required instructions from the equipment manufacturer's representative shall be given during the period.

C. Operation Instructions:

1. Prepare a diagram of the entire control system with a full description of the heating, ventilating and air conditioning systems.

2. After approval by the Engineer, the control diagram and complete operating instructions shall be mounted under glass and installed where directed.

3. Prepare maintenance manuals in electronic format which shall include all the necessary or pertinent data, such as:

a. Names, addresses and emergency phone numbers of all suppliers and manufacturers.

b. Part numbers of all replaceable items.

c. Oiling and lubrication instructions.

d. Air balance report.

e. Control diagram and operation sequence, together with labeling of controls and instruments to match the diagram.

f. A maintenance schedule which shall list all required maintenance on all equipment furnished under this section of the specifications and the intervals of which the items are to be performed.

D. Clean-Up:

1. After all heating, ventilating and air conditioning work has been tested and approved, the Contractor shall thoroughly clean all parts of the equipment installation. Exposed parts which are to be painted are to be thoroughly cleaned of cement plaster and other materials and all greases and oil spots removed with solvent. Exposed rough metal work to be carefully brushed down with steel brushes to remove rust and other spots and left in proper condition to receive painter's finish.

2. Remove all debris from the job site, all cartons, boxes, packing crates, excess materials not used occasioned by the work and to the satisfaction of the Owner.

3. If the above requirements of clean-up are not to the satisfaction of the Owner, the Owner reserves the right to order the work done and the cost of which shall be borne by the Contractor.

4. The Contractor shall remove on a daily basis all debris from the job site, to the satisfaction of the Owner.

5. If the above requirements of clean-up are not to the satisfaction of the Owner, the Owner reserves the right to order the work done by a third party and the cost of which shall be borne by the Contractor.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

    a. Constant-volume air systems.
    b. Multizone systems.
    c. Induction-unit systems.
2. Duct leakage tests.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: If requested by the Owner, conduct a TAB conference at Project site. Insert after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:

    a. The Contract Documents examination report.
    b. The TAB plan.
    c. Needs for coordination and cooperation of trades and subcontractors.
    d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. System Readiness Checklists: Within 30 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Sample report forms.

H. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
2. TAB Technician: Employee of the TAB specialist and certified by AABC as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.7 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.

2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 00 00.
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 00 00 "Duct Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP**)** units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 23 00 00 – 2.4 Ductwork and Accessories.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Architect/Engineer of Record for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record fan and motor operating data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.

3.9 DUCT LEAKAGE TESTS

A. Witness the duct pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified tolerances.

C. Report deficiencies observed.

3.10 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.11 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Contractor to provide the necessary sheaves, pulleys and other accessories needed to meet the tolerance requirements.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.12 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.13 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.

2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Terminal units.
4. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches (mm), and bore.
    i. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches (mm), and bore.
    f. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm (L/s).
    b. Total system static pressure in inches wg (Pa).
    c. Fan rpm.
    d. Discharge static pressure in inches wg (Pa).
    e. Filter static-pressure differential in inches wg (Pa).
    f. Preheat-coil static-pressure differential in inches wg (Pa).
    g. Cooling-coil static-pressure differential in inches wg (Pa).
    h. Heating-coil static-pressure differential in inches wg (Pa).
    i. Outdoor airflow in cfm (L/s).
    j. Return airflow in cfm (L/s).
    k. Outdoor-air damper position.
    l. Return-air damper position.
    m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch (mm) o.c.
    f. Make and model number.
    g. Face area in sq. ft. (sq. m).
    h. Tube size in NPS (DN).
    i. Tube and fin materials.
    j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm (L/s).
    b. Average face velocity in fpm (m/s).
    c. Air pressure drop in inches wg (Pa).
    d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
    e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
    f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
    g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
    h. Water flow rate in gpm (L/s).
    i. Water pressure differential in feet of head or psig (kPa).
    j. Entering-water temperature in deg F (deg C).
    k. Leaving-water temperature in deg F (deg C).
    l. Refrigerant expansion valve and refrigerant types.
    m. Refrigerant suction pressure in psig (kPa).
    n. Refrigerant suction temperature in deg F (deg C).
    o. Inlet steam pressure in psig (kPa).

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Fuel type in input data.
    g. Output capacity in Btu/h (kW).
    h. Ignition type.
    i. Burner-control types.
    j. Motor horsepower and rpm.
    k. Motor volts, phase, and hertz.
    l. Motor full-load amperage and service factor.
    m. Sheave make, size in inches (mm), and bore.
    n. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

2. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm (L/s).
    b. Entering-air temperature in deg F (deg C).
    c. Leaving-air temperature in deg F (deg C).
    d. Air temperature differential in deg F (deg C).
    e. Entering-air static pressure in inches wg (Pa).
    f. Leaving-air static pressure in inches wg (Pa).
    g. Air static-pressure differential in inches wg (Pa).
    h. Low-fire fuel input in Btu/h (kW).
    i. High-fire fuel input in Btu/h (kW).
    j. Manifold pressure in psig (kPa).
    k. High-temperature-limit setting in deg F (deg C).
    l. Operating set point in Btu/h (kW).
    m. Motor voltage at each connection.
    n. Motor amperage for each phase.
    o. Heating value of fuel in Btu/h (kW).

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches (mm), and bore.
    h. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches (mm), and bore.
    f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
    g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm (L/s).

b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. (sq. m).
g. Indicated airflow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual airflow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

J. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary airflow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final airflow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in deg F (deg C).

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm (L/s).
b. Entering-water temperature in deg F (deg C).

c. Leaving-water temperature in deg F (deg C).
d. Water pressure drop in feet of head or psig (kPa).
e. Entering-air temperature in deg F (deg C).
f. Leaving-air temperature in deg F (deg C).

L. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.14 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.

B. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, Owner may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.15 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 09 23

DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. The Direct-Digital Control (DDC) System specified herein shall include materials, operator workstation, building controllers, sensors, control valves, wiring, installation, start-up, testing, documentation and training for a complete operable system as required for this project.

B. Controls Engineering shall be provided by the local controls manufacturer representative.

C. Work specified under this section shall be performed by, or under the direct supervision of the local controls manufacturer representative, or by a contractor that is certified by the controls manufacture to perform all work within Section 23 09 00 Instrumentation and Control for HVAC and those sections of 23 09 00 that have been specified herein.

D. Alternate techniques, modifications or changes to any aspect of these specifications may be submitted as a voluntary alternate no later than (15) days prior to the bid date and with sufficient information for a complete evaluation. This information shall include product data sheets, a UL508A Standard for Industrial Control Panels statement of compliance for any locally manufactured control panels, a detailed sequence of operation and engineered shop drawing. Shop drawings shall include the following as a minimum. Point to point wiring diagrams for each piece of equipment to be controlled, a network riser diagram that will depict quantity and location of the operator workstation, controllers, routers and repeaters required for this project.

1.2 RELATED SECTIONS

A. Section 23 00 00 - HEATING, VENTILATION AND AIR CONDITIONING.

B. Section 26 00 00 – ELECTRICAL

1.3 SUBMITTALS

A. Submit engineered shop drawings, sequences of operation, third party equipment and controls integration points and product data sheets covering all items of equipment for the proposed system prior to installation for approval. Any deviation from the contract documents shall be noted and the drawings signed and dated by the Contractor. Additionally, submit a UL508A Standard for Industrial Control Panels statement of compliance for any locally manufactured control panels.

B. After completion of the installation and commissioning, a full set of as-built documentation shall be turned over to the Owner. The as-built shall include operation and maintenance manuals, sequence of operation, shop drawings and digital copies of the following.
   1. Complete DDC System database backup
   2. Source files for all custom written controller applications
   3. Source files for graphics if required for this project

1.4 WARRANTY

A. Components, system software, and parts shall be guaranteed against defects in materials, fabrication, and execution for (1) year from date of system acceptance. Provide labor and materials to repair, reprogram, or replace components at no charge to the Owner during the warranty period.

B. Provide a list of applicable warranties for components, this list shall include warranty information, names, addresses, telephone numbers, and procedures for filing a claim and obtaining warranty services.

C. Respond to the Owner's request for warranty service within (24) hours during normal business hours. Submit records of the nature of the call, the work performed, and the parts replaced or service rendered.

D. Contractor shall request VPN access from owner and provide remote maintenance, software updates and repair service for the duration of the warranty period.

1.5 TRAINING

A. Provide a competent instructor who is factory trained and has comprehensive knowledge of system components and operations to provide full instructions to designated personnel in the system operation, maintenance, and programming. Training shall be specifically oriented to installed equipment and systems.

B. Provide (8) hours of onsite owner familiarization and training for the installed system. Training shall include system overview, time schedules, emergency operation, and programming and report generation.

C. Owner employees attending this training session shall be provided with the following documentation:
1. System layout point to point connection diagram.
2. System components cut sheets.
3. Operations and maintenance data.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Do not store or install electronic hardware on the project until non-condensing environmental conditions have been established.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. DDC Equipment: Carrier OPEN BACnet Controls. No substitutions will be accepted.

B. Controls installation will be by Carrier Controls Expert Dealer.

C. The local manufacture representative will operate a free 40 hour a week, toll free customer support hotline for additional user support services that are required.

2.2 SYSTEM LISTING COMPLIANCE

A. Locally manufactured control panels shall meet all requirements as outlined by UL 508A standard and shall be both approved and listed by Underwriters Laboratories, Inc.

2.3 COMMUNICATION

A. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

C. Use owner provided Ethernet backbone for network segments.

2.4 OPERATOR INTERFACE

A. Description. The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and a stand-alone web server operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the

network. Operators with sufficient access level shall have an ability to make changes to all system and equipment graphics in the web server in addition to having full DDC system access to make configuration changes to the control system. Any tools required for making graphic changes shall be provided with web server.

B. Operator Interface. Furnish (1) Web server interface as shown on the system drawings.
   1. With the use of an owner provided remote SMTP email server the operators interface web server shall notify personnel of an alarm and record information about an alarm in the DDC system.
   2. Any required installation or commissioning software shall be provided to the owner.

C. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:
   1. Log In and Log Out
   2. Point-and-click Navigation
   3. View and Adjust Equipment Properties
   4. View and Adjust Operating Schedules
   5. View and Respond to Alarms
   6. View and Configure Trends
   7. Manage Control System Hardware
   8. Manage Operator Access

D. System Graphics. Operator interface shall be graphical and shall include at least one graphic per piece of equipment and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

E. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs.

F. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Furnish the following standard system reports.
   1. Alarm Reports
   2. Schedule Reports
   3. Security Reports
   4. Commissioning Reports
   5. Equipment Reports

G. Energy Conservation
   1. Outside Air Lockout. Lock out heating or cooling modes based on configurable outside air temperature limits.
   2. Demand Limiting
      a. System shall monitor building power consumption from building power meter pulse generator signals or from building feeder line watt transducer or current transformer.
      b. The system shall include all required hardware and software necessary to receive an Automated Demand Response (ADR) signal from the utilities Demand Response Automation Server (DRAS).
      c. When power consumption exceeds adjustable levels, or the system receives an ADR signal from the utility, the system shall automatically adjust set points, and take other programmatic actions to reduce demand.
   3. Optimal Start. The system shall bring the conditioned space to within occupied set points prior to the occupied time period to ensure occupant comfort.
   4. Demand Controlled Ventilation (DCV).Each controlled space shall have a Carbon Dioxide (CO2) sensor and shall maintain a ventilation setpoint through a DCV algorithm to fulfill the requirements of ASHRAE standard, 62-1989 “Ventilation for Acceptable Indoor Air Quality” (including Addendum 62a-1990).

2.5 CONTROLLERS

A. General. The control system shall be available as a complete package with the required input sensors and devices readily available. Provide BACnet Building Controllers (BC), Advanced Application Con

trollers (AAC), Application Specific Controllers (ASC), and Sensors (SEN) as required.

B. Stand-Alone Operation. Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of communication failure.

C. Serviceability. Controllers shall have diagnostic LEDs for power, communication, and processor.

D. Rooftop Unit Controller (RTC). Defined as Application Specific Controllers (ASC), shall be factory installed by the HVAC manufacturer and shall control all associated HVAC rooftop equipment functions in a single zone application or as part of a zoning system application.
   1. Capacity control shall be based by the RTC internal time clock and setpoints (cooling and heating) coupled with a communicating room sensor. The controls shall provide separate occupied and unoccupied cooling and heating setpoints.
   2. RTC shall utilize up to 2 speed of fan control, up to 3 stages of cooling, and up to 4 stages of heating.
   3. RTC shall provide economizer control that has been certified for Fault Detection and Diagnostics (FDD) by California Energy Commission (CEC). The FDD system shall detect the following faults:
      a. Air temperature sensor failure/fault
      b. Not economizing when it should
      c. Economizing when it should not
      d. Damper not modulating
      e. Excess outdoor air

E. General Purpose Controller. Defined as Advanced Application Controller (AAC) shall be a solid state micro-controller with pre-tested and factory configured software designed for controlling building equipment using DDC algorithms and facility management routines. The controller shall be capable of operating in either a stand-alone mode or as part of a network.

2.6 FIELD INSTALLED SENSORS

A. Space Temperature Sensors shall communicate to the controller over a 4-wire communication network and have setpoint adjustment, after hours override, occupancy sensor, LCD display and a communication service port.

B. Carbon dioxide sensor (CO2) shall be integrated into the Space Temperature Sensors and have integral programming to perform automatic baseline calibration without user interface. The recommended manual recalibration period shall not be less than five years.

C. Status indication for fans or pumps shall be provided by current sensing switch. The sensor shall be installed at the motor starter or motor to provide load indication. The unit shall consist of a current transformer, a solid state current sensing circuit (with adjustable set point) and a solid state switch. A light emitting diode (LED) shall indicate the on off status of the unit.

2.7 CONTROL PANELS

A. Provide single-door, UL 508A Listed; NEMA Type 1, 3R or 4 to match environmental conditions, wall-mount enclosures for each system under automatic control. Mount relays, switches, and controllers in cabinet and indicators, pilot lights, push buttons and switches flush on enclosure exterior face as required.

B. Fabricate panels from 16 gauge steel with ANSI 61 gray finish and shall include (1) black padlock handle that will accommodate a padlock with up to a 5/16-in. locking bar for secure access to the enclosure contents. All additional latches shall be black non-locking handle type.

C. Provide engraved name plates that identify each control panel and for each component mounted to the exterior of the enclosure.

D. Provide a complete wiring diagram, bill of material for all components and markings with the following information:
   1. Manufacturer’s name or trademark
   2. Supply voltage, number of phases, frequency, and full-load current for each incoming supply circuit

3. Enclosure type number

PART 3 EXECUTION

3.1 ELECTRICAL WIRING

A. This contractor is responsible for all low voltage electrical installation and wiring for a fully operational DDC System as shown on the drawings and shall perform electrical installation in accordance with local and national electrical codes and in accordance with Division 26.

B. Install all HVAC control wiring, 24vdc or less, in electrical metallic tubing (EMT) when wire is concealed in walls and in exposed areas. Rigid metal conduit (RMC) will be used when conduit will be installed on roofs. Plenum wire may be used in ceilings where anchored support is provided every 10 feet.

C. Electrical Contractor is responsible for providing power from local electrical panels to the DDC System control panels.

3.2 ACCEPTANCE PROCEDURE

A. Upon completion of the installation, the contractor shall start-up the system and perform all necessary calibration and testing to ensure the proper operation of the DDC System.

B. After all calibration and testing have been completed, the contractor shall schedule a hardware demonstration and system acceptance test to be performed in the presence of the designated owner's representatives.

C. The contractor shall be a member of the designated Commissioning Team and shall be responsible for performing procedures presented in specification and contract drawings as detailed in the Functional Performance Tests (FPT).

END OF SECTION

SECTION 260000

GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Work of this section includes everything necessary for or incidental to completing the electrical work, to provide a complete and operable electrical system, except as herein specifically excluded.

1.2 GENERAL REQUIREMENTS

A. Electrical System Characteristics: 208/120V. 3PH, 4W., 208/120V. 1PH, 3W.

B. Guarantee: Furnish a written guarantee for a period of one-year from date of acceptance.

C. Codes and Regulations: Work done under this Section shall comply with the latest edition of the following: California Electrical Code, State of California Title 24, State Building Standards, Occupational Safety and Health Administration (OSHA) requirements, State of California Title 17 and to all local codes having jurisdiction. In the case where the codes have different levels of requirements, the most stringent rule shall apply.

D. Wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, circuit breakers, etc., (all materials), arises on the Drawing and/or Specifications, the Contractor shall be responsible for providing and installing all material and services required by the strictest condition noted on Drawings and/or in Specifications to insure complete and operable systems as required by the Owner and Engineer.

E. The General and Supplementary Conditions, as well as Special Conditions apply in addition to items in the Electrical Section. Special attention is directed to the following sections:

1. Drawings and Specifications at the site.
2. Shop drawings and samples.
3. Record drawings.
4. Cutting and Patching.
5. Cleaning up.
6. Guarantee.
7. Tests.

F. Additional Work: Refer to Mechanical and Plumbing specifications for additional Electrical requirements.

G. Provide minimum of twenty percent (20%) spare fuses of each size specified on plan, and low voltage system devices.

H. Testing:

1. Scan:
   a. Infrascan test of the existing power distribution system affected by the building addition (i.e. panels, switchboards) and the new branch circuit panels shall be required.
   b. Infrascan certified reports shall be submitted on completion to the Owner and Engineer.
   c. Scans shall be performed by an independent testing laboratory with total connected loads in operation.

2. Megger:
   a. New branch circuit - phase, neutral and ground conductors.
   b. New insulated bonding conductors.

3. All circuits shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.

4. Grounding System: Shall be tested by an independent testing laboratory to meet resistance specified in Part 3.1, D.3 of these Specifications. It shall be this Contractor's responsibility to make adjustments, as required, to upgrade non-complying systems to proper and safe operation.

5. All certified testing reports shall be submitted to the Owner at completion of project.

I. All Core Cutting, Drilling, and Patching:

1. For the installation of work under this Section, the aforementioned shall be performed under this Section of the Specifications and the Concrete section of the Specifications.

2. No holes will be allowed in any structural members without the written approval of D.S.A. or the Structural Engineer.

3. For penetrations of concrete slabs or concrete footings, the work will be as directed in the Concrete Section of Specifications.

4. The contractor shall be responsible for patching and repairing surfaces where he is required to penetrate for work under this contract.

5. Penetrations shall be sealed to meet the rated integrity of the surface required to be patched and repaired. The patched surface shall be painted or finished to match the existing surface.

J. Verifying Drawings and Job Conditions:

1. This Contractor shall examine all Drawings and Specifications in a manner to be fully cognizant of all work required under this Section.

2. This Contractor shall visit the site and verify existing conditions. Where existing conditions differ from Drawings, adjustment shall be made and allowances included for all necessary equipment to complete all parts of the Drawings and Specifications.

K. Shop Drawings:

1. Drawings shall be submitted in six (6) bound sets accompanied by Letter of Transmittal, which shall give a list of the number and dates of the drawings submitted. Drawings shall be complete in every respect and bound in sets.

2. The Drawings submitted shall be marked with the name of the project, numbered consecutively and bear the approval of the Contractor as evidence that the Drawings have

been checked by the Contractor. Any Drawings submitted without this approval will be returned to the Contractor for resubmission.

3. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment which may be caused by the substitution. Samples shall be submitted when requested.

4. Shop drawings shall be submitted on the following but not limited to:

   a. Branch circuit/Distribution panels – Circuit Breakers and mounting hardware.

   b. Fire alarm system.

   c. Pull and Junction boxes.

   d. Wire/Cable.

   e. Conduit and fittings.

   f. Conduit supports.

   g. Communications system (Paging, Security, Clock).

   h. Safety/Disconnect swtiches.

   i. Receptacles.

L. Drawings of Record: The Contractor shall provide and keep up-to-date, a complete record set of blueprints. These shall be corrected daily and show every change from the original Drawings. This set of prints shall be kept on the job site and shall be used only as a record set. This shall not be construed as authorization for the Contractor to make changes in the layout without definite instruction in each case. Upon completion of the work, a set of reproducible Contract Drawings shall be obtained from the General Contractor and all changes as noted on the record set of prints shall be incorporated thereon with black ink in a neat, legible, understandable and professional manner. Refer to the Supplementary General Conditions for complete requirements.

1.3 WORK IN COOPERATION WITH OTHER TRADES

A. Examine the Drawings and Specifications and determine the work to be performed by the site utilities contractor, electrical, mechanical, plumbing, building contractor and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, disconnects, relays, and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment.

B. Provide power and control circuits, conduit and wire as indicated on the Mechanical and Plumbing drawings as required for complete and operable systems.

C. The electrical contractor shall be responsible for obtaining back-boxes for all communication/ signal system devices/equipment from the low voltage contractor’s for rough-in. He shall coordinate the delivery of the backboxes to avoid building construction delays. In the event that the backboxes are not delivered as scheduled, the electrical contractor shall be responsible for installing the correct backboxes, patching and refinishing walls disturbed by the installation of the subject backboxes.

1.4 TESTING AND ADJUSTMENT

A. Upon completion of all electrical work, this Contractor shall test all circuits, switches, motors, breakers, motor starter(s) and their auxiliary circuits and any other electrical items to insure perfect operation of all electrical equipment.

B. Equipment and parts in need of correction and discovered during such testing shall be immediately repaired or replaced with all new equipment and that part of the system shall then be retested. All such replacement or repair shall be done at no additional cost to the Owner.

C. All circuit shall be tested for continuity and circuit integrity. Adjustments hall be made for circuits not complying with testing criteria.

D. All certified testing reports shall be submitted to the Engineer at completion of project.

1.5 IDENTIFICATION

A. Identification nameplates shall be Micarta 1/8" thick and of approved size, with bevelled edges and engraved white letters 1/4" high minimum on black background. Nameplates shall be provided for all circuits in the distribution switchboards, and selector switches. Inscriptions on equipment shall be identical to those indicated in panels and/or motor control centers and other similar devices. Each nameplate shall be provided with drillings and suitable mounting screws corresponding to finish of the nameplate. The inscriptions in each nameplate shall be as indicated on the Drawings.

B. Identification of Air Conditioning Equipment: Equipment to be so identified shall include, but shall not be limited to: Pressure and temperature controllers; switches; equipment motors and boxes or cans housing other control items. Mechanical equipment nameplates shall have letters a minimum of 3/8" high.

1.6 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRINGDIAGRAMS

A. Prior to final acceptance of the job, the Electrical Contractor shall furnish to the Owner at least four (4) copies of operating and maintenance and servicing instructions, as well as four (4) complete wiring diagrams for the following item(s) or equipment:

1. Fire alarm system.

2. Circuit breakers.

3. Communications system.

B. All wiring diagrams shall specifically cover the system supplied. Typical drawings will not be accepted. Two (2) copies shall be presented to the Electrical Engineer and four (4) copies to the Owner.

1.7 ELECTRICAL CONTRACTOR'S RESPONSIBILITY

A. It shall be the Electrical Contractor's responsibility to obtain a complete set of Drawings and Specifications. He shall check the Drawings of the other trades and shall carefully read the entire Specifications and determine his responsibilities.

B. The contractor shall be responsible for reviewing the plans and specifications to ensure each room, where electrical line or low voltage equipment is to be installed, has sufficient space to accommodate the system cabinets, equipment and terminations while maintaining code mandated clearances about said equipment. The contractor shall identify problem areas prior to

bid, include all costs required for corrective measures in his bid and submit alternate equipment and materials suitable for the installation to the Architect/Engineer for acceptance as part of the product submittal process.

1.8 FINAL INSPECTION AND ACCEPTANCE

A. After all requirements of the Specifications and/or the Drawings have been fully completed, representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

1.9 RECORD DRAWINGS

A. Contractor shall furnish one set of reproducible record drawings before final payment of retention.

1.10 SUBSTITUTIONS

A. Substitution to specified equipment shall be submitted and received by the Engineer fifteen (15) days after the bid date for review and approval. Obtain D.S.A. approval for all substitutions.

B. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letter form and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples must be included in the submittal.

C. In the event that authorization is given for a substitute equal to bid, after award of contract the Contractor shall submit to the Engineer certified quotations from suppliers of both the specified and proposed equal material for price comparison and delivery dates.

D. In the event of cost reduction, the Owner will be credited with 100 percent of the reduction, arranged by Change Order.

E. The Contractor warrants that substitutions proposed for specified items will fully perform the functions required.

F. Substitutions or requests for substitution shall not be accepted and rejected for failure to comply with items A-E above.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials and Equipment: All electrical materials and equipment shall be new and shall be listed by Underwriter's Laboratories and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom made equipment must have complete test data submitted by the manufacturer attesting to its safety. In addition, the materials and equipment shall comply with the requirements of the following:

1. American Society of Testing Materials (ASTM).

2. Insulated Cable Engineers Association (ICEA).

3. National Electrical Manufacturer's Association (NEMA).

4. National Fire Protection Association (NFPA).

5. American National Standard Institute (ANSI).

B. Circuit Breakers:

1. Circuit breakers shall match existing in manufacturer, operation and short circuit duty. Provide new circuit breakers with required mounting hardware.

2. Circuit breakers AIC rating shall be equal to or greater than the highest AIC rating of any one existing circuit breaker in the panel/switchboard.

3. Circuit breakers shall be the number of poles and current capacity as indicated on the single line diagram.

4. Circuit breakers shall be provided with a device for locking circuit breaker in "OFF" position.

C. Conduit:

1. Rigid conduit shall be full weight threaded type aluminum or steel, except where specifically required to be steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing or sherardizing process.

2. Galvanized Rigid Conduit (GRC), shall be full weight threaded type aluminum or steel, except where specifically required to be steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metallizing, or sherardizing process.

3. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242 and meeting Federal Specification WWC-581 (latest revision).

4. Electrical Metallic Tubing (EMT), shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces.

5. Flexible metal conduit shall be constructed of aluminum or hot-dipped galvanized steel strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Used only as directed by the Engineer.

6. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory installed fittings. For outdoor installations and motor connection.

7. Non-Metallic Conduit:

a. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only.
b. Conduit and fitting shall be produced by the same manufacturer.

D. Fittings:

1. Condulet type fittings shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system. These fitting shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.

2. Metallic condulet covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductor do not pass through the cover.

3. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.

4. EMT fittings, connectors and couplings, shall be steel, zinc or cadmium plated, raintight, threadless, compression or tap-on multiple point, steel locking ring type with insulated throat.

5. Flexible steel conduit connectors shall be or malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.

6. Die cast, set screw or indenter type fittings are not acceptable.

7. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.

E. 600 Volt Conductors - Wire and Cable:

1. All conductors shall be copper. SimPull type or equal.

2. Type THHN/THWN thermoplastic, 600 volt, UL approved, dry and wet locations, for conductor sizes up to and including #4 AWG.

3. Type XHHW cross-linked synthetic polymer, 600 volt, UL approved, for dry and wet locations, for conductor sizes #2 AWG. and above.

4. Cross-linked synthetic polymer, XHHW, 600 volts, UL approved, for installation underground, in concrete or masonry.

5. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.

6. Wire and cable shall be factory color coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color coded and it shall be maintained throughout.

7. Systems Conductor Color Coding:

   a. Power 208/120V, 3PH, 4W:

      (1) Phase A = Black
      (2) Phase B = Red
      (3) Phase C = Blue
      (4) Neutral = White

   b. Ground Conductors:

      (1) Green

   c. Communication/Fire Alarm System:

      (1) As recommended by the manufacturer.

8. All color coding for #8 conductor and above shall be as identified above, utilizing phase tape at each termination.

9. No conductors carrying 120 volt or more shall be smaller than #12 AWG.

F. Junction and Pullboxes:

1. For interior dry locations, boxes shall be galvanized one-piece drawn steel, knockout type, with removable, machine screw secured covers.

2. For outside, damp or interior/exterior surface mounted locations, boxes shall be heavy cast aluminum or cast iron with removable, gasketed, non-ferrous machine screw secured covers.

3. All boxes shall be sized for the number and sizes of conductors and conduits entering the box and equipped with plaster rings where required. Each conductor shall be terminated at an insulated, barriered terminal connector and completely identified with an engraved fiber identification marker, Electrovert or Underwriter's Safety Device Company.

G. Outlet Boxes:

1. For fixtures, boxes shall be galvanized, one-piece drawn steel, knockout type equipped with 3/8" fixture studs and plaster rings where required.

2. Unless otherwise noted on plan or specified herein, outlet boxes shall be 4” square x 2 1/8” deep, one-piece drawn steel, knockout type, mounted flush with in wall. Provide with plaster rings and wall plate.

3. For all other communication/signal system devices, outlet boxes shall be as recommended by the system manufacturer and provided complete with plaster rings and covers.

4. For locations where standard boxes are not suitable due to number and size of conduit to be terminated, special boxes shall be designed to fit space or meet other requirements and submitted for approval.

5. For surface mounting or exposure to wet or damp locations, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.

H. Switches:

1. Switches located outdoors or in damp or wet locations shall be the same as above provided with steel locking weatherproof lift cover.

2. Switches controlling or disconnecting single phase motor loads in excess of 1/3HP shall be horsepower rated and approved or motor control service. Switches shall be complete with overload device of proper motor nameplate rating, where required.

3. Disconnect (safety) switches shall be fused, heavy duty type meeting NEMA Specifications. Switches shall be provided with rejection type fuse blocks. Provide switches with the number of poles, the voltage, current and horsepower ratings as required. Provide externally operable, quickmake, quick-break type mechanism with cover interlock and padlockable in either the open or closed position. Unless indicated otherwise, provide switches indoors in NEMA Type 1 enclosure and in NEMA Type 3R rain-tight enclosure where indicated to be outdoors or weatherproof. Provide nameplate indicating equipment served. Provide unit as manufactured by Challenger or approved equal Siemens or Westinghouse.

I. Receptacles:

1. Convenience outlet shall consist of duplex convenience receptacle mounted in an outlet box in the wall, flush with the finish surface and shall be complete with wall plate.

2. Receptacles for convenience outlets, unless otherwise indicated, shall be industrial heavy duty type, duplex 3W grounding type, 20A, 125V, Hubbell-Bryant #5362-*. (*) color as selected by Architect.

3. Weatherproof receptacle shall be industrial heavy duty type, ground fault interrupter, 20 ampere, three wire grounding type, 120 volt, Hubbell-Bryant # GF-5362-I, with steel lockable lift cover U.L. listed for “wet” locations when in operation.

4. Receptacles located outdoors shall be provided with steel weatherproof box and lockable lift cover U.L. listed for “wet” locations when in operation.

J. Terminal Cabinets:

1. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, as indicated on plan, size as indicated on plan but in no case less than 24” high, 30” wide and 6” deep. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.

2. Provide each terminal cabinet with a full size plywood backboard and terminal blocks (minimum 25% or 12 spare terminal blocks). All wires terminating on the terminal blocks shall be identified with an engraved fiber tag.

3. Surface mounted terminal cabinets shall be installed complete with full length skirts of the same construction and finish as the terminal cabinet.

4. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet

K. Plywood Backboards:

1. Where indicated for telephone or communications system terminals or other equipment assemblies, provide full room height and width backboards. Use Douglas Fir Plywood, fire resistive, exterior grade, finished one side and prime coat painted on all surfaces with finish coat of gray enamel. Unless otherwise indicated, use 3/4" thick plywood. Where terminal cabinets are used, provide full size plywood backboard to mount inside the terminal cabinet.

L. Painting:

1. Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed outdoors and in public view shall be painted with colors selected by the Architect to match the subject exterior surface. Refer to painting section of the specifications for additional requirements.

M. Seismic Design and Anchoring of Electrical Equipment:

1. Seismic anchorage of electrical equipment shall conform to C.C.R. Title 24, 2019 CBC with California Amendments. Anchorage details for roof/floor mounted equipment shall be as shown on plans.

PART 3 - EXECUTION

3.1 PREPARATION AND INSTALLATION

A. Installation of Conduit and Outlet Boxes:

1. All conduit exposed or installed in concrete and masonry, shall be galvanized rigid steel conduit (GRC), or intermediate metal conduit (IMC).

2. Rigid conduit may be installed under floor slabs, under concrete sidewalls an as noted on the Drawings. Rigid conduit installed under slabs shall be 1" trade size minimum and shall be wrapped with 20 mil. polyvinyl chloride plastic tape. No conduit shall be installed/run horizontally in concrete slabs/floors.

3. All conduit except as hereinafter specified, installed in concrete/masonry walls, damp locations, hazardous locations, surface mounted up to 8’-0” above finished floor or subject to mechanical injury shall be heavy wall, threaded, galvanized rigid steel conduit (GRC), or intermediate metal conduit (IMC).

4. Flexible steel conduit shall only be permitted to be used at connections to vibrating electrical equipment. All flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Use of flexible conduit shall be as approved by the Engineer.

5. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or EMT and in accordance with Article 345 of CEC and UL Information card #DYBY.

6. All conduit installed in the dry walls or ceilings of the building shall be steel tube (EMT), Galvanized Rigid Steel (GRC), or Intermediate Metal Conduit (IMC).

7. Conduit shall be run so as not to interfere with other piping fixtures or equipment.

8. The ends of all conduit shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.

9. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.

10. Underground conduit shall be, unless otherwise indicated, Schedule 40 PVC (polyvinyl chloride) installed at depth of not less than 24" below grade. Concrete encased with 2” minimum between conduits and 3” minimum between the last conduit and the edge of the duct-bank. Conduit separation shall be maintained using plastic spacers located at 10'-0" intervals. Where power and communication/signal conduits are run in a common trench a (12") inch minimum separation shall be maintained between power and communication/signal conduits. The grounding wire in plastic conduit shall be rated in accordance with Section 250- of 2008 CEC.

11. All underground conduit shall be 1" minimum trade size for steel and for PVC.

12. Where underground conduit runs stub-up, conduit shall transition to GRC underground. The contractor shall use GRC elbows and GRC risers wrapped in 20 mil. PVC tape for stub-ups.

13. PVC conduit shall not be run in walls or above grade.

14. Where underground conduit runs penetrate floor slab, conduit shall terminate 6” above finished floor with a grounding bushing.

15. Where conductors enter a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.

16. Where conduit extends through roof to equipment on roof area, this Contractor shall provide 24 gauge galvanized sheet metal flashing cones with 4" flanges on roof surface. This flashing shall be delivered to the roofing contractor for installation. The actual location of all such roof penetrations and outlet shall be verified by the Contractor.

17. All conduit underground, in masonry and concrete and where concealed under floor slabs shall have joints painted with thread compound prior to makeup.

18. All conduit shall be supported at intervals not less than 10'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two hole conduit clamp properly secured.

19. Where conduit racks are used the rack shall consist of two piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.

20. Nail-in conduit supports will not be allowed. One piece set-screw type conduit clamps or perforated iron for supporting conduit will not be permitted.

21. Seismic Conduit Support:

    a. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

CONDUIT TYPE	MAXIMUM SPACING
EMT, IMC	10'-0"
GRC (3/4” thru 1 ½”)	10'-0"
GRC (2” thru 2½”)	16'-0"
GRC (3” and larger)	20'-0"

22. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.

23. Open knockouts in outlet boxes only where required for inserting conduit.

24. Outlet boxes on metal studs shall be attached to metal hangers, tack welded or bolted to studs; on wood studs attachment shall be with wood screws, nails not acceptable.

25. All boxes shall be covered with outlet box protector, Appleton SB-CK. Keep dirt from entering box or panels. If dirt does get in, it shall be removed prior to pulling wires.

26. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover and painted as directed by the Architect with weatherproof paint to match building.

27. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.

28. All conduit shall have a 200 lb test poly-propylene pull line left in place for future use in all runs tagged with a plastic tag at terminating end indicating the location of the opposite end of the conduit.

29. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/rack, see note 19. Refer to note 18 for support of single conduit runs within suspended ceilings. Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system.

30. All conduit shall be installed concealed in walls, under floors or ceilings. Exposed conduit will not be permitted unless specifically approved in writing by the Architect/Engineer. When approved by the Architect/Engineer exposed conduits shall be painted to match the finish of the wall or ceiling to which it is supported to.

31. Provide complete conduit system for all line voltage systems. Provide conduit for low voltage systems installed over inaccessible ceilings and in rooms with no dropped ceilings. The Contractor shall coordinate the location of inaccessible or open ceilings with the Architectural Reflected Ceiling Plan and in the filed with the ceiling contractor

32. Provide a complete conduit system for routing of Fire Alarm system wire/cables.

33. Provide conduit only for routing of HVAC control wiring. Refer to Mechanical drawings for conduit requirements.

34. Provide ceiling access panels for junction/pull boxes, equipment, devise/outlets installed over inaccessible ceilings. Ceiling access panels shall be minimum 12”x12” for junction/pull boxes. 24”x24” for all other applications..

B. Installation of 600 Volt Conductors:

1. All line voltage wire, including control circuits, shall be installed in conduit.

2. All communications wire/cable shall be listed for open wiring (without conduit) and shall be plenum rated. Communications wire/cable shall be supported by “J” hooks installed along the perimeter walls of the building or full-height interior walls. Low voltage wiring installed over inaccessible ceilings shall be installed in conduit.

3. All line voltage circuits and feeder wires shall be continuous from the service point to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.

4. All low voltage wire/cables shall be continuous from the service point to terminal or farthest outlet. No joints will be allowed.

5. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires. No joint shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.

6. Provide conduit only for routing of HVAC control wiring. Refer to Mechanical drawings for conduit requirements.

7. Install UL approved, fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.

C. Joints in 600 Volt Conductors:

1. Joints in 600 volt conductors smaller than No. 4 AWG shall be made with Scotchlok spring type connectors. Wires No 4 AWG and larger shall be joined together with approved type of pressure connector and taped with #33 3M tape, three (3) layers minimum to provide insulation not less than that of conductor. Connections to switch or busbar shall be made with

one-piece copper lugs. Splicing of all 600 volt or less in-line connections #2 AWG through 350 MCM shall be made with 3M brand PST connector.

2. Joints/splices shall be done in junction or pull boxes.

3. Splices of communications wire/cable will not be permitted. Communications wire/cable shall run continuously from its point of origin to its destination point.

D. Grounding:

1. Provide grounding for entire electric installation as shown on plans and as required by applicable codes. Included as requiring grounding are:

   a. Conduit.
   b. Neutral or identified conductors of interior wiring system.
   c. Switchboards and Branch Circuit Panelboards.
   d. Non-current carrying metal parts of fixed equipment.
   e. Telephone distribution equipment.

2. Grounding and bonding conductors shall be sized per the latest edition of the California Code of Regulations, Title 24, State of California and the CEC.

3. Provide and install an equipment grounding conductor in all feeder and branch circuit conduits.

4. Where required to be installed, ground rods shall be 3/4" x 10', copper clad, installed individually or grouped as required to meet the specified resistance. Provide ground rods with all required clamps, fittings, wire and concrete boxes.

5. Building grounding system resistance to ground shall not exceed 25 ohm.

E. Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.

END OF SECTION

SECTION 27 51 23

SUPERVISED NETWORK INTERCOM AND PAGING SYSTEM

1. INTRODUCTION

1.1 GENERAL

A. Where applicable visit the site, verify all existing items shown on plans or specified, and be familiar with the working conditions, hazards, and local requirements involved. Submission of bids shall be deemed evidence of such visit. All proposals shall take these existing conditions into consideration before bidding.

B. All materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacture, model, and quality, unless otherwise specified.

C. Manufacturer's names are listed herein to establish a standard. The products of other manufacturers will only be acceptable if approved by the specifying architect 10 days prior to bid. These products must: be of equal or better quality than the features specified herein, will serve with equal efficiency and dependability, and satisfy the purpose for which the items specified were intended.

D. Contractor shall do all necessary cutting and drilling of present walls, floors, ceilings, etc., for the installation of new work; but no structural work shall be cut, unless specifically shown on drawings and/or approved by the Owner. All exposed building surfaces damaged by installation or removal of electrical work shall be patched and finished in the same materials and manner as adjacent areas by this Contractor.

E. Contractor shall co-ordinate their work with the Owner for times which changeover, removal of existing equipment, and new connections of existing systems can be completed.

F. Disconnect and remove existing Intercom control panel, all system devices/components, and wire/cable. Wherever possible existing conduits are to be re-used. Mandrel all existing conduits prior to pulling new wire/cable. Where existing conduit is found to be damaged and not suitable for re-use, the contractor shall provide and install new conduit for the routing of new wire/cable. The contractor shall patch and repair all surfaces and finishes where equipment/devices are removed and/or replaced. Repair or refinishing of existing walls, floors/ground or ceiling shall be as directed by the Architect.

G. At no time during the construction phase when school is in session and when teacher’s are on campus shall it be acceptable for the intercom-paging-class pass and clock system to be inoperable or not serving the buildings/rooms connected to the existing intercom-paging-class pass and clock system. The contractor shall provide temporary intercommunications between all buildings and rooms within the buildings whenever the system is inoperative or shut-down for any reason. A temporary school wide intercommunications plan to be implemented during system shut-downs or inoperable periods shall be submitted to the School District for approval prior to start of the demolition phase. Temporary school wide intercommunications shall at a minimum consist of walky-talkies for all staff members and battery operated self-correcting atomic clocks for all rooms currently provided with system clocks.

1.2 RACEWAYS AND CABLES

A. Electrical work will conform to the California Electric Code and applicable local ordinances.

B. All 125-volt electrical conductors shall be installed in galvanized electrical metallic tubing with compression type fittings and couplings, minimum 1/2" size conduit.

C. All low-voltage wires and cables concealed in walls shall be run in EMT conduits from flush outlet boxes to above accessible ceilings. Provide conduits where cables penetrate firewalls above ceilings.

D. All EMT entering boxes shall be served with insulating throat connectors and locknuts.

E. No raceway shall be located in proximity of hot water lines or excessive heat.

F. Where raceways cannot be run concealed in walls, use Wiremold Series surface raceway complete with all fittings, box extension rings, and required accessories. Co-ordinate routing of surface raceways with the Owner.

G. Use Cast "C" clamps, "U" straps, or ring hangers attached to rods, and/or brackets fastened to structure.

H. No perforated straps or tie wires permitted for supporting raceways.

I. Use wire ties for supporting low voltage cables run concealed above ceilings. Do not run cables loose on ceiling tiles. Support from structure above. Group cables in bundles.

J. Tie mounts, plates, and anchors shall be used.

K. Ground all electrical apparatus in accordance with the National Electric Code.

1.3 QUALITY ASSURANCE

1 Manufactures: Firms regularly engaged in manufacture of integrated communication systems, time keeping systems, and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for no less than five years.

A. Installer's Qualifications: Firms with at least five years of successful installation experience with projects utilizing integrated communications systems and equipment similar to that required for this project.

B. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

C. The Contractor shall be an established communications and electronics Contractor that has had and currently maintains a locally run and operated business for at least five years. The Contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges. Contractor shall have an office and warehouse withing 50 miles of Owner’s District Office.

D. The Contractor shall show satisfactory evidence, upon request, that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to the system. The Contractor shall maintain at their facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

E. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The Contractor shall have attended the manufacturer’s installation and service school and upon request must show proof of attending such a school.

1.4 SCOPE OF WORK

A. Furnish and install all materials, labor, equipment, permits, etc., to provide communications system as described herein and illustrated on the drawings for a complete operating system.

B. All manufactured articles, material, and equipment shall be applied, installed connected, erected, used, cleaned, adjusted, and conditioned as recommended by the manufacturers, or as indicated in their published literature, unless specifically herein specified to the contrary.

C. All work shall be performed by competent professionals and executed in a neat and professional manner providing a thorough and complete installation. Work shall be properly protected during construction, including the shielding of soft or fragile materials. At completion, the installation shall be thoroughly cleaned and all tools, equipment, obstructions, or debris present as a result of this portion of work shall be removed from the premises.

D. Program the operational characteristics matching the operation described herein, adjusting for call routing, transfers, priorities, and volume levels.

E. Remove all existing conduit, wire device, etc., being abandoned due to relocation.

F. The Contractor shall provide a minimum of eight hours of in-service training with this system. These sessions shall be broken into segments, which will facilitate the training of individuals in the operation of this system. Operator Manuals and User Guides shall be provided at the time of this training.

1.5 SUMMARY

A. Work Included. The scope of work of this section consists of the design, installation, and programming of all materials to be furnished under this SECTION, and without limiting the generality thereof, consists of providing all labor, materials, equipment, plant, transportation, appurtenances, and services necessary and/or incidental to properly complete all work as shown on the drawings, as described in the specifications, or as reasonable inferred from either or, in the opinion of the Architect and Owner, as being required and in general, is as follows:

1. Supervised Network Intercom and Paging System, including but not limited to:

    a. Supervised network amplifiers, back boxes, and all equipment, cabling and support required to interface the public address system to the Owner’s telephone system via SIP Trunk Interface.

    b. Supervised network system speakers, and ceiling mounted speakers, wall mounted horn, both interior and exterior.

    c. Cabling to support the Public Address System (NOTE: category 5/6 cable must conform to Owner guidelines. Coordinate with Owner prior to submission for approval).

d. Master and secondary clock system, clocks and cabling. Elapsed time indicator control panels where shown on the drawings.

e. Supervised network PA override signal to local sound systems. Coordinate with 27 40 00 contractor.

f. Supervised network emergency messaging display/clock capable of receiving and scrolling up to 64 character long custom messages without affecting or replacing display of time segments, and coded messages simultaneous with plain text message (displacement to time segments permissible for coded messages).

g. Interactive Graphical User Interface (IGUI) supporting a pictorial view of architectural room locations on a map, and controlling intercom functions including zone or all page, dynamic zone assignments, answering intercom call-ins, selecting and distributing program sources to any and all zones. IGUI will also annunciate, locate and indicate loss of communication to all supervised network devices including speakers, amplifiers, emergency messaging display/clocks, and notification switches.

h. Emergency communication shall be initiated by the local console or from a centrally located district office via a District Wide Emergency Communication platform (included/not included in this contract). Emergency communication shall include but not be limited to, pre-recorded audio, live audio, emergency textual message display activation, computer pop-up notification, SMS Text message, and email.

1.6 SUBMITTALS

A. Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.

B. Shop Drawings: Composite wiring and/or schematic diagrams of the complete system as proposed to be installed. Drawing shall include relative position of all major components, typical connections, field components, accessories, and cable types.

C. Product Data: Include catalogue data sheets, manufacturer’s default specifications, user operation guides, and bill of materials.

D. Quality control shall include the following:

1. Name, address, and telephone number of the nearest fully equipped service organization.

2. Submit a certificate of completion of installation and service training from the system manufacturer.

3. Submit a list of comparable completed projects. Furnish the name, address, telephone number, and contact name of end user.

2. **PRODUCTS**

2.1 **GENERAL DESCRIPTION OF NETWORK INTERNAL COMMUNICATION SYSTEM**

A. Supply and install a complete supervised network based intercom system. Field wiring shall be CAT 5E or CAT 6 cable, control wiring for power distributions and very long runs, and utilize an optional fiber backbone (when distances exceed normal Ethernet limitations). All station equipment shall utilize standard RJ-45 modular connections. All remote devices utilizing standard structured cabling shall be capable of PoE (Power over Ethernet) or power supplied within the CAT 5E or CAT 6 cable jacket. Wiring shall be capable of either being installed in conduit or cable trays, where shown on the plans

B. The system shall be capable of interconnecting with the building LAN (Local Area Network). This connection shall be minimal and utilize only one Ethernet 100 Mbps (or optionally 1 Gb) connection per station to accomplish all intercom operations. Ethernet ports and associated network switches that are required to connect any intercom devices will be provided by the OWNER.

C. Provide a separate circuit for each room and administrative office so each room, speaker, amplifier, and emergency messaging display/clock can be individually addressed.

D. Overall intercom communications network shall utilize Ethernet or VoIP communications between all major components: administrative consoles, intercom stations, amplifiers and individual paging speakers, and network switches. Systems not utilizing Ethernet or VoIP communications protocol to each end-point device will not be acceptable. Systems not capable of supervising all networked devices including network amplifiers, network speakers, notification switches, and emergency messaging display/clocks will not be acceptable.

E. The network shall support a VLAN configuration to separate activity in the intercom system from other in building LAN traffic. In locations where the supervised network communications system will be considered as part of the facility's life safety systems, a dedicated and isolated network shall be required.

F. The system shall interface to the facility's PBX via SIP trunk connectivity.

G. The Communications System shall include master clock support and synchronization of digital secondary clocks, event scheduling, and messaging software allowing the facility to configure multiple schedules per school, multi zone time tone signaling for class changes, and message notification.

H. The system shall support fault monitoring and trouble notification features. When a fault monitoring device detects a fault, devices will notify of trouble should they be capable and configured to do so. Faults shall include but not be limited to devices:

   a. Disconnecting from the network

   b. Having invalid configuration

   c. Having mismatched firmware

2.2 **DESCRIPTION OF NETWORK INTERCOM / PA / MESSAGING FEATURES**

A. The system specified is based on the Telecor eSeries Supervised Network based Communications System providing at least the features and functions outlined below. It shall be installed and programmed by a local authorized and certified Telecor dealer.

B. The system shall utilize a decentralized network structure not requiring any head-end equipment, central server, or any other control hardware to maintain system operation. Systems utilizing centralized electronics and subject to a single-point-of-failure (power supply, CPU, server, power, etc.) shall not be accepted unless the system has 100% duplication of all centralized operating equipment running concurrently and can automatically take over,

including up to the minute programming configuration in the event of a failure of the main system head-end electronics or any required, centralized electronics required to make the system fully operational. Systems that are not based on decentralized structure or systems that do not provide 100% duplication of head-end or systems that operate in a “down-graded” operational mode as the result of a centralized failure are not acceptable.

C. All station devices shall receive power and data through a Power-Over-Ethernet switch. Once plugged into the LAN through a Power-over-Ethernet network switch, all networked devices shall be immediately operational and as applicable shall be able to place or receive calls and pages from Stations as well as page all devices in the network. Consoles, intercom stations, clocks, emergency displays, or speakers connected to the network shall not require any network configuration or administration to function.

D. Each Intercom Station, Loudspeaker, clock/message display, shall be assignable to all or any combination of Unlimited Paging, Program Distribution or Time Zones in the system.

E. Each Classroom shall be provided with two Call Stations located in separate locations in order to comply with NEMA Standard SB40 for Emergency Communications in K-12 Schools. On Call switch shall provide the ability to generate normal calls to a designated location while the other shall generate Emergency level calls.

F. Speech shall be transmitted in the frequency range from 50 Hz to 7 kHz and shall use a maximum of 128 kbps of bandwidth during a call. In order to assure maximum intelligibility, all system audio shall be HD Audio as defined in Intel(TM) High Definition Audio Specifications, June 17, 2010.

G. Intercom communications between consoles and system devices shall be non-blocking with no channel restrictions or limitations (other than network capacity) to the number of simultaneous conversations at any time between pairs of intercom stations, intercom station to console, console to console, console to speaker or zone of speakers, program source to a speaker or zone of speakers, or bell tones to a speaker or zone of speakers regardless of number of stations or consoles.

H. Any and all device shall have the ability to have its programming downloaded, individually or simultaneously via the network. Programming shall be downloadable in a series of human readable, industry standard comma-separated values (CSV) files that can be saved and edited using common spreadsheet applications. Consoles, intercom stations, clocks, displays, and speakers residing on a network shall have the ability to update their programming, simultaneously from a CSV file. Furthermore, all devices shall also have the capability to be configured directly, such that device numbers, names, zones, and call-in destinations can be altered in real time without the uploading or downloading of their programming. System shall be capable of uploading firmware updates to all device classes simultaneously, via the network, without the requirement of tools, by authorized technician or qualified facility technician or representatives.

I. Audio communications between all devices shall be accomplished with latency values of a maximum of 0.1 seconds and connection times of 0.01s for 1 to 500 speakers.

J. The system shall support a minimum of 50 channels of simultaneous duplex communication paths on the intercom system LAN, plus a minimum of 10 simultaneous duplex channels for PBX integration.

K. The system shall be capable of routing calls from the Public Switched Telephone Network (PSTN) into any classroom, zone or the entire school via the District’s SIP enabled Telephone System. This shall allow for remote monitoring and two-way voice communications from outside the facility to classrooms as well as paging into areas of the school. Additional features shall include:

    a. The ability to place call-ins from classroom call stations to SIP Telephones

    b. The ability to initiate calls from SIP Telephones to eSeries Classroom Speakers.

    c. The ability to initiate zone and all call paging announcements from SIP Telephones to

eSeries Speakers throughout the facility.

d. The ability to make outside calls from Administrative Consoles to the PSTN via the Districts Phone System.

L. The System shall allow users to configure multiple schedules per school, with an unlimited number of programmable events in each schedule. Each Event shall sound a user selectable tone and play a user provided audio file or an external audio source. In addition a textual message shall be able to be programmed to be displayed at associated message displays throughout the school. All scheduling assignments shall be performed via a simple to use Graphical User Interface (GUI) from a non-dedicated PC residing in the School. Programming shall also be accomplished from a non-dedicated PC at the District Office. The following features and functions shall be provided. Systems that cannot provide these, shall not be acceptable.

a. The system schedules shall facilitate the requirements of combined facilities (e.g. elementary and middle schools in a common building) where multiple schedules running concurrently would be required.

b. Each event shall play any of the available tones, audio files or audio sources provided. Events shall be directed to any one or more Time Zones in the systems.

c. Events shall include textual messages to clock/message displays. These shall be formatted as fixed, flashing or scrolling displays that can include up to 200 characters in length.

d. Time Tones may be manually activated from Administrative Consoles or selected SIP phones residing on the school IP-PBX.

e. An integral Master Clock shall provide time synchronization to all secondary digital clock / Message Displays throughout the school. The communications shall be capable of obtaining it's time synch signal from any NTP time server.

M. The System shall be capable of automatically distribute SMS and email notifications to relevant staff members when an emergency event is occurring at the facility. Notifications shall be distributed to user alert devices such as mobile phones and smart devices. Mobile phones shall receive the notifications as SMS messages while smart devices shall receive email messages. Emergency events include:

a. The activation of emergency-themed element icons on a PC GUI (e.g., Lockdown, Evacuate, etc.) i

b. Emergency Calls placed from Call Stations located in room locations.

N. The system shall automatically distribute SMS and email notifications to appropriate technical support staff in the event that the system is experiencing a fault.

2.3 SUPERVISED NETWORK ADMINISTRATIVE CONTROL CONSOLE

A. The Supervised Network Administrative Control Console (subsequently referred to as Console) shall be a Telecor model e300 or approved equal. The Console shall be supervised and allow the operator to establish two-way communications with an intercom station, talkback speaker, or another Console using the handset or speakerphone. VOX functioning shall be automatically enabled when the handset is used. The Push-to-Talk button shall toggle the Console between talk and listen mode when the speakerphone is used. The Console shall provide a 2-line by 20-character LCD display. The display shall be able to be tilted at different angles for optimum viewing. When there are no active calls, the display shall show the Console name and dial number. If a time server is connected to the network, the display shall also show the time and date.

B. Incoming calls to a Console shall show the originating station dial number and name on the Console display. Calls shall be displayed in the order they are received. The operator shall be

able to scroll through the list of calls and answer them out of sequence. Emergency call-ins shall be distinctly annunciated both visually and audibly.

C. The Console shall allow call-ins to be forwarded to another Console, or for calls to be put on hold or transferred to another Console location. Additionally, call-ins or calls shall be forward/transfer-able to PBX telephone extensions via a SIP trunk interface.

D. The Console shall be able to select remote audio sources connected at any location on the local area network, and distribute the audio broadcast from the source to all speakers in a facility or to selected areas such as a speaker zone or a selection of speakers. The Console shall be capable of audio source verification by attendant prior to page zone activation. In this manner attendants shall be able to listen to the audio source locally, including listening to pre-recorded announcements, prior to system broadcast.

E. The Console shall be able select a tone or a pre-recorded announcement and broadcast the tone or announcement to all facility speakers or to select areas, such as a speaker zone or a selection of speakers.

F. The Console shall be equipped with digital volume control that shall allow for the separate adjustment of the speaker listen and handset listen volumes. The levels for intercom listen, tones, and program distributions shall be independently adjusted and stored in memory.

G. The system shall allow user programming of alphanumeric architectural room names and numbers. The Console shall be capable of using 1 to 7 digit sequences for dial out and call-in identification, and shall display station numbering, station name, and call-in priority.

H. The end-user shall be allowed to choose and determine the number and location of Consoles. The end-user shall not be limited by pre-set manufacturer limitations of the number of Consoles required by this project; allowing for unrestricted future expansion. Consoles may be added at any time. Consoles added by the end-user that exceed the engineered design for this project shall be at owner's expense. Communication between consoles or consoles and intercom stations or rooms shall not be inhibited by channel number restrictions.

I. The Console shall be capable of displaying room statuses such as Privacy and Do Not Disturb and shall have the ability to override any status limiting communication between the Console and a station with Privacy or Do Not Disturb status activated. Temporary override shall not interfere with continued activation of Privacy and Do Not Disturb after communication has been established and electively terminated.

J. The Console shall support an optional desktop microphone that shall be a Telecor model MCC-PM-MA or approved equal. The desktop microphone shall provide additional buttons, indicators and circuitry to control the Console during intercom and paging operations. The desktop microphone shall feature a gooseneck microphone that includes a ring LED around the microphone to indicate when the microphone is live. The desktop microphone shall connect to the Console via CAT5 or higher cable with RJ-45 terminations. The desktop microphone shall feature pushbuttons for listen audio volume control, Push to Talk, Call Cancel, forwarding Console call-ins to another pre-programmed Console, and zone paging. These push buttons shall behalf identically to their Console counterparts. The desktop microphone shall also feature a 2.5mm jack to support a headset. A headset pushbutton shall toggle between directing audio to the desktop microphone speaker and the connected headset. Also featured shall be a ¼" phono jack to support a footswitch that behaves as the Push to Talk button.

2.4 SUPERVISED NETWORK INTERCOM TALK-BACK SPEAKER

A. The Supervised Network Intercom Talk-Back Speaker (subsequently referred to as Network Speaker) shall be a Telecor model eS8-TB. The Network Speaker shall be supervised and capable of up to 10 watts of audio signal and provide a minimum of 92db @ 1 meter SPL for maximum intelligibility. Speaker spacing shall be as defined by manufacturer to provide maximum intelligibility.

B. The Network Speaker shall provide transmission of HD audio as generated from intercom console and/or associated push-to-talk, intelligent microphone, supervised network amplifier, or program sources connected to the network.

C. The Network Speaker shall provide a dry contact output that can be activated remotely from a station or from a console, such as may be required in a door release application.

D. The Network Speaker shall receive power and data over a RJ45 connect CAT5E/6 cable via a Power-Over-Ethernet switch port. Once plugged into the LAN through a Power over Ethernet network switch, the Network Speaker shall be immediately functional and be able to receive calls and pages from consoles on the network. The Network Speaker shall not require any network configuration or administration to function.

E. The Network Speakers shall support talkback; to optimize intelligibility talkback capabilities shall be supported via a microphone conditioned for low noise, HD audio, and with compression and noise gate capability. Stations that use the speaker instead of a separate microphone for talkback capability shall not be accepted.

F. The Network Speaker shall have a call-in roll-over feature where if it places a call-in to a primary call destination which is not answered after a preset amount of time, the call-in shall be automatically escalated to a secondary call-in destination. If both the primary and secondary call-in destinations are unavailable, the call-in shall be redirected to a back-up Station, Console, or telephone device.

G. The Network Speaker shall have the capability to be configured as a member of 1 or more paging zones.

H. The Network Speaker shall support the direct connection with RJ45 connectors of two, supervised room notification stations. The stations shall provide the means for: normal calls, emergency calls, privacy mode, and do not disturb mode. Notification stations shall include a call placed assurance status LED to indicate a call has been placed. Notification stations shall be supervised and immediately indicate disconnection or a wiring fault.

I. In addition to the visual call-in assurance status indicators on the notification stations, call-in assurance status indication must also be provided on the associated speaker. Also, in addition to visual call-in assurance, audible call-in assurance shall also be provided in support of persons with visual disabilities.

J. Under blackout conditions the notification station shall be illuminated such that it can be located in the dark.

K. Normal call stations must support the ability to activate emergency call-in signals via multiple button presses and press and hold operations. Emergency call stations shall be separate and clearly labeled with a red button so as to impart obvious operation in the event of an emergency. Systems that only provide a single call station with dual emergency and normal operation shall not be acceptable.

L. The Network Speaker shall provide local, visual indication of operation or failed-communication and shall immediately annunciate a loss of communication at the main console location.

M. Network Speaker volume must be capable of individual level settings through the network. Settings must not be adjustable without authorization. Volume controls located in rooms must be centrally lockable via the network. Systems that allow a volume adjustment without authorization shall not be acceptable. Systems that utilize a manually operated transformer or resistive volume control design shall not be acceptable. Volume controls shall be capable of establishing and maintaining levels for intercom, paging, program distribution, and tones, independently for each of the above functions. Emergency announcements shall be sent at a volume/level as required by the AHJ and shall not be affected by the adjustment of other speaker volume/levels for the purposes of paging, intercom, or other lower priority audio events.

2.5 SUPERVISED NETWORK MASTER/SATELLITE TALKBACK SPEAKER

A. The Supervised Network Master/Satellite Talkback Speaker (subsequently referred to as the Master Talkback Speaker) shall be a Telecor model eS8-TB4 or approved equal. The Master Talkback Speaker shall support all functionality of the Telecor model eS8-TB (specified above).

B. The Master Talkback Speaker shall be supervised and shall support the connection of Satellite Speakers, and support up to four watts of additional 25V Satellite Speaker load. Satellite Speakers shall be Telecor model S8T2570 or approved equal.

C. The Satellite speakers shall not support talkback; to optimize intelligibility talkback capabilities shall be supported from a single point via a microphone conditioned for low noise, HD audio, and with compression and noise gate capability. Stations that use the speaker instead of a separate microphone for talkback capability shall not be accepted.

D. The Satellite Speaker shall receive power over a RJ45 connect CAT5E/6 cable via the Supervised Network Master/Satellite Talkback Speaker. Both the Supervised Network Master/Satellite Talkback Speaker and the Satellite Speaker shall receive all power through a single Power-Over-Ethernet switch port. Systems that require auxiliary power or additional external or supplementary audio power amplification are not acceptable.

2.6 SUPERVISED NETWORK EMERGENCY DISPLAY/CLOCK

A. The Supervised Emergency Display/Clock (subsequently referred to as Message Display) shall be a Telecor model e365-TB, e2443-MA or approved equal. The Message Display shall be supervised and shall simultaneously display the time and date. The time shall be displayed in hours, minutes, and seconds. Hours and minutes shall be displayed in large 2.25” digits. The seconds shall be slightly smaller for easy distinction. The date shall be displayed in plain text by a 10-character, dot matrix display showing the day of the week, followed by the month and date. Loss of communication to the Message Display shall result in an immediate indication of communication loss with the device and annunciated at the designated locations.

B. The Message Display shall receive power and data over a RJ45 connect CAT5E/6 cable from a single Power-Over-Ethernet switch. Once plugged into the LAN through a Power over Ethernet network switch, the digital calendar Message Display shall be immediately functional. The Message Display shall not require any network configuration or administration.

C. The Message Display shall by default show the time and date which shall be synchronized to all other Message Display. If time signal communication to the Message Display is lost, it shall maintain the time independently, and remain synchronized to other Message Displays connected on the local area network. Once communication is restored, the Message Display shall resynchronize with the time server and shall be automatically updated to current data communication provided at time of restoral.

D. The Message Display shall provide a dry contact output that can be activated remotely from a station or console, such as may be required in a door release application.

E. The Message Display shall be capable of supporting notification devices and shall have a call-in roll-over feature where if a call-in to the primary call destination is not answered after a pre-set amount of time, the call shall be automatically escalated to a secondary call destination. If both the primary and secondary call destinations are unavailable, the call shall be redirected to a back-up station or console.

F. The Message Display shall have the capability to be configured as a member of 1 or more paging zones.

G. The Message Display shall optionally activate strobe and siren signals in conjunction with emergency call-ins. Siren shall be automatically suspended upon an audio connection. Strobe shall be maintained until call completion.

H. The Message Display shall automatically activate and maintain strobe signals in conjunction with emergency pages, programs, tones, announcements, and/or textual messages.

I. In addition to displaying the time, the Message Display shall also feature elapsed timer and count-down functions. Timer functions shall include the ability to count upwards from zero to 24 hours, as well as counting down to zero from a specified value. The timer shall be controlled using the Telecor model 2481-TBP Timer Button Panel, providing start, stop, and reset functionality. When not operating as a timer, the Message Display shall default back to displaying the current time. Elapsed time and countdown functions shall also be controlled via contact closure and connected directly to the Message Display

J. Mounting options for the Message Display shall include: surface mount and dual mount with the 2423 dual mounting kit, creating a double-faced version. The Dual Mounting Kit shall be supplied with a bracket that shall allow the Emergency Display/Clock to be mounted 4" away from a wall or ceiling surface. An optional 2433 clock guard shall also be available for the surface mount models. The guards shall be constructed from sturdy, heavy gauge steel and include a Plexiglas window that shall provide both protection and optimum visibility of the display.

2.7 SUPERVISED NETWORK EMERGENCY DISPLAY/CLOCK COMPANION TALKBACK SPEAKER

A. The Emergency Display/Clock Companion Talkback Speaker (subsequently referred to as Companion Speaker) shall be a Telecor model e365-TB-SPK or approved equal. The Companion Speaker shall be supervised and shall be ceiling or wall mountable in a location distinct from the supervised network emergency display/clock. Systems that do not provide flexible talkback speaker ceiling mount options are not acceptable.

B. The Companion Speaker shall receive power and data over a RJ45 connect CAT5E/6 cable from the Supervised Emergency Display/Clock which is connected to a single Power-Over-Ethernet switch port. Once plugged into the Emergency Display/Clock, the Companion Talkback Speaker shall be immediately functional. Systems that require more than one Ethernet PoE port to support time and simultaneous textual messaging, paging, program, tone distribution, strobe and siren activation signals, and normal and emergency call-in shall not be acceptable. The Companion Talkback Speaker shall not require any network configuration or administration

C. The Companion Speakers shall support talkback; to optimize intelligibility talkback capabilities shall be supported via a microphone conditioned for low noise, HD audio, and with compression and noise gate capability. Stations that use the speaker instead of a separate microphone for talkback capability shall not be accepted.

D. The Companion Speaker shall be used in conjunction with the Supervised Emergency Display/Clock to support the direct connection of two, supervised room notification stations via RJ45 connectors. The stations shall provide the means for: normal calls, emergency calls, and privacy and do not disturb modes. Notification stations shall include a call placed assurance status LED to indicate a call has been placed. Notification stations shall be supervised and immediately indicate disconnection or a wiring fault.

E. The Companion Speaker shall provide transmission of HD audio as defined by Intel(TM) High Definition Audio specifications, June 17th, 2010 as generated from intercom console and/or associated push-to-talk, intelligent microphone, supervised network amplifier, or program sources connected to the network.

F. In addition to the visual call-in assurance status indicators on the notification stations, call-in

assurance status indication must also be provided on the associated Companion Speaker. Also, in addition to visual call-in assurance, audible call-in assurance shall also be provided in support of persons with visual disabilities.

G. Under blackout conditions the notification station shall be illuminated such that it can be located in the dark.

H. Normal call stations must support the ability to activate emergency call-in signals via multiple button presses and press and hold operations. Emergency call stations shall be separate and clearly labeled with a red button so as to impart obvious operation in the event of an emergency. Systems that only provide a single call station with dual emergency and normal operation shall not be acceptable.

I. The Companion Speaker shall provide local, visual indication of operation or failed-communication and shall immediately annunciate a loss of communication at the main console location.

J. The Companion Speaker shall enable the Emergency Display/Clock to support the call-in roll-over feature where if it receives a call-in as a primary call destination which is not answered after a pre-set amount of time, the call shall be automatically escalated to a secondary call destination. If both the primary and secondary call destinations are unavailable, the call shall be redirected to a back-up station or console.

K. The Companion Speaker volume must be capable of individual level settings through the network. Settings must not be adjustable without authorization. Volume controls located in rooms must be centrally lockable via the network. Systems that allow a volume adjustment without authorization are not acceptable. Systems that utilize a manually operated transformer or resistive volume control design shall not be acceptable. Volume controls shall be capable of establishing and maintaining levels for intercom, paging, program distribution, and tones, independently for each of the above functions. Emergency announcements shall be sent at a volume/level as required by the AHJ, and shall not be affected by the adjustment of other speaker volume/levels for the purposes of paging, intercom or other lower priority audio events.

2.8 SUPERVISED CALL STATIONS

A. The Supervised Call Stations, as indicated on the drawings, shall be Telecor model eCS-1 eCS-2, eCS-3, eCS-4, eCS-5, eCS-6 or approved equal. The station shall be used to initiated calls from remote locations to eSeries Consoles.

B. Call Stations shall be monitored for call line failure. In the event of an open circuit, short circuit or short to ground, the System shall detect the fault and notify a designated console operator automatically. The type of fault and its identity on the system shall be displayed on a designated console screen.

C. Call Stations shall provide “message waiting” indications to staff members. If no one is present in a room to respond to a call, or the room is in Privacy or Do Not Disturb mode, the console operator shall have the option to leave a Message Waiting (MW) indication at the Station. If the MW option is chosen, the LED indicator on the room call switches shall begin to pulse. When a call-in is initiated from the room, the MW indication shall be automatically deactivated, and the call-in shall be automatically routed to the console that left the MW indication.

D. Call Stations shall utilize a momentary contact touchpoint to initiate a “Normal” priority level call. Stations equipped with an “Emergency” touchpoints shall initiate “Emergency” priority level calls. All stations shall have a Call Assurance LED. The LED shall flash when a call in initiated, confirming call placement to the user. The LED shall continue to flash until the call is answered by the console operator.

E. Calls Stations that are equipped with “PRIVACY” touchpoints shall place the room into a “Privacy” state, preventing the monitoring of audio activity in that room. When in the state privacy, the touchpoint shall illuminate indicating privacy status. When a call is initiated from

the Call Station, the privacy state shall automatically be suspended for the duration of the call and automatically re-enabled when the call is complete. If a Console places a call to a location that has a Call Station that is in “Privacy”, the caller shall be given verbal instructions, automatically generated by the console, that the room has been placed in privacy and the callers options are to cancel the call, leave a message waiting indication or connect regardless. If they choose to connect, the audio shall be allowed to be transmitted from the console to the room, but the calling party shall not be able to listen to the room audio unless the party in the room turns off the privacy feature.

F. Call stations that are equipped with “DO NOT DISTURB” (DND) touchpoints shall place the room into DND mode when pressed. When DND mode is enabled, the back lit LED on the station shall illuminate, indicating that the station is in a DND state. Schedule scheduled events, zone pages and normal priority audio programs shall be blocked from being broadcast into a room that is set into the DND state. However, Emergency pages, manual tones and high priority audio programs shall continue to be broadcast into the room. If a call-in is initiated from a room is set to DND, the DND status shall be automatically suspended for the duration of the call, and automatically re-enabled when the call is completed. If a call is placed from a Console to a location that has a Call Station set to DND, ”, the caller shall be given verbal instructions, automatically generated by the console, that the room has been placed in DND and the callers options are to cancel the call, leave a message waiting indication or connect regardless. If they choose to connect, the intercom call shall proceed normally allowing the caller to speak to the party in the room.

G. Call stations that are equipped with "CHANNEL SELECT" touchpoints shall toggle through the available public channels that the room shall be tuned to.

H. Call stations that are equipped with "VOLUME" up and down touchpoints shall increase or decrease the volume of the current audio operation type the call station is engaged in. The type of audio operations that can be affected are intercom, normal page, emergency page, and public channel.

2.9 SUPERVISED NETWORK INTERCOM STATIONS

A. The Supervised Network Security Intercom Station (subsequently referred to as Intercom Station) shall be a Telecor model eSTN-0, eSTN-1, eSTN-2, eSTN-3, or approved equal. The Station shall be supervised and used to establish communication between specific areas of a facility, providing for two-way communications as well as call-in capabilities.

B. The Station shall be equipped with zero to three tamperproof push-button switches as required for the application. The unit shall be inscribed with simple operating instructions on the stainless steel faceplate. Stations shall support placement of a call-in (normal or emergency), the annunciation of a call-in, answering of a call-in for intercom, and placement of an all call, emergency, or zone page as required.

C. The Station shall have a station status LED indicator with “Status” inscribed on the faceplate.

D. The Station shall provide a dry contact output that can be activated remotely from another station or from a console, such as may be required in a door release application.

E. The Station shall receive power and data through a Power-Over-Ethernet switch. Once plugged into the LAN through a Power over Ethernet network switch, the Station shall be immediately functional and be able to receive calls and pages from consoles on the network. The Station shall not require any network configuration or administration to function.

F. The Stations shall have a call-in roll-over feature where if it receives a call-in as a primary call destination which is not answered after a preset amount of time, the call shall be automatically escalated to a secondary call destination. If both the primary and secondary call destinations are unavailable, the call shall be redirected to a back-up station or console.

G. The Station shall have the capability to be configured as a member of 1 or more paging zones.

H. The Station shall be wall-mounted on a 3-gang backbox with a depth of no less than 2.75”. Mounting hardware shall be tamper-proof. The face plate shall be fabricated from 11 gauge stainless steel with a brushed, mar-resistant finish. The Station shall be designed to withstand physical damage and everyday wear-and-tear. The buttons shall be tamper-proof and the overall assembly shall be designed to be vandal-proof. A G3 weather-seal gasket shall be available as an additional option to weatherproof the Stations.

2.10 SUPERVISED SPEAKER BREAKOUT MODULE

A. The Speaker Breakout Module shall be a Telecor model eSBM-TB or approved equal. It shall provide the means of integrating traditional analog speakers and call initiating devices to the eSeries System. The Module shall also be a Single Zone Paging Adapter that can drive an amplifier to provide paging coverage in a facility. The Module shall have three relay outputs that can activate automatically during a call processing operation.

B. The Module shall receive power and data through a Power-Over-Ethernet switch. Once plugged into the LAN through a Power over Ethernet network switch, the Module shall be able to place or receive calls and pages from the eSeries network. The Module shall not require any network configuration or administration to function.

C. Speech shall be transmitted through the Module in crystal-clear HD Audio. Audio shall be transmitted in the frequency range from 50 Hz to 7 kHz and shall use a maximum of 128 kbps of bandwidth during a call. Audio between the Module and eConsoles shall be non-blocking.

D. The Module shall support eSTB-12 2x2 Ceiling Inlay Speakers, which shall connect to the eSBM-TB via a standard CAT5 cable or conventional 8Ω/25V/70V speakers to provide paging and talkback operation from eSeries e300 eConsoles or phones via an eSIP and an IP-PBX.

E. The volume of the speakers shall be adjustable individually, by zone, or across the entire eSeries network via the ePort Management Interface or eCI Control Interface. Volume controls incorporated into certain eCS station models shall also allow a user to adjust the speaker volume locally. Volume levels shall be set by specific functions: intercom, paging, emergency paging, and Public Channel operations.

F. Call-in capabilities shall be provided with addition of any of Telecor's eSeries Call Stations. The eCS-6 and eCS-3 shall be used to initiate Normal and Emergency calls respectively. Advanced stations that provide additional features shall also be available: the eCS-1 (Privacy and Normal Call), eCS-2 (Do Not Disturb and Normal Call) , and eCS-4 (Volume Control, Public Channel Select and Normal Call). All eCS Call Stations shall also provide "message waiting" indication.

G. The eSBM-TB shall also support placing normal and emergency priority call-ins from simple pushbutton call switches. Pressing the normal call switch shall initiate a normal call-in, and either pressing it three times quickly or pressing and holding it for three seconds to shall place an emergency call-in. Pressing the emergency switch once shall place an emergency call-in.

H. The Module shall have the ability to direct normal and emergency call-ins to different devices. If the device that is configured to receive the call-in loses network connectivity, the Module shall automatically search for an alternate destination. If no other suitable call-in destinations exist, the Module shall audibly and visually indicate a fault.

I. The Module shall have a call-in roll-over feature where if a call-in to the primary call destination is not answered after a preset amount of time, the call shall be automatically copied to a secondary call destination. If both the primary and secondary call destinations are unavailable, the call shall be redirected to a back-up eConsole.

J. The Module shall have the capability to be configured as a member of one or more paging zones.

K. The Module shall have a built-in 4-watt audio amplifier that shall drive up to 4 watts of audio to a small zone of 25/70 volt loudspeakers. The module shall provide a line level audio output that can connect to an external power amplifier for applications where the speaker zone load exceeds 4 watts.

L. The Module shall be monitored for network connectivity. If the Module's network connection is lost, targeted e300 eConsoles shall report that station as absent and display its dial number. When the Module is used with eCS Call Stations, the Module shall also provide full supervision and monitoring for Call Station and call-in destination connectivity. If a wiring fault is detected between an eCS Call Station and the Module, the Module shall audibly and visually indicate the error utilizing the status LEDs on the Module. The eCS Call Stations shall pulse to indicate a trouble condition. In case of a fault, the ePort or eLog shall log the location, time, date and type of fault. If so configured, the ePort, eLog, eCI and eAmplifiers shall also generate an alarm tone.

M. The Module's status LED that shall flash in different patterns to indicate normal operation, call-in assurance, message waiting, a call or paging audio in progress, or to indicate an error.

N. The Module shall be equipped with three relays that can be used to operate auxiliary devices such as strobe lights, tone initiating devices and door locks.

O. The eSBM-TB shall be wall-mounted using the attached mounting brackets.

2.11 SUPERVISED NETWORK AMPLIFIERS

A. The Supervised Network Amplifier (subsequently referred to as Network Amplifier) shall provide a minimum of 25 watts for paging and public address and shall be capable of utilizing analog amplifiers to increase the amount of amplified signal from the network amplifier. The Network Amplifier shall be connected directly to the network switch by an RJ45 connector and shall receive signals directly from the network.

B. The Network Amplifier shall be supervised and in the event that network communications is lost, an audible alert shall sound on the Amplifier. The Network Amplifier shall provide a silence feature to mute the audible alert for 24 hours.

C. The Network Amplifier shall also be capable of receiving local input from local devices such as tape decks, iPod docks, CD players, etc. The network amplifier shall be capable of transmitting signals received from the local input to other network locations or locally to directly connected 25/70 volt or 8 ohm analog speakers.

D. Each Network Amplifier shall be capable of providing two audio inputs for local devices and shall be programmable as either a microphone or line-level input.

E. The Network Amplifier shall be controlled remotely such that audio programs, input, tones, textual messages, or announcements may be initiated by other devices connected at different locations on the local area network.

F. The Network Amplifier shall have a minimum of 4 local tone/pre-recorded announcement audio message control lines which when activated will distribute tones/pre-recorded audio messages to intended network amplifiers for re-distribution, network talk-back speakers (or a zone), and/or local 25/70 volt or 8 ohm analog speakers directly connected to amplifier. Each network amplifier shall be capable of storing four (4) pre-recorded announcements in addition to a minimum of 16 tones. Tones and announcements shall be activated locally or from other network devices.

G. The Network Amplifier shall store and transmit companion textual messages for each stored audio announcements. Textual messages shall be automatically broadcasted to the same zones along with the audio messages such that any device programmed for that zone

automatically receives both the audio and textual announcement/message and automatically reproduced each or both messages to the extent of the devices' capabilities.

H. The Network Amplifier shall be capable of transmitting HD level audio as defined by Intel(™) High Definition Audio specifications, June 17th, 2010 at a minimum.

I. The Network Amplifier shall shut down to protect itself should an output short circuit fault or overload occur that jeopardizes the integrity of the Network Amplifier.

J. The Network Amplifier shall be able to continuously broadcast public channel audio that other devices shall be able to tune to. The Network Amplifer shall support one public channel audio source. The eSeries network shall support up to 10 simultaneous public channels. Public channel audio being received by any station device shall be of the lowest priority and will be overridden by any other audio broadcast, pages, and intercom calls.

2.12 SUPERVISED INTERACTIVE GRAPHICAL USER INTERFACE

A. The system shall include an Interactive Graphical User Interface (subsequently referred to as IGUI). The software shall reside on Telecor provided PC and should have ability to interface to District Wide Emergency Communication system located in district office.

B. The IGUI shall be supervised and shall utilize an easy-to-use Graphical User Interface for quick and easy graphically aided navigation to access functionality for all intercom stations, paging zones, and program distribution sources. Emergency operations shall be simplified through the IGUI allowing stored audio files and alphanumeric messages for message displays to be activated from the IGUI. The IGUI shall allow common operations such as daily announcements to become simplified into single touch activated icons; removing the need for multi-step console set ups and dial strings.

C. The voice device used to originate voice communication for the IGUI to selected locations shall be a system console, telephone handset, or microphone independent from the computer hosting the IGUI. The voice device shall remain functional and accessible regardless of the operational state of a computer supporting the IGUI.

D. The IGUI shall allow the creation of a custom operating screen(s) based on the floor plans of the facilities. Icons representing intercom stations, zones used for paging, tone distribution, textual Message distribution, and audio program distribution shall be incorporated onto the floor plans. The IGUI software shall provide:

   a. Simple routine call processing, including: hold, transfer, and forward
   b. Activation of remote station auxiliary relays for applications such as door lock or release
   c. Emergency functions
   d. Paging
   e. Audio program distribution
   f. Customizable page elements
   g. Customizable operating screen
   h. Element library for emergency event icons
   i. Initiation of emergency and non-emergency messaging, textual and audible
   j. Remote station volume adjustment
   k. Remote activation of do not disturb status and/or message waiting status
   l. Remote station trouble indication
   m. Remote station background music channel selection
   n. Dynamic zone management for interactive on-the-fly console specific zones
   o. Single touch emergency response (supporting both actual emergencies and drills) including but not limited to all or any combination of the following:

      - Live voice notification
      - Pre-recorded audio message

- Digital plain text messaging with simultaneous numerically coded message capability
- Remote system activation, i.e., access control systems, CCTV systems, door release systems, etc.

E. The IGUI must provide an efficient and reliable method of notifying the occupants within the facility of critical situations. A variety of emergency tone signals that reside within the intercom/paging system shall be activated by clicking on pre-programmed buttons on the IGUI screen, initiating the transmission of tone signals to speakers, and alphanumeric messages to message displays/digital clocks. A “lockdown” icon shall be designed as per Owner direction, with Owner selecting the appropriate tone. Whole building macros for emergency or off-normal response shall be built into the internal communication system as directed by the Owner. Each macro shall be capable of being activated by the console, the IGUI as indicated on plans or as directed by the Owner or AHJ. It shall be possible to activate a WAV file message or Owner selected tone coinciding with multi-language textual messages for distributions to zones as directed by the Owner, all from a single activation icon located on the IGUI. Other single action macros shall be activated in similar fashion via the IGUI and a custom labeled icon. Plain language labeling of all icons on the IGUI shall be user changeable.

2.13 **CONTROL INTERFACE**

A. The Control Interface shall be a Telecor model eCI or approved equal. It shall provide a Desktop Application for PC interaction with the Intercom and Paging system, a Command Interface Protocol for external system interaction with 3rd party systems, Group Zone functionality, and a Scripting Engine supporting multiple sequential operations.

B. The system shall incorporate a Windows based Desktop application that makes use of a Command Protocol Interface, allowing external systems to interact with the Network Intercom and Paging System. Combined with the Scripting and Group Zones features, the Desktop application shall be able to generate a preprogrammed series of operations from a single action. These features shall be used in conjunction with a graphical user interface and the Microsoft Windows desktop.

C. Default Scripts shall be used to generate customized shortcuts according to the needs of a facility. These shortcuts shall then be placed directly on the Windows desktop and shall be able to activate virtually any Intercom and Paging function by clicking on the shortcut icon. These shall include activating:

   a. Alerts, audio distributions, coded and plain text messages, intercom operations.
   b. Pre-Recorded Evacuate, Lockdown, and All Clear audio files.
   c. Companion text messages for audio alerts.
   d. Coded messages on all secondary digital clocks and displays.

D. The Desktop Application shall also be able to use to activate SMS text messages, computer pop-up notifications, and email distributions in conjunction with any Desktop Script. Desktop Icons such as a Panic Button shall be able to send SMS notifications to a crisis team, advance warning to building occupants through pop-ups to heighten the level of awareness.

E. Any Desktop location running the Application shall have the ability to create and send an instant message using the Desktop’s keyboard any display. The textual message can be sent independently or as a companion message to an audible alert.

F. The Desktop Application shall be capable of utilizing Soft Call and Panic buttons. Soft Call buttons shall be able to be created to operate as a call button on the desktop with a normal or emergency call priority. They shall also be able to be combined with other preset or on-the-fly custom text messages. Panic buttons shall allow a user to unobtrusively activate an audio path from the panic button location to another eSeries device at a security location. This shall allow security personnel to listen to an occurring situation and provide the appropriate

response.

G. The System shall be capable of streaming multiple audio programs over 10 available channels, simultaneously, to speaker locations in the facility. The ability to turn the broadcast on or off to a specific location shall be controlled from the Desktop Application.

H. A user from the Desktop Application shall be able to enable or disable Do Not Disturb (DND) mode for a group of devices such as speakers or intercom stations.

I. Volume Adjustments to individual devices, devices in a zone, or all devices in the intercom and Paging System shall be able to be made from the Desktop Application

J. The Desktop Application shall be able to be used to create a call directory to provide the user with the ability to quickly and easily place calls to a large number of prospective recipients and locations. The shortcuts shall be able to be customized with the name of the call recipient or location. The call directory shall also be able to contain shortcuts that activate message waiting indications in addition to the option of placing calls.

K. The system shall interface with other external systems using a Command Interface Protocol. External systems include integrated security management or building management systems via devices such as computers, programmable logic controllers, or software based annunciator panels.

L. The Command Interface Protocol shall be used to send real time commands and receive real time status messages between the 3rd party system and eSeries devices. The Command Interface Protocol shall be an ASCII protocol that includes both outbound messaging, and support for inbound command via a virtual COM port and a physical USB connection.

M. Scripting shall allow operations to be carried out in sequence. Scripts shall be activated in various ways including: automatically based on the day of week and time of day, using an eConsole or a phone, or by using eDesktop, or from other scripts.

N. When scripts from an eConsole or PBX phone (via eSIP), the name of the script shall be displayed on the eConsole or phone. Then the user shall be presented with options to enable or disable the script (depending on the current state of the script). eConsoles and PBX phones that dial the script number shall hear voice prompts for enabling or disabling the script.

O. Scripts shall be used for scheduling time tone programs that include tones, pre-recorded messages, and textual messages displayed on e365-TB Message Display/Clocks reoccurring at specific times and days.

P. Scripts shall be able to perform cascading evacuation operations where evacuation audio messages are automatically first distributed to zones closest to the location of an emergency before spreading outwards to other zones according to a time schedule, thus reducing evacuation route congestion throughout the facility.

Q. Group Zones shall allow groups of page zones or devices to be defined as a group zone with a dial number. Group Zones shall be able to be accessed from eDesktop, eConsoles or PBX phones.

R. Group zones shall be the destination for various functions including textual messages, or audio operations, such as pages or audio program distributions). Group zones shall be assigned customized names which will appear on eConsole or phone displays when they are dialed.

S. Group Zones shall make it possible for a dial number to forwarded to a different destinations based on time and day. For example, common audio operations directed to a Group Zone dial number shall be able to be configured to go to the usual destination during regular hours but to a different destination outside of regular hours.

T. Group Zone shall support designated priorities, such as emergency. Operations that are to a zone with a priority are automatically elevated to override any normal or lower priority operations the devices in that group zone are receiving.

2.14 SUPERVISED SIP TRUNK IP/PBX INTERFACE

A. The system Session Internet Protocol (SIP) Interface shall be a VoIP PBX phone interface of the same manufacturer as the supervised network intercom and paging system. Third party gateway devices shall not be accepted.

B. The SIP Interface shall be supervised and shall connected directly to the facility's network and the PBX's network and shall provide the following:

   i. Establish a barrier gateway between the intercom and paging network and the PBX and/or common computer network.

   ii. Transparent audio operation between VoIP PBX phones and any device on the supervised network intercom and paging system. Paging access from any telephone on the facility system VoIP PBX to any intercom speaker, speaker zone, intercom station, console, all speakers, or paging horns and zones throughout the facility.

   iii. Any call-in from the supervised network intercom and paging system shall be capable of being routed directly to a VoIP PBX phone. Call-in stations can be configured and programmed to automatically dial any number on the publicly switched telephone network, landline, or cellular number through the SIP interface and via the PBX.

   iv. Ability to escalate a call-in directed to a console to be redirected to a VoIP PBX connected phone via the SIP Interface. Escalation can also include the ability to dial any number on the publicly switched telephone network, landline, or cellular number through the SIP interface via the PBX.

   v. Ability to initiate alarm and crisis response protocols from any VoIP PBX connected phone.

   vi. Ability to require security access code to utilize the intercom or paging system emergency communication features.

   vii. Minimum of 10 simultaneous telephone channels of access to/from VoIP PBX phone system. Full caller ID support from any supervised network intercom call-in device to a VoIP PBX connected phone identifying the calling station ID/Location.

   viii. Emergency level call-in to be uniquely identified as emergency on the VoIP PBX phones.

   ix. Activation of all supervised networked intercom and paging system emergency tones and pre-recorded announcements from any phone connected to the building VoIP PBX phone system.

   x. The SIP Interface shall additionally allow for calls to be placed from a console to any phone number on the publicly switched telephone network (landline or cellular). Additionally, intercom calls at a console may be transferred to any number on the publicly switched telephone network to any landline or cellular number through the SIP interface via the PBX.

C. Systems that connect to a building or district phone system and are limited to a SLT or CO connection will not be accepted as a substitute for a fully operational SIP Interface.

D. The SIP Interface shall support integration with InformaCast systems. The InformaCast system shall be able to activate messages activated via dialing on a Console and via the InformaCast web interface. The InformaCast messages shall include text to message displays, pre-recorded audio, and ad-hoc audio to eSeries devices which will be appropriately distributed to targeted and applicable eSeries devices.

2.15 **MASTER CLOCK /MESSAGE HOST**

A. The Master Clock / Message Host shall be a Telecor model eMH or approved equal. It shall be a time master device for the eSeries network which enables configuration and activation of eSeries operations from a web-based graphical user interface (GUI). An unlimited number of operations shall be managed for activation by schedules or use The application shall be web-based and secured via HTTPS certification. It shall be preconfigured with a variety of default operations, schedules, audio, and icons for quick customization. Users shall log into the application from any desktop computer or mobile smart device using a supported web-browser. Supported web browsers shall include Microsoft Edge, Mozilla Firefox, Google Chrome, and Apple Safari.

B. Master Clock functionality shall include central time keeping and synchronization of all other eSeries devices throughout the eSeries network.

C. The Master Clock shall manage an unlimited number of calendar-based schedules, which are collections of operations intended to be performed frequently, periodically, or on specific dates and times. For example, a schedule may be a series of bell tones that consistently indicate class changes. Users shall set schedules so that the operations they contain will activate accordingly.

D. Schedules shall be viewed, enabled or disabled in a calendar. The calendar shall display schedules on a daily, weekly, monthly or yearly basis. The eMH shall support scheduling operations up to 10 years into the future.

E. An unlimited number of holidays shall be specified and marked on the calendar. This shall indicate days where disabling all schedules may be appropriate.

F. The Master Clock shall obtain time from and synchronizes with Network Time Protocol (NTP) servers directly or via an NTP-enabled eSIP present on the eSeries network.

G. Operations shall include several components, including: pre-announce tones, pre-recorded audio, scrolling textual messages, and coded messages. If desired, specific details of the components shall be customized. Customization shall include: the number of times the pre-announce tone plays, the message scroll speed, and the delay before pre-recorded audio repeats. Depending on the operation type, user-activated operations shall be distributed immediately or queued for later distribution.

H. The Home page shall provide a quick overview of eMH-managed operations. This shall include the next scheduled operation, the schedules that are currently active, and the next scheduled school drill. The eMH shall include user specific short tutorial videos that explain various aspects of the GUI and provides built-in on demand training.

I. The Live page shall show currently active and upcoming operations. A history of recently performed operations shall confirm operations occurred as intended. Also, users shall easily initiate on-the-fly operations on the Live page by configuring and activating them on demand.

J. Routine operations shall include an unlimited number of pre-configured common audio distributions. Examples shall include announcements for special assemblies, bus arrivals, staff meetings, and festive events.

K. Operations shall be associated with eSeries eCI scripts so that they shall be activated by users. The GUI shall indicate if the eCI script is active even if it was activated via other means such as dial access code or Visual Console for eSeries. Other emergency operations (such as Lockdown) shall also be seamlessly integrated with Visual Console for eSeries.

L. Audio files shall be used for tones or announcements while images shall be used as icons throughout the GUI to represent different operations or schedules. Audio file formats shall include (WAV and MP3) and images to support operations.

M. Access shall be user-account controlled. An unlimited number of users shall be supported with a high level of individual customization. Users shall be given access to only the pages

and operations relevant to their intended roles. For each page, users shall be granted permissions to activate or configure operations and schedules from a desktop or, for certain users, from mobile devices. An administrator account shall have full access to view and make configuration changes on all pages, while an operator account shall be limited to activating routine or emergency operations and enabling or disabling schedules.

N. Users with administrative privileges shall have the ability to configure the site name, time, time zone, test zone, and import and export databases. To aid installers with initial configuration, a test mode shall be provided as well as a database import/export feature. Test mode shall redirect all activated operations to a test zone (that only the installer occupies) to prevent disrupting other people during configuration and testing. Database import/export shall allow the configuration to be exported for backup purposes or to copy to other installations.

O. The system shall be configured for an unlimited number of dedicated emergency response operations. A corresponding drill operation shall be automatically created for each emergency situation. Users shall be able to activate emergency response operations from facility PCs or remote mobile devices.

2.16 eCALL VIRTUAL CALL STATION

A. eCall provides a virtual call station on a Windows-based PC. Calls are placed by simply clicking on the virtual call button on the PC Screen. This initiates a call to an eConsole which displays the origin of the call. Once answered, voice communications are instantly established over the classroom speaker with the caller.

B. The station is designed to mimic the look and operation of an actual station. Operations are interactive and animated to provide visual feedback to the user.

C. The eCall application can be deployed on both fixed and mobile PCs. The user is automatically prompted to register their room location for situations where they move from classroom to classroom.

D. Desktop stations can also be customized to combine various feature buttons, creating the exact functionality to meet the requirements of a facility.

E. When not in use, eCall minimizes to an icon on the desktop’s notification area.

3. EXECUTION

A. Install the system in accordance with the manufactures printed instructions and recommended cable types.

B. Provide point to point wiring diagrams showing location of all wire pulls. Mark all cables corresponding to point to point wiring diagrams.

C. System Acceptance Test

1. Have the company field adviser adjust the completed system to desired volume levels of customer.

2. The system shall operate for at least two weeks with no failures or changes required.

3. Test every circuit in the system to ensure proper operation.

4. Test each daily function school will be using making sure staff is knowledgeable in the operation of the system.

D. The Contractor, in order to provide the level of service and parts the Owner requires, shall have technicians dispatched and a warehouse, within 50 miles of the Owner’s, District Office.

E. The Contractor shall provide a one-year warranty of the installed system against defects in material and workmanship. All labor and materials shall be provided at no expense to the Owner during normal hours. The warranty period shall begin on the date of acceptance by the Owner.

F. The Contractor shall, at the Owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

G. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

END OF SECTION

SECTION 281600

INTRUSION ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Integrated Digital Alarm Communicator and Access Control System (DACS), including but not limited to the following:
   1. Control panel.
   2. Enclosures.
   3. Lock and key.
   4. Power Supplies.
   5. Accessories required to provide a complete DACS.
   6. System O and I manual.
   7. System programming.
   8. Batteries.
   9. Wiring.
   10. Conduits.

B. The Contractor shall be responsible for identifying requirements for permits from the local police department for the installation of the alarm system specified herein and shall assist the Owner in obtaining the relevant alarm permits.

1.2 RELATED SECTIONS

A. Section 260000 – General Electrical Requirements.

1.3 SYSTEM DESCRIPTION

A. A functionally complete, integrated Digital Alarm Communicator System (DACS) per manufacturer's guidelines, codes and specification requirements.
   1. The DACS shall include a Control Panel with built-in Ethernet jack for event communication and remote services.
   2. The DACS shall include a Control Panel with an optional, supervised telephone line interface module.
   3. The DACS shall include recording and retention of event information in a dedicated event log.
   4. The DACS shall incorporate an integral real-time clock, calendar, and a test timer.
   5. The DACS shall incorporate battery charging capabilities with supervision of battery voltage and battery leads.
   6. The DACS shall accommodate a time / event-based scheduling system.
   7. The DACS shall be capable of supervision of peripheral devices and communications interfaces.
   8. The DACS shall accommodate configuration and operation of separate, independent areas.
   9. The DACS shall accommodate hard-wired or wireless point expansion via eight-point interface modules and RF receivers.
   10. The DACS shall accommodate addressable expansion utilizing a 2-wire bus
   11. the DACS incorporate removable terminal strips for wiring connection to facilitate simple service and replacement
   12. The DACS shall have electrically supervised detection loops and power supplies with battery(s) maintenance. This supervision shall be programmable for the purposes of reporting this information to the DACR.
   13. The DACS shall be capable of sending (manually or automatically) test and status reports to remote DACRs.

14. The DACS shall be able to accommodate test, diagnostics, and configuration programming functions locally or remotely via a portable programmer or a computer running the Remote Programming Software (RPS).
15. The DACS shall annunciate alarm, trouble, service reminders, and other relevant system status messages in custom English, Latin American Spanish, Portuguese, Canadian French, Hungarian, Greek, Italian, Polish, German, Dutch, Swedish and/or Chinese text at the ACC.

1.4 REFERENCES

A. National Electric Code, Article 760.

B. National Fire Alarm Code (NFPA 72).

C. Administrative Council for Terminal Attachments (ACTA):
1. ANSI/TIA-968-A-2002 Technical Requirements for Connection of Terminal Equipment to the Telephone Network.

D. American National Standards Institute (ANSI):
1. ANSI C63.4 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

E. California State Fire Marshal (CSFM):
1. Title 19, California Code of Regulations, Building Material Listing Program (BML).

F. Federal Communications Commission (FCC):
1. Title 47 C.F.R. Part 15; Class B – Radiated and Conducted Emissions.
2. Title 47 C.F.R. Part 68; rules governing the connection of Terminal Equipment (TE) to the Public Switched Telephone Network (PSTN).

G. The National Institute of Standards and Technology of the United States of America (NIST):
1. Federal Information Processing Standards Publications 197 (FIPS 197) –Advanced Encryption Standard (AES).

H. International Organization For Standardization (ISO):
1. 9001 - Quality System.

I. Underwriters Laboratories, Inc. (UL):
1. UL 50 - Enclosures for Electrical Equipment.
2. UL 294 – Access Control System Units.
3. UL 365 - Police Station Connected Burglar Alarm Units and Systems.
4. UL 609 - Local Burglar Alarm Units and Systems.
5. UL864 – Control Units and Accessories for fie Alarm Systems (Commercial Fire)
6. UL 985 - Household Fire Warning System Units.
7. UL 1023 - Household Burglar Alarm System Units.
8. UL 1076 – Proprietary Burglar Alarm Units and Systems
9. UL 1610 - Central Station Burglar-Alarm Units.
10. UL 60950-1 - Information Technology Equipment - Safety.
11. UL 636 – Hold up alarms

1.5 SUBMITTALS

A. Product Data: Manufacturer's data, user and installation manuals for all equipment and software programs including computer equipment and other equipment required for complete Digital Alarm including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings: Shop drawings shall provide details of proposed system and the work to be provided. Include point-to-point drawings of systems and wiring diagrams of individual devices.
   1. Detailed wiring diagrams and system description.
   2. Floor plans and site plan indicating equipment/device locations and interconnecting wiring.
   3. Full Schematic of system, including wiring information for all devices.

C. Documentation to be submitted by the Contractor upon completion of system installation:
   1. "As-builts": Upon completion of installation, the Contractor shall prepare "as-built" drawings of the system. These "As-builts" shall be 30 inches by 42 inches (76 cm by 107 cm) format mylar reproducible drawings of each floor plan indicating exact device locations, panel terminations, cable routes and wire numbers as tagged and color-coded on the cable tag.
      a. Additionally, final point-to-point wiring diagrams of each type of device (on 30 inches by 42 inches (76 cm by 107 cm) format) shall be included in the "as-builts."
      b. "As-builts" shall be submitted to the Owner for approval prior to the system acceptance walk-through.
   2. Operation and maintenance manuals: Three sets of operating manuals shall be provided explaining the operation and maintenance of the system.
   3. Parts list.
   4. Maintenance required and maintenance schedule.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualification:
   1. The system shall be the standard product of one manufacturer, and the manufacturer shall have been in business manufacturing similar products for at least 5 years.
   2. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standard.

B. Installer Qualification:
   1. Minimum of five years experience installing access control, surveillance and security systems and devices.
   2. After-sales support: The Contractor shall be a factory-authorized and trained dealer of the system and shall be factory-trained and certified to maintain/repair the system after system acceptance.

C. System Requirements:
   1. All equipment, systems, and materials furnished and installed under this section shall be installed in accordance with the applicable standards of:
      a. National Codes: NEC, NFPA, UBC, BOCA, SBCCI, IBC, as applicable.
      b. Approvals and listings: UL, ULC, FM, ANSI SIA CP-01, CSFM, NYC-CoA, as applicable.
      c. Local Authorities Having Jurisdiction (AHJ).

D. Mock-Up: provide a mock-up for evaluation of installation techniques and application workmanship.
   1. Finish system in areas designated by Architect.
   2. Do not proceed with remaining work until workmanship and aesthetics are approved by Architect.
   3. Remake mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened, undamaged containers; and unharmed original identification labels.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Protect store materials from environmental and temperature conditions following manufacturer's instructions.

D. Handle and operate products and systems according to manufacturer's instructions.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. All components, parts, and assemblies supplied by the manufacturers and installed by the Contractor shall be warranted against defects in material and workmanship for a period of at least 12 months (parts and labor), commencing upon date of acceptance by Owner. A qualified factory-trained service representative shall provide warranty service.

B. Service/Maintenance:
1. System maintenance and repair of system or workmanship defects during the warranty period shall be provided by the Contractor free of charge (parts and labor).
2. Periodic testing of the system shall be carried out on a monthly or quarterly basis to ensure the integrity of the control panel, the sensing devices, and the telephone lines.
3. The installer shall correct any system defect within six hours of receipt of call from the Owner.
4. Extended service/maintenance agreements shall be offered by the Contractor for up to four years after the warranty expires. The agreement shall be renewable monthly, quarterly, or yearly.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. North America: Bosch Security Systems, Inc.; 130 Perinton Parkway; Fairport, NY 14450. ASD. Toll Free Tel: 800-289-0096. Tel: 585-223-4060. Email: request info (presales.support@us.bosch.com). Web: www.boschsecurity.us.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of section 01600.

2.2 GENERAL DESCRIPTION

A. Control Panel and Features:
1. The DACS control panel shall be Bosch Security Systems, Inc. model B9512G comprising a fully integrated intrusion and residential fire control system. The control panel shall support the following:
a. The DACS system is capable of being utilized as a combination Intrusion and Commercial Fire system per code. Fully integrated intrusion and fire functions

allow users to interface with 1 system instead of 2

b. Optional Telephone Line Module, programmable for signaling and supervision.
c. Integrated Conettix IP based communication provides high-speed, secure alarm transport and control.
d. 32 programmable areas with perimeter and interior partitioning.
e. 8 on-board, hardwired points with expansion capability for a total of 599 using a combination of wired or wireless points.
f. Compatibility with Color Graphic Touch Screen, 2-line alpha numeric capacitive touch, ATM style LCD or 2-line LCD style Alarm Keypads.
g. Local or remote programming, test, and diagnostic capability via a computer running the Remote Programming Software (RPS).
h. The system shall include an integrated USB port for local programming and diagnostics using a computer running Remote Programming Software (RPS) and a male USB2.0 to male USB 2.0 cable with no additional hardware modules required.
i. The system shall support the use of an Apple iOS device and/or Android device for control. Functions to include arming, disarming and control of outputs and access door, viewing of connected IP cameras. This application shall connect directly to the DACS using internet, wifi or cellular communications and shall not require a third party server of network operations center (noc).
j. The DACS will allow integration with up to 16 Bosch IP video cameras using the built-in Ethernet connection, allowing the cameras to act as inputs and outputs.
k. The DACS shall support integration with the Bosch Video Management System (BVMS) using the built-in Ethernet adapter.
l. The DACS shall support up to thirty-two (32) custom functions allowing the installer to combine up to 6 functions into one command. These custom functions shall be operated by keypad command, point activation, keyfob button, or programmable schedule
m. The DACS shall support up to 32 keypad shortcuts which allow the installer to define which commands are available at each keypad.
n. The system shall offer multiple language support that can be assigned per keypad. The system shall offer multiple language support that can be assigned per keypad. Languages supported must include English, Latin American Spanish, Portuguese, Canadian French, Hungarian, Greek, Italian, Polish, German, Dutch, Swedish and/or Chinese.
o. The DACS shall support flash firmware upgrades of systems firmware for the control panel and peripherals, allowing for future updates.
p. Integrated real time clock, calendar, test timer and programmable scheduling capability for relay control and automatic execution of system functions based on a time / event.
q. Provide 1.4 amps of power for standby operation and 2.0 amps of alarm power, both rated at 12 VDC.
r. 3 configurable form ‘C’ wet or dry-contact relay outputs with expansion capability for up to an additional 472 dry-contact relay outputs.
s. Integrated battery charger with reverse hook up protection, battery supervision and battery deep discharge protection.
t. Supervision of peripheral devices and communications interface(s).

B. Point Functionality and Expansion:
1. Each point in the system shall be programmable to provide the following type of response in the system:
a. Always on (24 hour response).
b. On when the system is Master Armed.
c. Only on when the system is Perimeter Armed.
d. Displays / Does Not Display at the ACC when the point is activated.
e. Provides / Does Not Provide entry warning tone.
f. Sounds / Does Not Sound audible alarm indication.

g. The Point is bypassable / not bypassable.
h. Alarm Verification with programmable verification time.
i. Fire Alarm Point
j. Relay activation by Point.
k. Provides / Does Not Provide "watch point" capability.
l. Provides Swinger Bypass.
m. Defers Bypass Report.
n. Can return to the system after being force armed and then restoring.
o. Can return to the system after being bypassed and then restoring.
p. Keyswitch arming (maintained or momentary)
q. Activate by Custom Function
r. Activate following an output
s. Gas Alarm

2. The system shall support a programmable Monitor delay functionality for supervision of points during disarmed periods. These points may be programmed to ignore status from 1 to 60 minutes and will activate only if the point is off-normal for this time period.
3. The system shall support a programmable delay response functionality for supervision of points during armed or disarmed periods. These points may be programmed to ignore status from 1 to 60 minutes and will activate only if the point is off-normal for this time period.
4. The system shall support virtual points and outputs for customized programming of events
5. The DACS shall be capable of supporting "group zoning." Group zoning refers to the combining of points into a separately identifiable and separately annunciated (programmable text) areas.
6. The DACS shall be capable of allowing variable point response times via programming. Point response times shall be programmable over a range of 300 milliseconds to 4.5 seconds.
7. The DACS shall have the capability to expand up to 599 separately identifiable points, of which 8 are on-board and 472 are off-board wired, addressable or wireless points.
   a. The 8 on-board points shall be able to accommodate powered class B functionality using a powered loop interface module.
   b. Point Expansion Modules (Wired and Wireless) shall be able to be located remote to the main panel to a maximum distance of 1000 feet.
   c. Addressable modules shall be able to be located remote to the panel to a maximum of 500 feet.
8. The DACS shall have the capability to expand up to 99 separately identifiable points, of which 8 are on-board and 91 are off-board addressable points connected to multiplexed backbone trunks via wired modules and/or wireless receivers.
   a. The 8 on-board points shall be able to accommodate powered class B functionality using a powered loop interface module.
   b. Point Expansion Modules (Wired and Wireless) shall be able to be located remote to the main panel to a maximum distance of 1000 feet.
   c. Addressable modules shall be able to be located remote to the panel to a maximum of 500 feet.

C. Areas/Accounts:
1. The DACS shall support 32 independent areas. Each of the 32 areas shall have custom text associated with the armed state, disarmed state and point-off-normal state.
2. The DACS shall be capable of assigning 1 to 4 account identifiers to the areas depending on the distribution of areas per account.
3. The DACS shall be capable of assigning 1 to 2 account identifiers to the areas depending on the distribution of areas per account.
4. All of the areas must be capable of Master (All) and/or Perimeter (Part) arming (excluding predefined Interior protection).
5. The DACS shall be capable of logically grouping 1 or more points into an area, or

conversely, dividing 2 or more points into two or more areas.

6. Any area shall be configurable to allow arming by specific users when a programmable number of devices are faulted or bypassed.
7. Areas shall be independently controlled by their corresponding ACC.
8. Area(s) shall accommodate assignment of independent account numbers to define annunciation, control, and reporting functions.
9. The DACS shall be capable of linking multiple areas to a shared area which may be automatically controlled (hallway or lobby).
10. The DACS shall accommodate conditional area arming dependant on the state of other areas (master or associate). Any area can be configured for perimeter and interior arming, not requiring a separate area for this function.

D. Output Relay Expansion: The DACS shall provide the capability for output relay expansion using relay expansion modules. Independent control of relay functions by area shall be possible through programming assignments.

1. The DACS shall be capable of activating 472 additional relay outputs for auxiliary functions based on its classifications (area vs. panel wide). Output Expansion Modules shall be able to be located remote to the main panel to a maximum distance of 1000 feet. 8 relays (Form C) are to be provided per octo-relay module
2.
3. The DACS shall be capable of activating 64 additional relay outputs for auxiliary functions based on its classifications (area vs. panel wide). Output Expansion Modules shall be able to be located remote to the main panel to a maximum distance of 1000 feet. 8 relays (Form C) are to be provided per octo-relay module
4. The DACS shall be capable of controlling relays and automatically executing system functions based on a time / event scheduling program. The program can be hour, day of week or day of month based.
5. Relays and other outputs may be programmed to follow up to 14 different area conditions or up to 12 panel conditions. Relays may also be programmed to follow individual points or groups of points.
6. The DACS shall support 5 different types of alarm output selections: Steady, Pulsed, California Standard, Temporal Code 3 and Temporal Code 4.

E. Scheduling: The DACS shall support scheduling capabilities with the following characteristics:

1. Arm / Disarm specific area(s) based on open/close windows.
2. Bypass / Unbypass point(s).
3. Activate / Deactivate relay(s).
4. Send test reports.
5. Up to 4 programmable holiday schedules of 366 days each (includes leap year). Based on the holiday settings, different time windows for open/close and other system functions can be executed.
6. Automatic adjustment of system clock for daylight savings time.

F. Alarm Keypads:

1. The DACS shall accommodate connection with up to 32 ACCs, each capable of displaying custom English, Latin American Spanish, Portuguese, Canadian French, Hungarian, Greek, Italian, Polish, German, Dutch, Swedish and/or Chinese text on a liquid crystal display.
2. The Alarm Keypads shall accommodate viewing and configuration of system parameters including:
   a. Network Parameters:
      1) DHCP Enable/Disable for the selected network module.
      2) UPnP Enable/Disable for the selected network module.
      3) IP Address for the selected network module
      4) Subnet Mask for the selected network module.
      5) Default Gateway for the selected network module.

6) Port Number for the selected network module - The module's port number shall range from 0 to 65,535.
7) DNS Server Address for the selected module's DNS server IP address
8) DNS Host Name for the selected module. The DNS host name shall contain up to 63 characters.
9) AES Encryption Key Size – Enable/Disable encryption by selecting the AES encryption key size for the selected network module.
10) AES Encryption Key String - The user shall be able to display, add and modify the AES encryption string based upon the key size previously configured for the selected network module.

b. Point Parameters:
1) Point Selection between one and the maximum number of points in the control panel.
2) Point Registration to allow system response from a specific physical point on any one of the expansion modules; On-board or Point expansion modules (wired or wireless)
3) Wireless points shall be able to be enrolled in the system via an auto enrollment feature.

c. Event Routing Parameters to allow programming of up to 4 report routing groups as well as configuration of primary and secondary paths.

G. User Passcodes and Authority: Passcodes shall be programmable with authority levels to allow users to operate any or all areas.
1. Up to 2000 different passcodes shall be accommodated
2. Up to 500 different passcodes shall be accommodated.
3. Each passcode shall be 3 to 6 digits (variable) and be assigned a 32-character user name
4. User access to System features and functions shall be configurable based on 14 individually programmable levels of authority assigned to the user passcode. Additionally, the system shall have the capability to assign to the user passcode, a different authority level in each of the areas. A service passcode can be assigned to the servicing agent allowing the agent limited access to system functions. User-programmable / activated functions include:
a. Arming the system: All areas, specific area(s) only, perimeter instant, perimeter delayed, perimeter partial, watch mode, and arming the system with a duress passcode.
b. Disarming the system: All areas, specific area(s) only and disarming with a duress passcode.
c. Viewing system status: Faulted points, event memory, bypassed points, area status and point status.
d. Implementation functions: Bypass a point, unbypass a point, reset sensors, silence bell, activating relays, initiating the remote programming function locally to allow programming the system from a remote location.
e. Testing the system: Local Walk test, Service Walk test, Fire test, send report to remote DACR to check the telephone link, and programming the time and date for the next test report transmission.
f. Change system parameters: ACC display brightness, system time and date, and add/delete/change passcodes.
g. Extend the closing time of the system.
h. Transmitting special alerts and activating audible and visible signals.
i. Executing multiple commands / ACC keystrokes from a single Menu / Command List item. This function shall be able to have a 32 character (alphanumeric) title to identify it on the ACC display.
j. Editing of time / event based scheduling program from the ACC.
k. The DACS shall also provide a "service menu" to implement functions such as

viewing and printing the system log, displaying the system firmware revision number, and defaulting (toggling) text displays between custom and default text displays for troubleshooting.

5. The DACS shall allow users to change their own user passcode from the Alarm Keypad (ACC). Managers shall be capable of changing the user passcodes and authority assignments by area of other users from the ACC.
6. The DACS shall incorporate a programmable "Passcode Follows Scope" feature to allow users to arm or disarm only the area they are entering with one simple command or control all areas from one ACC.

H. Access Control: THE DACS shall support access control using the B901 access control module(s).

1. The DACS shall support up to 32 door control modules to control 32 doors. Each door controller shall be capable of being programmed through the DACS from the local programmer or the RPS.
2. The DACS shall support up to 8 D9210C door control modules to control 8 doors.
3. The DACS shall use 26 bits or 37 bits of card/token specific data to identify the user. The card data shall not be truncated or shortened in making the identification of the user.
4. The access control module shall be able to be configured independently from the other doors. Door controllers shall include the following features and functions:
    a. Supervised, wired connection to normally open or normally closed contacts.
    b. 14 programmable levels of access authority
    c. Programmable entry/exit door strike and shunt control. The door opening can terminate a programmable door buzzer. The door contact is shunted when valid access is being granted through the door.
    d. A request to exit and a separate request to enter supervised input. A programmable feature provides for door shunting on request to exit without activating the lock output.
    e. Buzzer output that can be programmed to activate if the door is held open beyond a programmable time. Additionally, the ACC can display a door closing warning.
    f. The door can be programmed to activate an alarm or trouble in the door left open condition. The DACS shall be capable of transmitting the Door Left Open indication to the DACR.
    g. The door strike shall be capable of being programmed to automatically unlock if the area is completely disarmed and will not automatically unlock if the area is selectively disarmed.
5. The DACS shall be capable of being programmed, on a time basis, to record access granted and or access denied events by door.
6. The DACS shall allow each authority profile to specify whether users holding that authority are to be granted access into the area based on whether the area is completely disarmed, perimeter armed or completely armed.
7. The DACS shall be able to automatically disarm the area or convert the arm state of the area from fully armed to perimeter armed based on the authority level assigned to the user and area or arm an area from a particular reader.
8. Assigned users shall be able to manually control the door from an ACC by setting the door to Normal Operation, Manually Locked or Secured (valid cards will not operate).
9. The DACS shall log access control events and accommodate programming capability for transmission of the events to primary and/or secondary DACRs, including door and user identity.

I. Communication: The DACS shall be capable of reporting system events and supervisory reports including alarm, trouble, missing modules, restorals, system status, AC failure, battery status to primary and secondary off-site DACR's. The following features shall be supported.

1. The DACS shall be capable of communicating via dial-up analog telephone lines, over a LAN/WAN/Internet using a wired network interface module, or over a cellular network using a CDMA Cellular interface module.

2. The Bosch Modem4 communications format shall be utilized for optimum system performance. The Modem4 format provides the maximum data information to the receiver for alarms, troubles, restorals, bypasses, relay activation, opening/closings, and card access. The detailed information includes the point numbers with text, peripheral device numbers, user numbers with text, and area information. As an alternative format, SIA DC09 or Contact ID may be used although they will include less detailed information like point or user text.
3. The DACS shall be capable of sending text (SMS) messages to compatible devices without requiring that these message are sent to a monitoring center
4. The DACS shall have the capability of communicating with up to 8 different DACRs using up to 4 different phone numbers, up to 24-digits in length and/or 4 URL/IP addresses over a network.
5. The DACS shall report to a Commercial Central Station that is using a Bosch D6600 Receiver/Gateway or a Bosch D6100i Receiver using Modem4 as a preferred format or Contact ID as an alternate format.
6. The DACR shall provide the transmission information sent from the DACS that includes alarms, troubles, restorals, bypasses, relay activation, opening/closings, and card access. When using the ModemIIIa² format the detailed information includes the point numbers with text, peripheral device numbers, user numbers with text, and area information.
7. The DACS reports shall be classified, by event, into eleven subcategories or "report groups." Each group represents similar types of events. Individual events within each group shall be selectively enabled or disabled for transmission. The eleven report groups shall be as follows:
   a. Fire Reports.
   b. Burglar Reports.
   c. User Reports.
   d. Test Reports.
   e. Diagnostic Reports.
   f. Relay Reports.
   g. Auto Function Reports.
   h. RPS Reports.
   i. Point Reports.
   j. User Change Reports.
   k. Access Reports.
8. The DACS shall have the capability to verify the integrity of the remote communications path and switch to alternate paths when a communications failure occurs.
9. The DACS shall be capable of unattended mode of operation whereby programming and configuration updates are automatically transferred using the Remote Programming Software (RPS). These updates can initiate from either the control panel or the remote computer using RPS.

J. Network Communication: The DACS shall be capable of network communications over a LAN, WAN, Intranet, or the Internet. The system shall include supervision of the network communication utilizing configurable periodic heartbeats to the Digital Alarm Communications Receiver (DACR). The DACR shall provide notification of the loss of communications from a networked system after a programmable timeframe since the last communication. The notification options shall be programmable and include local annunciation or indication to automation software.
   1. The network interface module shall be capable of supporting Dynamic Host Communication Protocol (DHCP) to obtain an IP Address.
   2. The system shall support a method of authentication between the control panel and the receiver to ensure that the control panel has not been compromised or replaced.
   3. The network interface modules shall be capable of supporting encryption using a minimum of 256-bit AES Encryption (Rijndael) certified by NIST (National Institute of

Standards and Technology) utilizing the Cipher Block Chaining (CBC) method.

4. The network interface module shall support a 10/100BaseT connection to an Ethernet network.
5. The control panel shall be capable of network communication with a programmable poll time to send periodic heartbeats to the receiver, programmable ACK Wait time, and programmable retry time. In the situation where a communication path is unsuccessful, the control panel shall be capable of attempting backup communication through an available communication method to the same receiver or a backup receiver.
    a. The control panel shall have the ability to automatically adjust the heartbeat rate of a backup path that is using cellular to the heartbeat rate of the primary path in case of a primary path failure. Upon restoral of the primary path, the heartbeat rate of the backup path shall automatically restore to the original rate. This allows a system utilizing cellular communications to keep the wireless charges low.
    b. The network communication between the control panel and the receiver shall use Modem4, SIA DC09 or Contact ID.
    c. The control panel shall be capable of two-way communication using a wired network interface module with a 10/100BaseT on a LAN/WAN/Internet configuration or with a cellular module on the Internet.
    d. The control panel shall be capable of configuring the destination of the receiver using a URL or static IP Address.
    e. The control panel shall be capable of using DNS to lookup the IP Address of the receiver when programmed with a URL.
    f. The control panel shall support UPnP for automated Port Forward configuration in the router where the control panel is installed.
    g. The control panel shall support AutoIP to enable the RPS software to connect to the control panel locally using an IP Direct connection.
    h. The control panel shall support configuration of the IP parameters from the keypad eliminating the need for a PC to configure the IP device.
    i. The control panel shall support network diagnostics from a keypad to allow local testing of network connectivity. The diagnostics should include, Ethernet cable connected, gateway configuration ok, DNS lookup operational, and external network connectivity (such as the Internet) operational.
    j. The system shall be capable of meeting DCID 6/9 and UL 2050 standards.

K. Event Log: The DACS shall maintain a log of events indicating time, day, month, year type of event, account number, area number, user ID, point text, user text and primary/secondary event route. The system shall allow the following characteristics:
    1. The DACS shall be capable of storing up to 10,000 events
    2. The DACS shall support viewing of logs locally at the ACC and remotely via an upload to a remote central station computer running the RPS software.
    3. The DACS shall provide notification via a report to the DACR when the event log reaches a programmable “percent full capacity". This allows retrieval of stored events via RPS to prevent any loss of event history.
    4. Group, signal type and area can route events to specific receivers.
    5. Each DACR shall be designated as a primary, backup, or duplicate destination for each report group. Assigning an event to multiple routing groups provides for duplicate destinations for the event. The transmission of grouped events allows the reporting of different types of information to different remote DACRs.

L. Testing, Diagnostic, and Programming Facilities: The DACS shall be capable of sending (manually or automatically) test and status reports to remote DACRs.
    1. The DACS shall be capable of sending automatic tests daily, weekly or once every 28 days. Automatic test times shall be programmable to provide an offset of up to 24 hours from the current time.
    2. Automatic test reports shall be programmable to be deferred by one test interval if any

other report is transmitted in the current interval.

3. Automatic test reports and remote system access for diagnostics shall be supported via a remote central station computer with Remote Programming Software (RPS).
4. The DACS shall be programmable locally or remotely. Programming shall be accomplished via a Keypad or a computer with a remote programmer and diagnostic software package (RPS).
5. The DACS shall allow an on-site user to initiate remote programming while on-line with the servicing location. The remote programming device must provide a compare feature and allow for downloading either the stored program or the (un)modified program copied from the panel.
6. The DACS shall allow the local programming option to be disabled and must provide a method to program a panel while no one is on premises, when the panel shares a line with an answering machine.
7. The DACS shall accommodate IP Diagnostic to verify settings and operation of the network interface modules; Host name, MAC address, IPV4 address assignment. The IP Connection test shall include; Link test to verify physical cable integrity, Ping test to verify gateway response, ping test to verify address on the internet.
8. Wireless point diagnostics shall include signal strength and device states of registered wireless points in the system.
9. The number of system testing and programming sessions shall be restricted via the use of program locking features and passwords. Passcode protection in excess of sixteen million combinations is required.
10. New modules support enhanced diagnostics through RPS

M. Miscellaneous Features: Programmable alarm output timer, 4 programmable entry delay times, exit delay programmable by area, individually programmable point of protection text, point bypassing, key switch arming capability with LED outputs, and fire verification.

N. False Alarm Reduction: The DACS shall comply with all ANSI SIA CP-01 2010 requirements for false alarm reduction

O. Ambush Detection: The DACS shall include an early ambush feature that requires that the user disarm, and then inspect the facility within a specified time period, before entering their passcode or a different authorized passcode again. If the user does not enter a passcode a second time, a duress event is generated. If the user does enter a passcode within the specified time period, the system disarms.

P. Two man rule: The DACS shall include a programmable feature that requires 2 separate passcodes to be entered to disarm the system. After 1 passcode is entered, the system will prompt for a second passcode to be entered on the same ACC. Without the second passcode, the system shall not disarm.

Q. Dual Authentication: The DACS shall support Dual Authentication by area. Areas programmed for Dual Authentication require activate of a card and a passcode to allow access to system functions, arm/disarm, or access control doors.

R. Area Re-Arm: The System shall support programmable area re-arm time of 1 minute to 24 hour.

S. User-Programmable Features: The DACS shall provide a menu driven interface to provide a user-friendly command structure for programming / customizing the system to the operational criteria of the application. The DACS shall be capable of being operated via:
   1. The Command Structure.
   2. Menu / Command List.

2.3 SYSTEM INTERFACE REQUIREMENTS

A. Grounding: The Contractor shall properly earth ground the DACS to prevent electrostatic charges and other transient electrical surges from damaging the DACS panel.

B. Primary power: The Contractor shall provide a dedicated 120 VAC power circuit to the DACS system. This circuit shall be connected to the emergency power system. The 120 VAC is stepped down to power the DACS panel using a class two, plug-in transformer. This power circuit shall be properly rated to continuously power all points and functions indefinitely in full alarm condition.

C. Primary power supervision: When the primary power source fails, the system can be configured to report an "AC Fail" message to a commercial central station.
   1. The message can also be programmed to "tag-along" with another message transmitted to the central station.
   2. The system will always display a loss of primary power on the ACC and may be configured to provide additional audible warning.
   3. The transmission delay of this message is programmable from 5 seconds to 86 minutes with an optional 6 to 12 hour transmission delay

D. Secondary power (standby battery): The Contractor shall provide adequate battery power as defined by the relevant application criteria, (UL 864 and UL 985 for alarm installations or NFPA 72 chapters for fire applications). Appropriate battery chargers shall be provided consistent with the battery back-up capacity. The most current accepted version of NFPA 72 and any applicable local codes or AHJ requirements must be met accordingly.

E. Secondary power supervision: When the secondary power source experiences a 85 percent depletion of its standby capacity, the system can be configured to report a "Low Battery" message to a commercial central station. The system will always display a low battery condition on the ACC and may be configured to provide additional audible warning.

F. Telephone interface: The control panel in the DACS shall be equipped with an optional phone line monitor and shall interface with the phone lines via RJ-31X jacks for supervision of the telephone line connection.
   1. The telephone line interface shall conform with FCC rules (Title 47 C.F.R. part 68).
   2. When a telephone line is determined to be out of service by the DACS panel, the event will be annunciated locally on the ACC and transmitted to the central station over the alternate communications interface. The transmission delay of this message is programmable from ten to two-hundred forty seconds.

G. Ethernet Interface: The DACS shall include a integrated Ethernet interface module as the primary, or back-up means of communicating to a DACR.
   1. Built-in IP-based alarm transport, programming, and control
   2. The module shall accommodate 128 and 256-bit AES encryption using CBC (Cipher Block Chaining) mode.
   3. 10BASE T or 100BASE T network connection
   4. Full-duplex and half-duplex support

H. Cellular interface: The DACS may use a cellular radio module as the primary, or backup, means of communicating to a DACR. Up to 4 IP Addresses shall be available for routing system events. The supervision time shall be programmable with a range of 5 to 65,535 seconds. The module shall accommodate 128 and 256-bit AES encryption using CBC (Cipher Block Chaining) mode.

I. Auxiliary function control interfaces: The DACS shall accommodate auxiliary functions such as activating bells, strobes, or lights and shall be accomplished using the optional application specific relay modules. These auxiliary interfaces shall be electrically isolated to avoid inter-system interferences or damage to the system.

J. Wiring: The contractor shall provide cables consistent with the manufacturer's recommendations. The following general guidelines shall be followed for wiring installation:
   1. Wiring shall be appropriately color-coded with permanent wire markers. Copper conductors shall be used.
   2. All signal cables provided under this contract shall be Class II, plenum-rated cable where required. Where subject to mechanical damage, wiring shall be enclosed in metal conduits or surface metallic raceway.
   3. Data wires shall not be enclosed in conduit or raceways containing AC power wires.
   4. Where EMI may interfere with the proper operation of the DACS circuits, twisted/shielded cable shall be used.

K. Environmental Conditions: The DACS shall be designed to meet the following environmental conditions:
   1. The system shall be designed for a storage temperature of -10° C to 70°C (14° F to 158°F).
   2. The system shall be designed for an operating temperature of 0° C to 50°C (32° F to 120°F).
   3. The system shall be designed for normal operation in an 85% relative humidity environment.
   4. The system shall meet or exceed the requirements of FCC rules Title 47 C.F.R. Part 15, Class B devices, and Part 68, IEC EMC directive

2.4 ACCESSORIES

A. System Accessories::
   1. Intrusion System Accessory: Model B9512G.
   2. Main Office Command Center Keypad: B942 Touch Screen Keypad
   3. Remote Building Command Center Keypad: B915 Basic Keypad
   4. Professional Series TriTech+ Motion Detectors with Anti-mask: ISC-PDL1-WA18G
   5. Commercial Contacts for recessed doors: ISN-CTC75-W
   6. Commercial Contacts for surface mount doors: ISN-CSM20-WG
   7. Auxiliary Power Supply for remote devices and SDI2 Bus devices: B520 in a B10 Medium Control Panel Enclosure.
   8. Back Up Battery: D126 12V 7Ah
   9. Plug In Transformed: D1640 Transformer Plug In,16V 40VA
   10. Point Expansion Module: B299 Expansion Module, SDI2
   11. Point Expansion Point Input Module: D9127U POPIT Module without Tamper.
   12. Network Communication Module: B426 Ethernet Communication Module
   13. Cellular Communication Module: B444-V Plug-in cell module, VZW LTE. Provide required antenna hardware, antennas, and antenna cable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive devices and notify adverse conditions affecting installation or subsequent operation.

B. Do not begin installation until unacceptable conditions are corrected.

C. If preparation is the responsibility of another installer, notify architect of unsatisfactory preparation before proceeding.

D. Ensure selected location is secure and offers protection from accidental damage.

E. Location shall provide reasonable temperature and humidity conditions, free from sources of electrical and electromagnetic interference.

F. Ensure power source is protected against accidental shutoff.

G. Install all equipment and materials in accordance with the "current" recommendations of the manufacturer. The work shall also be in accordance with:
   1. Installation criteria defined in these specifications and in the construction documents.
   2. Factory Representative can be the Bosch Security Systems Inc Security Dealer.
   3. Approved submittals.
   4. Applicable requirements of referenced standards.

H. The contractor shall provide the following services as part of the contract:
   1. Supervision of sub-contractors.
   2. Coordination of other contractors for system-related work (electrical contractor, finish hardware contractor, architect, and general contractor).
   3. Attending site construction/coordination meetings.
   4. Keeping updated construction drawings at the construction site.
   5. Meeting construction deadlines per the construction schedule.

I. Programming of the system shall include the following tasks:
   1. Programming system configuration parameters (hardware and software, zone/circuit numbers, communication parameters).
   2. Programming operational parameters such as opening/closing reports and windows, system response text (custom English) displays of events, activation of relays that drive auxiliary devices, and identifying types of zones/loops.
   3. Programming passcodes according to the authorities and functions defined by the owner.
   4. Other system programming tasks required by the owner. These additional programming requirements shall be coordinated between the owner and the contractor.
   5. Operational Testing: The contractor shall perform thorough operational testing and verify that all system components are fully operational.
   6. Hard-copy System Printout: The contractor shall submit a hard-copy system printout of all components tested and certify 100 percent operation indicating all devices/panels/units have passed the test criteria set forth by the manufacturer.
   7. Acceptance Test Plan Form: An acceptance test plan form shall be prepared/provided by the contractor prior to the acceptance walk-through.
   8. This form shall include separate sections for each device/panel/unit as well as a column indicating the manufacturer's performance allowance/margin, a column indicating the result of the testing performed by the contractor (pass/fail), and an empty column for recording findings during the walk-through.
   9. Fire Alarm Systems shall comply with NFPA 72 Standards for inspection, testing, and maintenance.

J. The contractor shall certify completion in writing and schedule the commissioning walk-through. The contractor shall provide all the tools and personnel needed to conduct an efficient commissioning process.

3.2 FIELD QUALITY CONTROL

A. Installation contractor shall submit a written test report that the system has been 100 percent tested and approved. Final test shall be witnessed by the owner, engineer, electrical contractor, chief security officer, and performed by the installation contractor. Final test report shall be received and acknowledged by the owner prior to request for final payment.

B. Provide instruction to the owner's satisfaction with regard to proper use and operation of the system.

C. Determine and report all problems to the manufacturer's customer service department.

3.3 ADJUSTING

A. System maintenance and repair of system or workmanship defects during the warranty period shall be provided by the Contractor free of charge (parts and labor).

B. Periodic testing of the system shall be carried out on a monthly or quarterly basis to ensure the integrity of the control panel, the sensing devices, and the telephone lines.

C. The installer shall correct any system defect within six hours of receipt of call from the Owner.

3.4 DEMONSTRATION

A. Demonstrate at final inspection that surveillance system and devices functions properly.
   1. The Contractor upon completion of installation shall furnish training in the complete operation of the systems.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before substantial completion.

END OF SECTION

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 RELATED SECTIONS

A. Section 26 00 00 – General Electrical Requirements.

1.2 DESCRIPTION

A. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

B. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.

C. The system shall be support additional, alternate Fire Command Centers, which shall be capable of simultaneous monitoring of all system events. Alternate Fire Command Centers shall also support an approved method of transferring the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions, and Firefighter's Telephone communication functions.

D. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.

E. The fire alarm system shall be manufactured by an ISO 9001:2008 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994

F. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof). It’s acceptable for peripheral devices to be manufactured outside of the U.S. by a division of the U.S. based parent company.

G. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

H. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.3 SCOPE:

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

B. Disconnect and remove existing fire alarm control panel, fire alarm annunciator, all system devices/components, and wire/cable. Wherever possible existing conduits are to be re-used. Mandrel all existing conduits prior to pulling new wire/cable. Where existing conduit is found to be damaged and not suitable for re-use, the contractor shall provide and install new conduit for the routing of new wire/cable. The contractor shall patch and repair all surfaces and finishes where equipment/devices are removed and/or replaced. Repair or refinishing of existing walls, floors/ground or ceiling shall be as directed by the Architect.

C. At no time during the construction phase shall it be acceptable for the existing fire alarm system to be inoperable or not protecting the buildings connected to the fire alarm system. The contractor shall provide a 24 hours per day, seven days per week firewatch whenever the system is inoperative or shut-down for any reason. A firewatch plan to be implemented during system shut-downs or inoperable periods shall be submitted to the School District for approval prior to start of the demolition phase.

D. The contractor shall schedule a site visit with the School District Maintenance & Operations (M&O) department prior to start of the demolition phase to assess the status and operation of the existing system. The contractor shall submit a pre-construction report to the School District M&O department outlining any deficiencies found during the site visit. Areas found to be deficient or not protected by the existing fire alarm system shall be provided with a 24 hours per day, seven days per week firewatch until the new fire alarm system is DSA certified and in operation.

E. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
2. Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
6. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
7. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone which ever is greater.
8. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
9. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
   Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.
   Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.
   Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.
10. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Digital amplifiers shall provide built-in speaker circuits, field configurable as four Class B (Style Y), or two Class A (Style Z) circuits.
11. Digital amplifiers shall be capable of storing up to two minutes of digitally recorded audio messages and tones. The digital amplifiers shall also be capable of supervising the connection to the associated digital message generator, and upon loss of that connection shall be capable of one of the following system responses:

a. The digital amplifier shall automatically broadcast the stored audio message.
b. The digital amplifier shall switch to a mode where a local bus input on the digital amplifier will accept an input to initiate a broadcast of the stored message. This bus input shall be connected to a NAC on a local FACP for the purpose of providing an alternate means of initiating an emergency message during a communication fault condition.
c. Speaker circuits shall be either 25 VRMS or 70VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
d. Two-way emergency telephone (Fire Fighter Telephone) communication shall be supported between the Audio Command Center and up to seven (7) remote Fire Fighter's Telephone locations simultaneously on a telephone riser.
e. Means shall be provided to connect FFT voice communications to the speaker circuits in order to allow voice paging over the speaker circuit from a telephone handset.
f. The digital audio message generator shall be of reliable, non-moving parts, and support the digital storage of up to 32 minutes of tones and emergency messages, shall support programming options to string audio segments together to create up to 1000 messages, or to loop messages and parts of messages to repeat for pre-determined cycles or indefinitely.

1.4 GUARANTY:

A. The fire alarm control panel, voice panels and any head-end equipment shall have a manufacturer’s warranty of a minimum of 3 years.

1.5 POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire detection system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, required tests, and list pricing for any replacement products included on the bill of materials, along with the list pricing for products not on the bill of materials; if test and inspection rates are different than full service rates the bid/proposal shall include pricing for all levels for a minimum period of five (5) years Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

.

1.6 APPLICABLE STANDARDS AND SPECIFICATIONS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

B. 2019 California Building Code, Part 2, Title 24.

C. 2019 California Electrical Code, Part 3, Title 24.

D. 2019 California Mechanical Code, Part 4, Title 24.

E. 2019 California Fire Code, Part 9, Title 24.

F. 2019 California Referenced Standards Code, Part 12, Title 24.

G. Public Safety, Title 19, C.C.R. State Fire Marshal regulations.

H. NFPA 72, Local Alarm Systems, 2016 Edition with California Amendments.

I. Manufacturer’s Specifications.

J. All requirements of the Authority Having Jurisdiction (AHJ).

1.7 APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL	Underwriters Laboratories, Inc
ULC	Underwriters Laboratories Canada
FM	Factory Mutual
FM 6320	Factory Mutual Gas Detection System
NYFD	New York Fire Department
CSFM	California State Fire Marshal

B. The system shall be certified for seismic applications in accordance with the International Building Code (IBC). The basis for qualification of seismic approval shall be via shake table testing.

1.8 SUBMITTALS:

A. Shop Drawings:

1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit to the Architect for review, eight copies of a complete submission.
2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
3. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.
4. The second section shall include a copy of the Installing Fire Alarm Contractor’s valid C-10 and C-7 California State Contractors License, letters of factory authorization and guaranteed service, list of 20 projects of equal scope and list of proposed instrumentation to be used by the Contractor.
5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets.
6. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications and current CSFM listings.
7. The fifth section shall contain voltage drop calculations for each circuit, dB loss calculations for the speaker circuits, battery calculations for the voice evacuation panel and voice evacuation expander panel, sequence of operation, installation details, system/device manufacturer’s wiring diagrams, floor plans and site plan indicating equipment/device locations and interconnecting wiring.

B. Submittals that include equipment data sheets but no plan drawings and site specific wiring diagrams shall be considered incomplete, will not be reviewed, and shall be returned to the Contractor for re-submittal.

PART 2.0 PRODUCTS

2.1 MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE:

A. Main FACP or network node shall be a NOTIFIER Model NFS2-3030 and shall contain a microprocessor based Central Processing Unit (CPU) and power supply. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

B. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:

1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

2.2 System Capacity and General Operation

A. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels / nodes per network.

B. The control panel shall be capable of expansion via up to 10 SLC loops. Each module shall support up to 318 analog/addressable devices for a maximum system capacity of 3180 points. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a keypad for the control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of either thpany.

C. All programming or editing of the existing program in the system shall be achieved without interrupting the alarm monitoring functions of the fire alarm control panel.

D. The FACP shall be able to provide the following software and hardware features:

1. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
2. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
3. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
4. Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases in

stalled with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.

5. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
6. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
7. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the sensitivity testing requirements of NFPA 72.
8. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
9. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop. A single change to one CPU database shall not require a database download to other CPUs.
10. History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.
11. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
12. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
13. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
14. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
15. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
16. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
17. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
18. Local Mode: If communication is lost to the central processor the system shall provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
19. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
20. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.
21. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector with up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result ofall cooperating detectors chamber readings.

22. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.
23. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
24. Mass Notification Override:The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.
25. Security Monitor Points: The system shall provide means to monitor any point as a type security.
26. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
27. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.
28. Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
29. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
30. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
31. 100 trouble equations per device: The system shall provide support for up to 100 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
32. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.
33. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.

34. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

E. Network Communication

1. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels/nodes per network.

F. Central Processing Unit

1. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
2. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
3. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
4. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
5. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
6. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.

G. Display

1. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide eleven Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, CONTROLS ACTIVE, and CPU FAILURE.
2. The system display shall provide a keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

H. Loop (Signaling Line Circuit) Control Module:

1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Ionization, Photoelectric, or Thermal) and 159monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. Each Loop shall be capable of operating as a NFPA Style 4 (Class B) circuit.

4. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

I. Digital Voice Command Center

1. The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.
2. Function: The Voice Command Center equipment shall perform the following functions:

    a. Operate as a supervised multi-channel emergency voice communication system. Operate as a two-way emergency telephone system control center.
    b. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
    c. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
    d. Provide all-call Emergency Paging activities through activation of a single control switch.
    e. As required, provide vectored paging control to specific audio zones via dedicated control switches.
    f. Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
    g. Provide a software utility capable of off-line programming for the DVC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the DVC shall not inhibit the emergency operation of other nodes on the fire alarm network.
    h. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SLC controlled switching.
    i. The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
    j. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

J. Power Supply:

1. The Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. The Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.
3. The Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.
4. The Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Main Power Supply shall be power-limited per UL864 requirements.

6. The Main Power Supply shall communicate power supply, line voltage, battery status and charger status to the local LCD display. Any abnormal condition shall be annunicated and logged to the system alarm history log.
7. Addressable Charger Power SupplyThe auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24 VDC power. . NOTIFIER model # ACPS-610
8. The addressable power supply for the fire detection system shall provide up to a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 10.0 amps of 24 volt DC general power. The power supply shall have an additional 0.5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 12 - 200 amp hour batteries.
9. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as Class "B" circuits. All circuits shall be power-limited per UL 864 requirements.
10. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
11. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
12. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.
13. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
14. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of zero, two, eight or sixteen hours shall be programmable.
15. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be programmable.
16. The addressable power supply mounts in either the FACP backbox or it's own dedicated surface mounted backbox with cover.
17. Each of the power supply's four output circuits shall be programmed- for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
18. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of and end-of-line resistor. When the power supply's output circuit is selected as General 24 VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
19. When selected for Notification Appliance Circuits, the output circuits shall be individually programmable for Steady, March Time, Dual Stage or Temporal.
20. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
21. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
22. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

K. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power () for distribution to speaker circuits.
2. Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
3. The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:

    a. Earth Fault on DAP A (Digital Audio Port A)
    b. Earth Fault on DAP B (Digital Audio Port B)
    c. Audio Amplifier Failure Detected Trouble
    d. Active Alarm Bus input
    e. Audio Detected on Aux Input A
    f. Audio Detected on Aux Input B
    g. Audio Detected on Firefighter's Telephone Riser
    h. Receiving Audio from digital audio riser
    i. Short circuit on speaker circuit 1
    j. Short circuit on speaker circuit 2
    k. Short circuit on speaker circuit 3
    l. Short circuit on speaker circuit 4
    m. Data Transmitted on DAP A
    n. Data Received on DAP A
    o. Data Transmitted on DAP B
    p. Data Received on DAP B
    q. Board failure
    r. Active fiber optic media connection on port A (fiber optic media applications)
    s. Active fiber optic media connection on port B (fiber optic media applications)
    t. Power supply Earth Fault
    u. Power supply 5V present
    v. Power supply conditions - Brownout, High Battery, Low Battery, Charger Trouble

4. The audio amplifier shall provide the following built-in controls:

    a. Amplifier Address Selection Switches
    b. Signal Silence of communication loss annunciation Reset
    c. Level adjustment for background music
    d. Enable/Disable for Earth Fault detection on DAP A
    e. Enable/Disable for Earth Fault detection on DAP A
    f. Switch for 2-wire/4-wire FFT riser

5. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
6. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
7. System shall be capable of backing up digital amplifiers.
8. One-to-one backup shall be provided by either a plug-in amplifier card or a designated backup amplifier of identical model as the primary amplifier.
9. One designated backup amplifier shall be capable of backing up multiple primary amplifiers mounted in the same or adjacent cabinets.
10. Multi-channel operation from a single amplifier shall be supported by the addition of an optional plug-in amplifier card.

L. Audio Message Generator (Prerecorded Voice)/Speaker Control:

1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.

2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
3. A built-in microphone shall be provided to allow paging through speaker circuits.
4. System paging from emergency telephone circuits shall be supported.
5. The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:

    a. Lamp Test
    b. Trouble
    c. Off-Line Trouble
    d. Microphone Trouble
    e. Phone Trouble
    f. Busy/Wait
    g. Page Inhibited
    h. Pre/Post Announcement Tone

M. Controls with associated LED Indicators:

1. Speaker Switches/Indicators

    a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
    b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.\

2. Emergency Two-Way Telephone Control Switches/Indicators

    a. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
    b. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

N. Remote Transmissions:

1. Provide local energy or polarity reversal or trip circuits as required.
2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.
4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

O. Field Programming

1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.
2. All field defined programs shall be stored in non-volatile memory.

P. Specific System Operations

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may

be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

Q. System Point Operations:

1. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
2. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
3. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:

    a. Device Status.
    b. Device Type.
    c. Custom Device Label.
    d. Software Zone Label.
    e. Device Zone Assignments.
    f. Analog Detector Sensitivity.
    g. All Program Parameters.

4. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.
5. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
7. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

2.3 SYSTEM COMPONENTS:

A. Fixed Emergency Telephone Handset

1. The telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.
2. The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.
3. The two-way emergency telephone system shall support a maximum of seven (7) handsets on line (off hook) without degradation of the signal.

B. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
3. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.
4. Communication shall include vital system status such as:

    a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
    b. Independent Addressable Device Status
    c. AC (Mains) Power Loss
    d. Low Battery and Earth Fault
    e. System Off Normal
    f. 12 and 24 Hour Test Signal
    g. Abnormal Test Signal (per UL requirements)
    h. EIA-485 Communications Failure
    i. Phone Line Failure

5. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 3,064 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
6. The UDACT shall be capable of being programmed with the same programming utility as the host FACP, and saved, edited and uploaded and downloaded using the utility. UDACT shall be capable of being programmed online or offline. The programming utility shall also support upgrading UDACT operating firmware.
7. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.
8. An IP or IP/GSM Communicator option shall be available to interface to the UDACT and be capable of transmitting signals over the internet/intranet or Cellular (GSM) network to a compatible receiver.

C. Field Wiring Terminal Blocks

1. For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

D. Printer

1. The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.
2. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power

supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

3. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

E. Smoke Control Annunciator

1. On/Auto/Off switches and status indicators (LEDS) shall be provided for monitoring and manual control of each fan, damper, HVAC control unit, stairwell pressurization fan, and smoke exhaust fan. To ensure compliance the units supplied shall meet the following UL categories: UUKL, PAZX, UDTZ, QVAX as well as the requirements of NFPA 90A, HVAC, and NFPA 92A & 92B, Smoke Control. The control System shall be field programmable for either 90A operation or 92A/B operation to allow for future use and system expansion.
2. The OFF LED shall be Yellow, the ON LED shall be green, the Trouble/Fault LED shall be Amber/Orange for each switch. The Trouble/Fault indicator shall indicate a trouble in the control and/or monitor points associated with that switch. In addition, each group of eight switches shall have two LEDS and one momentary switch which allow the following functions: An Amber LED to indicate an OFF-NORMAL switch position, in the ON or OFF position; A Green LED to indicate ALL AUTO switch position; A Local Acknowledge/Lamp Test momentary switch.
3. Each switch shall have the capability to monitor and control two addressable inputs and two addressable outputs. In all modes, the ON and OFF indicators shall continuously follow the device status not the switch position. Positive feedback shall be employed to verify correct operation of the device being controlled. Systems that indicate on/off/auto by physical switch position only are not acceptable.
4. All HVAC switches (i.e., limit switches, vane switches, etc.) shall be provided and installed by the HVAC contractor.
5. It shall be possible to meet the requirements mentioned above utilizing wall mounted custom graphic.

2.4 Gateway & Webserver Options

A. Common Alerting Protocol (CAP) Gateway: The system shall support an optional CAP Gateway (Common Alerting Protocol). The CAP Gateway translates fire system messages to industry standard CAP messages for integration with CAP-compliant clients. A CAP gateway shall be available from the fire alarm control panel manufacturer.

B. LEDSIGN Gateway: The system shall support an optional and proprietary LEDSIGN Gateway to interface to LED signs that will automatically display emergency messages. The signs shall be capable of storing up to 100 messages that can be activated via system programming with the ability to be manually overridden. The Sign Gateway shall support up to 10 independent signs, each sign capable of playing an independent message. Multiple LEDSIGN Gateways can be used in network applications. An LEDSIGN gateway shall be available from the fire alarm control panel manufacturer.

C. BACnet Interface Gateway: The system shall be capable of being interfaced with BACNet compliant clients. A BACnet interface supporting BACnet/IP communication shall be available from the fire alarm control panel manufacturer.

D. MODbus Interface Gateway: The system shall be capable of being interfaced with MODbus compliant clients. A MODbus interface supporting MODbus/TCP communication shall be available from the fire alarm control panel manufacturer.

E. Noti-Fire-Net Gateway: The system shall support an IP based gateway to enable the panel or local Noti-Fire-Net to be connected to an ONYXWorks workstation via the Internet or Intranet. This gateway shall also support the ability to integrate the system to an interactive firefighter's display. The Noti-Fire-Net Gateway shall be available from the fire alarm control manufacturer.

F. Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history, event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.

G. Web Portal Interface: The system shall be capable of being interfaced with a web portal to integrate with Inspection and Service Manager utilities. The web portal and inspection and service manager utilities shall be available from the fire alarm control panel manufacturer.

2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices – General

1. Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.
2. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
3. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
4. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
5. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
6. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
7. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
8. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
9. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications. The system shall also support an intelligent programmable sounder base, the programmable sounder base shall be capable of providing multiple tones based on programming and at a minimum be capable of providing a Temp-4 tone for CO (Carbon Monoxide) activation and a Temp-3 tone for fire activations and be capable of being synchronized with other programmable sounder bases and common area notification appliances; 85 DBA minimum.
10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

11. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
12. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

14. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

B. Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status;NOTIFIER model # NBG-12LX. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

C. Intelligent Photoelectric Smoke Detector: The intelligent photoelectric smoke detector shall be NOTIFIER model # FSP-851 and shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

D. Intelligent Thermal Detectors: The intelligent thermal detectors shall be NOTIFIER FST- series addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.

E. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs. The addressable monitor module shall be NOTIFIER model # FMM-1 (Class A or B) or FMM-101 (Class B)
2. The IDC zone shall be suitable for Style D/Class A or Style B/Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
4. For multiple dry contact monitoring a module shall be available that provides 10 Style B or 5 Style D input circuits; NOTIFIER model # XP10-M.

F. Two Wire Detector Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device); NOTIFIER model # FZM-1.

2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For multiple 2-wire smoke detector circuit monitoring a module shall be available that provides 6 Style B/Class A or 3 Style D/Class B input circuits; NOTIFIER model # XP6-MA.

G. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional circuit of compatible Notification Appliances, 24 VDC powered, polarized audio/visual notification appliances; NOTIFIER model # FCM-1
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with a current rating of 2 Amps for Style Z and 3 Amps for Style Y;
3. Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.

4. For multiple circuit control a module shall be available that provides 6 Style Y (Class B) or 3 Style Z (Class A) control circuits; NOTIFIER model # XP6-C.

P. Addressable Relay Module:

1. Addressable Relay Modules shall be available for HVAC control and other network building functions; NOTIFIER model # FRM-1.
2. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary devices energize at the same time on the same pair of wires;
4. For multiple relay control a module shall be available that provides 6 programmable Form-C relays; NOTIFIER model # XP6-R.

Q. Isolator Module: Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building; NOTIFIER model # ISO-X.

1. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
2. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
3. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

R. Serially Connected Annunciator Requirements

1. The annunciator shall communicate to the fire alarm control panel via an EIA 485 (multi-drop) two-wire communications loop. The system shall support two 6,000 ft. EIA-485 wire runs. Up to 32 annunciators, each configured up to 96 points, may be connected to the connection, for a system capacity of 3,072 points of annunciation.
2. An EIA-485 repeater shall be available to extend the EIA-485 wire distance in 3,000 ft. increments. The repeater shall be UL864 approved.
3. Each annunciator shall provide up to 96 alarm and 97 trouble indications using a long-life programmable color LED's. Up to 96 control switches shall also be available for the control

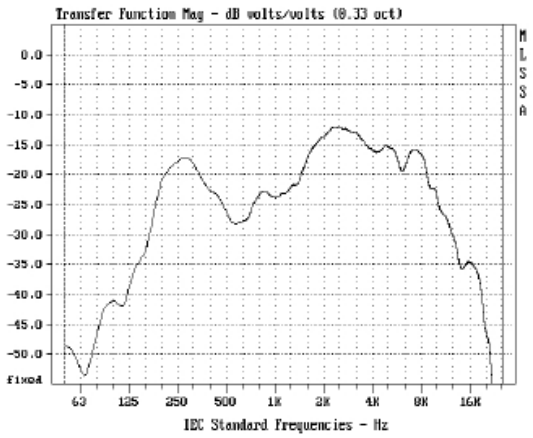
of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge and lamp test switch, and custom zone/function identification labels.

4. Annunciator switches may be programmed for System control such as, Global Acknowledge, Global Signal Silence, Global System Reset, and on/off control of any control point in the system.
6. An optional module shall be available to utilize annunciator points to drive EIA-485 driven relays. This shall extend the system point capacity by 3,072 remote contacts.
7. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

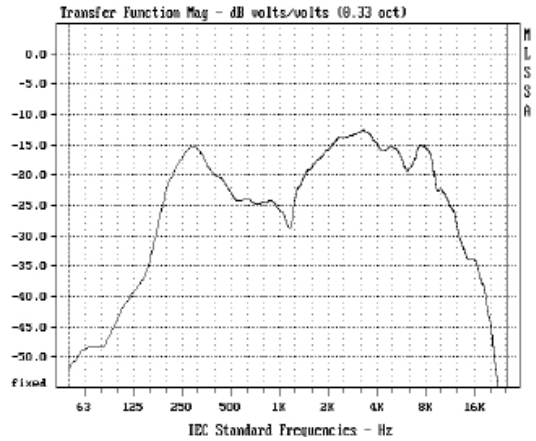
S. SpectrAlert Advance Speakers

1. The Speaker appliance shall be System Sensor SpectrAlert series. The speaker shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dual-voltage transformer speaker capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.
3. Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.
4. The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction.
5. All notification appliances shall be backward compatible.

Ceiling Speaker
Wide Band Frequency Response



Wall Speaker
Wide Band Frequency Response



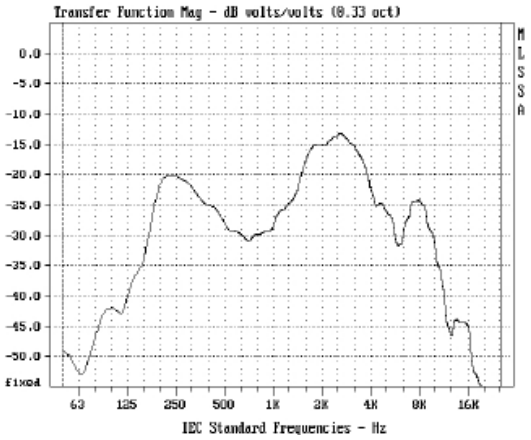
Note: The wide band frequency response is derived using MLS methods

T. SpectrAlert Advance Speaker Strobes

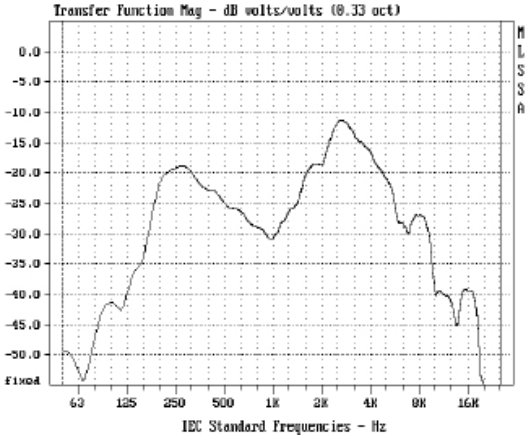
1. The Speaker Strobe appliance shall be System Sensor SpectrAlert series Speaker Strobe. The speaker strobe shall be listed to UL 1971 and UL 1480 and be approved for fire protective signaling systems. It shall be a dual-voltage transformer speaker strobe capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.

2. A universal mounting plate shall be used for mounting ceiling and wall speaker strobe products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes and the Sync•Circuit™ Module MDL3 accessory, if used, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts (includes fire alarm panels with built in sync). When used with the Sync•Circuit Module MDL3, 12-volt rated notification appliance circuit outputs shall operate between 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 to 33 volts. If the notification appliances are not UL 9th edition listed with the corresponding panel or power supply being used, then refer to the compatibility listing of the panel to determine maximum devices on a circuit.
3. Speaker strobes shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker strobe design shall isolate speaker components to reduce ground fault incidents.
4. The speaker strobe shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, or 115 when operating on 24V. The strobe shall comply with NFPA 72 and the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.
5. All notification appliances shall be backward compatible.

Ceiling Speaker Strobe
Wide Band Frequency Response



Wall Speaker Strobe
Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

6. Strobe lights shall meet the requirements of the ADA, UL Standard 1971and be fully synchronized.

PART 3.0 - EXECUTION

3.1. INSTALLATION:

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of CEC - Article 760 A and C, Power-Limited Fire Protective Signaling Cir

cuits or if required may be reclassified as non-power limited and wired in accordance with CEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and general contractor.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2. TEST:

The completed fire alarm system will be tested in accordance with NFPA 72 by the vendor, in the presence of the owner's representative and, if required, the local AHJ. A computer generated or typewritten testing report will be submitted, indicating each device tested, type of test performed, and test result. Control panels, remote processing units, and annunciators will also be tested and will list measured battery voltages with and without charger, supply voltage, and circuit breaker number and location. Handwritten reports will NOT be accepted for this final inspection report.

A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

B. Open initiating device circuits and verify that the trouble signal actuates.

C. Open and short signaling line circuits and verify that the trouble signal actuates.

D. Open and short notification appliance circuits and verify that trouble signal actuates.

E. Ground all circuits and verify response of trouble signals.

F. Check presence and audibility of tone at all alarm notification devices.

G. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.

H. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

I. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

J. The Speech Transmission Index (STI) shall be used to test the voice-evac system using the test signal referred to as STIPA — STI Public Address. Test signals can differ between instrument manufacturers. Therefore, only the test signal recommended by the test instrument manufacturer shall be used with their instrument.

K. The voice intelligibility shall be considered acceptable if at least 90 percent of the measurement locations within each acoustically distinguishable space (ADS) have a measured STI of not less than 0.45 (0.65 CIS) and an average STI of not less than 0.50 (0.70 CIS). The measurement shall be taken from an elevation of 5 feet. For reference the STI scale can be converted to CIS via the following calculation: CIS = 1 + log (STI).

3.3. FINAL INSPECTION:

A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4. WARRANTY:

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

3.5. INSTRUCTION:

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

B. Related Sections:
   1. Section 31 05 16 - Aggregates for Earthwork.
   2. Section 31 23 16 - Excavation.
   3. Section 31 23 17 - Trenching.
   4. Geotechnical report; bore hole locations and findings of subsurface materials.

1.2 REFERENCES

A. ASTM International:
   1. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   2. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with local City and County Standards.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials (existing and import) are subject to the approval of the Soils Engineer for use in the project. All earthwork shall conform with the requirements of the Geotechnical Evaluation.

2.2 SUBSOIL MATERIALS

A. Stockpiled Subsoil: Excavated on-site material with an organic content of less than 3 percent by volume, graded free of lumps and rocks larger than 3 inches, with not more 40 percent larger than 1 1/2 inches.

B. Imported Subsoil: Low or very low-expansion (UBC Expansion Index of 20 or less per C.B.C., Article 1803A.2) granular soils with a plasticity index of 12 or less, free of debris with lumps and rocks no larger than 3 inches. Materials shall contain sufficient fines (binder) to result in a stable subgrade. Imported material shall comply with DTSC requirements.

C. Ball Field Subsoil: Free of rocks larger than 1 inch in the top 12 inches of subgrade.

2.3 TOPSOIL MATERIALS

A. Stockpiled Topsoil: Excavated material, graded free of roots, rocks larger than one inch, subsoil, debris and large weeds.

B. Imported Topsoil: Friable loam, free of subsoil, roots, grass, excessive amounts of weeds, stones and foreign matter; acidity range (ph) of 5.5 to 7.5; containing an amount of organic matter normal to the region.

2.4 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and inspection services.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D1557.

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated subsoil and topsoil not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile materials on site.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 05 16

AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Coarse aggregate materials.
   2. Fine aggregate materials.

B. Related Sections:
   1. Section 31 05 13 - Soils for Earthwork: Fill and grading materials.
   2. Section 31 23 16 - Excavation.
   3. Section 31 23 17 - Trenching.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of fill to testing laboratory.

C. Materials Source: Submit name of imported materials suppliers.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Refer to Geotechnical Report for information and recommendations concerning soils at the site.

B. Perform Work in accordance with local City and County Standards.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate (Gravel): Crushed Gravel; Angular crushed, washed stone; free of shale, clay, friable material and debris; graded in accordance with ASTM C136.

B. Aggregate (Pea Gravel): Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ASTM C136; to the following limits:
   1. Minimum Size: 1/4 inch.
   2. Maximum Size: 5/8 inch.

2.2 FINE AGGREGATE MATERIALS

A. Fine Aggregate (Sand): Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter; graded in accordance with ASTM C136; all passing the No. 4 sieve and not more than 5% passing the No. 200 sieve.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136.

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 23 16

EXCAVATION
GENERAL

1.1 SECTION INCLUDES

A. Excavation for building foundations.

B. Excavation for slabs-on-grade, paving, and landscaping.

C. Excavation for site structures.

1.2 REFERENCES

A. 2019 California Building Code: Chapter 33, 8 Chapter 18 A.

1.3 QUALITY ASSURANCE

A. Comply with Chapter 29 of the California Building Code.

1.4 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.2 EXCAVATION

A. Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.

B. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving and site structures, and construction operations.

C. Machine slope banks to angle of repose or less, until shored.

D. Excavation cut not to interfere with normal 45 degree bearing splay of foundation.

E. Grade top perimeter of excavation to prevent surface water from draining into excavation.

F. Hand trim excavation. Remove loose matter.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd. measured by volume.

H. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

I. Correct unauthorized excavation at no extra cost to Owner.

J. Stockpile excavated material in area designated on site and remove excess material not being reused, from site.

3.3 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01 41 00.

B. Provide for visual inspection of bearing surfaces.

3.4 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.

B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION

SECTION 31 23 17

TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavate trenches for utilities from outside building to municipal utilities.

B. Compacted bedding under fill over utilities.

C. Backfilling and compaction.

1.2 REFERENCES

A. ASTM International:
1. ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Samples: Submit 10 lb. sample of each type of fill to testing laboratory in air-tight containers.

1.4 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the work are as indicated.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Types specified in Section 31 05 13.

2.2 BED MATERIALS

A. Sand: As specified for Type in Section 31 05 16.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify fill materials to be reused are acceptable.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with subsoil and compact to density equal to or greater than requirements for subsequent backfill material.

3.3 EXCAVATION

A. Excavate subsoil required for storm sewer, sanitary sewer, water, and gas piping to municipal utilities.

B. Cut trenches sufficiently wide to enable installation of utilities and allow inspection.

C. Excavation shall not interfere with normal 45 degree bearing splay of foundations.

D. Hand trim excavation. Remove loose matter.

E. Remove lumped subsoil, boulders, and rock.

F. Correct unauthorized excavation at no cost to Owner.

G. Correct areas over-excavated by error in accordance with Section 31 23 16.

H. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

3.4 BEDDING

A. Support pipe and conduit during placement and compaction of bedding fill.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Sand Fill: Place and compact materials in continuous layers not exceeding 6 inches compacted depth.

D. Maintain optimum moisture content of backfill materials to attain required compaction density.

E. Remove surplus backfill materials from site.

3.6 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus one inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 41 00.

B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D1557 and with Section 01 41 00.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1557 and with Section 01 41 00.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.8 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01 70 00.

B. Re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Buildings perimeter and site structure backfilling to subgrade elevations.

B. Site filling and backfilling.

C. Fill under slabs-on-grade and paving.

D. Consolidation and compaction.

E. Fill for over-excavation.

1.2 REFERENCES

A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18 inch Drop.

1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Samples: Submit 10 lb. sample of each type of fill to testing laboratory in air-tight containers.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Stockpiled Subsoil: Excavated material, graded free of lumps and rocks larger than 3 inches.

B. Imported Subsoil: Non-expansive predominantly granular soils, such as a silty sand, free of lumps and rocks larger than 6 inches, an debris. Expansion index less than 35, and no more than 50% of the material shall pass a No. 200 sieve. Material shall contain sufficient fines (binder) to result in a stable subgrade. Imported material shall comply with DTSC requirements.

C. Sand: Natural River or Bank Sand: Free of silt, clay, loam, friable or soluble materials or organic matter all passing the No. 4 sieve and only 5% passing the No. 200 sieve.

D. Pea Gravel: Natural Stone; washed, free of clay, slate, organic matter, graded in accordance with ANSI/ASTM C136, 1/4 inch to 5/8 inch.

E. Concrete: Structural concrete conforming to Section 03 30 00 with a compressive strength of 2,500 psi for fill to correct over-excavation.

F. Materials (existing and import) are subject to the approval of the Soils Engineer for use in the project.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify fill materials to be reused are acceptable.

B. Verify areas to be backfilled are free of debris or water.

3.2 PREPARATION

A. Generally, compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with subsoil fill and compact to density equal to or greater than requirements for subsequent backfill material.

C. Prior to placement of aggregate base course material at paved areas, compact subsoil to 95 percent of its maximum dry density in accordance with ANSI/ASTM D1557.

3.3 BACKFILLING

A. Backfill areas to contours and elevations.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Soil Fill: Place and compact material in continuous layers not exceeding 6 inches compacted depth.

D. Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation waterproofing and protective cover and utilities in trenches.

E. Maintain optimum moisture content of backfill materials to attain required compaction density.

F. Backfill against supported foundation walls.

G. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

H. Slope grade away from building minimum 2 inches in 10 ft., unless noted otherwise.

I. Make changes gradual. Blend slope into level areas.

J. Remove surplus backfill materials from site.

3.4 TOLERANCES

A. Top Surface of Backfilling: Plus or minus one inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 41 00.

B. Tests and analysis of fill material will be performed in accordance ANSI/ASTM D1557 and with Section 01 41 00.

C. Compaction testing will be performed in accordance with ANSI/ASTM D1557 and with Section 01 41 00.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished work under provisions of Section 01 50 00.

B. Recompact fills subjected to vehicular traffic.

END OF SECTION

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Herbicide

B. Prepared base.

C. Asphaltic concrete paving.

D. Surface sealer.

1.2 RELATED SECTIONS

A. Section 31 23 23 - Fill

B. Section 32 13 13 - Concrete Paving

C. Section 32 17 23 - Pavement Markings

D. Section 32 17 13 - Parking Bumpers

1.3 REFERENCES

A. The "Standard Specifications for Public Works Construction" (SSPWC) or "Greenbook Standards" and the "Standard Plans for Public Works Construction", 2015 Edition.

B. Asphalt Surfacing Materials: Furnish asphalt surfacing meeting the following requirement, furnished from a commercial asphalt central mixing plant.

C. Asphalt Binder: AASHTO M 320, PG 70-10

D. Asphalt Cement: ASTM 0338110 3381 M for viscosity-graded material, ASTM 0 946/0 946M for penetration-graded material.

E. Emulsified Asphalt Prime Coat: ASTM 0 977 or AASHTO M 140 emulsified asphalt, or ASTM 02397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

F. Tack Coat: ASTM 0977 or] AASHTO M 140 emulsified asphalt, or ASTM 02397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application

G. Seal Coat: California Greenbook 203-9 Specification

H. Undersealing Asphalt: ASTM 03141/0 3141M; pumping consistency.

I. Redwood Inspection Service - Standard Specifications for Grades of California Redwood Lumber.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with Standard Specifications for Public Works Construction.

B. Mixing Plant: Conform to State of California standards.

C. Obtain materials from same source throughout.

D. The Owners's inspector shall test the temperature of each batch of asphaltic concrete prior to placement. At the time of delivery to the work site, the temperature of mixture shall not be lower than 260 degrees F or higher than 320 degrees F, the lower limit to be approached in warm weather and the higher in cold weather. If asphaltic concrete temperature is not with these tolerances the affected batch shall be rejected.

E. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

F. Seal Coat Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located. Comply with the following as a minimum requirement: Standard Specifications Section 203-9, "SEALCOAT - ASPHALT BASED"

G. Agitate bulk materials during transport

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable San Bernardino County standards for paving work on public property.

1.6 TESTS

A. Testing and analysis of asphaltic mix will be performed under provisions of Section 01 41 00.

B. Submit proposed mix design of each class of mix for review prior to commencement of work.

C. Submit sample of base a minimum of three weeks prior to placing for testing.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt when base surface temperature is less than 40 degrees F.

PART 2 PRODUCTS

2.1 AGGREGATES

A. Base Course Material: Crushed base material shall consist of materials that meet the provisions of the SSPWC.Sub-Base Aggregate Maximum Size: 1-1/2 inches.
   1. Crushed Aggregate Base (CAB) per Section 200-2.2, ¾ " maximum of the SSPWC (Green Book).
   2. Crushed Miscellaneous Base (CMB) per Section 200-2.4, fine Sieve, of the SSPWC (Green Book).
   3. Crushed Miscellaneous Base (CMB) shall not contain Poly Chlorinated biphenyls (PCB) above laboratory detection limits when testing in accordance with EPA Method 8082.

4. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials.

B. Coarse Aggregate: ASTM 069210 692M, sound; angular crushed stone, crushed gravel.

C. Fine Aggregate: ASTM 0 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof.

2.2 HERBICIDE

A. Commercial chemical for weed control, registered by the EPA, and not classified as "restricted use" for locations and conditions of application. Provide in granular, liquid, or wettable powder form.

2.3 HEADERS AND STAKES

A. Headers: Construction heart grade, per paragraph 114 of Standard Specifications for Grades of California Redwood Lumber.

B. Stakes: Redwood of grade specified for headers.

C. Nails: Common, galvanized, 12d minimum.

2.4 ASPHALTS

A. Comply with provisions of Standard Publications for Public Works Construction:
1. Paving Asphalt: PG 70-10
2. Prime Coat: Liquid Asphalt, SC250 at areas w/ aggregate base only.
3. Tack Coat: Emulsified asphalt, SS-1h.

2.5 ASPHALTIC PAVING MIX

A. Provide hot plant mixed asphaltic concrete paving materials in accordance with section 203-6 of Standard Specifications for Public Works Construction.
1. Base Course Mix: Type II, B, PG 70-10
2. Parking and Drive Area Mix: Type II, C1, PG 70-10
3. Hardscape Play Area Mix: Type II, D, PG 70-10

2.6 SEAL COAT

A. Seal Coat: The materials for sealcoat shall conform to California Greenbook 203-9 Specification - "Sealcoat-Asphalt Based" of the Standard Specifications.

Seal Coat: Provide one of the following surface seals:
1. Diversified Asphalt Product: Over Kote
2. Western Colloid Products: Armor Top
3. Asphalt Coating Engineering: ACE Seal
4. SealMaster Pavement Products: MasterSeal

PART 3 EXECUTION

3.1 INSPECTION

A. Verify compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Apply weed killer to entire area to be paved. Follow manufacturer's application directions and provide sterilization certification from installer.

3.3 PLACEMENT OF BASE COURSE

A. Base:
   1. Spread the granular base material to a thickness providing the compacted thickness shown on the Drawings.
   2. Compact base to 90% relative compaction in all areas and 95% in bus and fire lane areas.

B. Thickness Tolerance: Minus 0.0 inch to plus 0.5 inch.

C. Smoothness Tolerance: 3/8" in ten feet.

D. Deviations: Correct by removing materials, replacing with new materials, and reworking or recompacting as required.

E. Moisture content: Only the amount needed to achieve the specified compaction.

3.4 PLACEMENT OF ASPHALTIC CONCRETE PAVING

A. Install headers and stakes to achieve arrangement of paving shown on the Drawings.

B. Remove all loose materials from compacted base.

C. Apply prime coat, and tack coat where required, and allow to dry.

D. Adjust frames and covers, if so required, to meet final grades.

E. Spreading Asphaltic Concrete Materials:
   1. Spread material in a manner which requires the least handling.
   2. Where thickness of finished paving will be 3 inches or less, spread in one layer unless otherwise indicated.

F. Rolling:
   1. After material has been spread to proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown.
   2. Roll in at least two directions until no roller marks are visible.
   3. Finished paving smoothness tolerance:
      a. Free from birdbaths.
      b. No deviations greater than 1/8 inch in six feet.

3.5 SEAL COAT

A. Apply sealcoat using a truck mounted tank, wheeled container, or can. Spread in continuous parallel lines by means of rubber faced squeegees, brooms or spray technique. On excessively rough areas consult your manufacturer’s representative. Apply seal coat to all asphalt concrete in accordance with manufacturer's instructions in two separate coats. Do not apply seal coat until 30 days after placing of asphaltic concrete paving.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 41 00.

B. Contractor to flood test paved areas after completion and prior to application of seal coat. Repair areas not conforming to specified tolerances as required prior to seal coat application.

3.7 PROTECTION

A. Immediately after placement, protect pavement under provisions of Section 01 50 00 from mechanical injury for 2 days.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete sidewalks, curbs, gutters, utility slabs, parking areas, driveways, driveway aprons and approaches.

1.2 RELATED SECTIONS

A. Section 31 23 23 - Fill

B. Section 32 12 16 - Asphaltic Paving

C. Section 32 17 23 - Pavement Markings

D. Section 32 17 13 - Parking Bumpers

1.3 REFERENCES

A. American Concrete Institute
   1. ACI 301 - Specifications for Structural Concrete.

B. ASTM International:
   1. ASTM A185/A185M - Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
   2. ASTM A615/A615M - Deformed and Plain Billet-steel Bars for Concrete Reinforcement.
   3. ASTM C33 - Standard Specification for Concrete Aggregates.
   4. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
   5. ASTM C150 - Standard Specification for Portland Cement.
   6. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   7. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.
   8. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

C. 2019 California Building Code

1.4 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field. Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Obtain materials from same source throughout.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

B. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.

1.6 TESTS

A. Testing and analysis will be performed under provisions of Section 01 41 00.

B. Submit proposed mix design to testing laboratory for review prior to commencement of work.

C. Owner's Inspector or Testing firm will take cylinders and perform slump tests in accordance with ACI 301.

1.7 SUBMITTALS

A. Submit product data for under provisions of Section 01 33 00.

B. Submit manufacturer's instructions under provisions of Section 01 33 00.

C. Concrete mix design, admixtures & curing compounds

D. Include data on joint filler and curing compounds.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150 Normal-Type I Portland type, gray color.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.2 FORM MATERIALS

A. Conform to ACI 301.

B. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

D. Joint Filler: ANSI/ASTM D1751, 1/4 inch thick, manufactured by J & P Petroleum Products, Inc., or Progress Unlimited, Inc.

2.3 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, Grade 60; deformed billet steel bars, uncoated finish.

B. Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in coiled rolls; uncoated finish.

C. Tie Wire: Annealed steel, minimum 16 gage size.

D. Dowels: ASTM A615, Grade 60, plain steel, uncoated finish.

2.4 ACCESSORIES

A. Curing Compound: ASTM C309, type 1-D.

B. Preformed Joint: ASTM D1751, 1/4" thick.

2.5 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Water Reducer: ASTM C 494/C 494M, Type A.

2.6 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Provide concrete of the following characteristics:
1. Driveways, Aprons and Approaches: Compressive strength of 2,500 psi at 28 days.
2. Sidewalks, Curbs, Gutters and Utility Slabs: Compressive Strength of 2,500 psi at 28 days.
3. Concrete for paving/flatwork does not require special inspection provided that CBC Section 1705A.3.3.1 requirements are followed.

C. Add air entraining agent to concrete mix for concrete work exposed to exterior.

D. Aggregates
1. Fine Aggregates: Fine aggregate shall consist of natural sand, manufactured sand, or a combination of the two, and is composed of clean, hard, durable particles. Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33/C 33M.
2. Coarse Aggregates: Coarse aggregate shall conform to ASTM C 33/C 33M, Class 5S, size designation 57 or 67.
3. Mix designs shall be a 1” minus type mix.

E. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by

not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement. ASTM 618, Class F

2.7 FINISHES

A. All paving shall provide medium salted or medium broom finish on all surfaces sloped less than 6% and slip resistant with heavy broom finish on all surfaces sloped greater than 6%. Comply with CBC Section 11B-302.1.

B. Surface slopes of accessible parking spaces and access aisles shall be the minimum possible and shall not exceed 2% (1:48) slope in any direction. Comply with CBC Section 11B-302 & 11B502.4.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify compacted subgrade is ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Moisten base to minimize absorption of water from fresh concreting operations.

B. Notify Architect a minimum of 24 hours prior to commencement of concreting operations.

3.3 FORMING

A. Place and secure forms to correct location, dimension, and profile.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.

3.4 REINFORCEMENT

A. Place reinforcement at mid-height of slabs-on-grade. Interrupt reinforcement at joints.

B. Place reinforcement to achieve slab and curb alignment as detailed.

3.5 FORMED JOINTS

A. Place expansion joints at 24 foot intervals to correct elevation and profile. Align curb, gutter, and sidewalk joints.

B. Place joint filler between paving components and building or other appurtenances.

C. Provide scored joints at indicated intervals of sidewalk.

3.6 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 for Hot and Cold Weather Placement.

B. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

C. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

D. Place concrete to pattern indicated. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

E. The concrete shall be mixed and placed as specified for 2,500 pound concrete in this Section. The surfaces shall be finished in the manner specified in Article 3.8. Joint and edges shall be tooled.

F. Exterior concrete slabs and paving shall be poured in panels approximately 400 sq. ft. in area.

3.7 EXPANSION AND CONTROL JOINTS

A. Sidewalks and covered passage slabs shall be built with expansion joints where shown on drawings, or as follows: Expansion joints for sidewalks shall be spaced approximately every 20' in each direction, maximum. Expansion joints shall be provided at all covered passage intersections, passages with each other and with other concrete, at all corners of buildings and walks.

B. Expansion joint material shall be of durable elastic compound so prepared that it will retain its required form during the placing of concrete. When compressed to half its thickness it shall return to 70% of its original thickness. Expansion joints shall extend entirely through the slab and be in one piece for the width of the slab.

C. Control Joints: Provide 1-1/2" deep saw cut 16 to 20 hours after pour, centered between expansion joints or as shown on plans.

3.8 FINISHING

A. Driveway Paving: Light broom. Comply with City of Phelan requirements for all off-site driveways.

B. Sidewalk Paving: medium broom at surfaces that slope less than 6%, heavy broom at surfaces that slope greater than 6%; radius and trowel joint edges.

C. Curbs and Gutters: Light broom.

D. At joints and markings, round off top edge of the slab with 1/4 inch edging tool.

E. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.9 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 41 00.

3.10 PROTECTION

A. Immediately after placement, protect concrete under provisions of Section 01 50 00 from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 32 17 13

PARKING BUMPERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Parking bumpers

B. Adhesive.

C. Steel bars for installation.

1.2 RELATED SECTIONS

A. Section 32 12 16 - Asphalt Paving

B. Section 32 13 13 - Concrete Paving

C. Section 32 17 23 – Pavement Markings

1.3 REFERENCES

A. State of California, Department of Transportation (Caltrans), Standard Specifications, latest edition

1.4 PERFORMANCE REQUIREMENTS

A. Paint Adhesion: Adhere to surface forming smooth continuous film two minutes after application.

B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within five minutes after application.

1.5 SUBMITTALS

A. Section 01 30 00 - Submittals: Requirements for submittals.

B. Shop Drawings: Submit Shop Drawings of bumpers, including plan layout and installation details, for approval.

C. Product Data: Submit manufacturers' product data of precast bumpers and epoxy adhesive for approval.

1.6 QUALITY ASSURANCE

A. Precast parking bumpers shall be manufactured for the intended purpose by a company or firm specializing in the manufacture of precast concrete parking appurtenances.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years experience.

B. Applicator: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 40 00 - Quality Control: Requirements for transporting, handling, storing, and protecting products.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. American Precast Concrete, (626) 443-0970

B. California Car Stops (951) 549-3785

C. American Precast Concrete Inc (800) 691-7118

D. Substitutions: Under provisions of Section 01 60 00.

2.2 MATERIAL

A. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 4000-psi minimum compressive strength, 5-1/2 inches high by 7 ½ inches wide by 48 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.

B. Steel reinforced anchor pins where required

PART 3 EXECUTION

3.1 INSTALLATION

A. Install wheel stops at all parking stalls as indicated on Drawings.

B. Anchor permanently in place in accordance with manufacturer's directions with epoxy adhesive and .

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Traffic lines and markings and paint.

B. Tactile detectable warning devices.

1.2 RELATED SECTIONS

A. Section 32 12 16 - Asphalt Paving.

B. Section 32 13 13 - Concrete Paving.

C. Section 32 17 13 - Parking Bumpers

1.3 REFERENCES

A. AASHTO M309 - White and Yellow Fast-Dry Traffic Paint.

B. ASTM International:
1. ASTM D34 - Chemical Analysis of White Pigments.
2. ASTM D969 - Laboratory Determination of Degree of Bleeding of Traffic Paint.
3. ASTM D1475 - Density of Liquid Coatings, Inks, and Related Products.
4. ASTM D2371 - Pigment Content of Solvent-Reducible Paints.

C. Federal Test Method Standard No. 41.

D. FS TT-P 1952D Type I.

E. FS TT-P 1952D Type II.

F. 2019 California Building Code

1.4 PERFORMANCE REQUIREMENTS

A. Paint Adhesion: Adhere to surface forming smooth continuous film two minutes after application.

B. Paint Drying: Tack free by touch so as not to require coning or other traffic control devices to prevent transfer by vehicle tires within five minutes after application.

1.5 PAVEMENT MARKINGS REQUIREMENTS

A. Accessible parking spaces serving a particular building or facility shall be located, and dispersed if serving more than one accessible entrance, on the shortest accessible route to an entrance or to multiple accessible entrances. CBC Sections 11B-208.3.1

B. Accessible parking spaces in a parking facility not serving a particular building or facility shall be located on the shortest accessible route to an accessible pedestrian entrance of the parking facility. CBC Sections 11B-208.3.1

C. Minimum number of required accessible parking spaces shall be provided in accordance with CBC Table 11B-208.2 for each parking facility provided.

D. For every six or fraction of six accessible parking spaces, at least one shall be an accessible van parking space. CBC Section 11 B-208.2.4

E. Accessible parking spaces and access aisles shall comply with CBC Section 11B-502 and shall be dimensioned to the centerline of the marked lines as follows:

1. Parking spaces and access aisles shall be marked according to CBC Figures 11B-502.2, 11B-502.3, and 11B-502.3.3. Their surfaces shall comply with CBC Section 11B-302 and shall be at the same level with slopes not steeper than 1 :48 in any direction. CBC Section 11B-502.4
2. Parking spaces shall be 9'x18' minimum and van parking spaces shall be 12'x18' minimum with an adjacent access aisle of 5'x18' minimum. Access aisles shall be placed on either side of the parking spaces except be located on the passenger side for van parking spaces. Van parking spaces shall be permitted to be 9'x18' minimum where the access aisle is 8'x18' minimum.
3. Access aisles shall be marked by a blue painted borderline around their perimeter. The area within the blue borderlines shall be marked with hatched lines a maximum of 36" on center in a color contrasting with that of the aisle surface, preferably blue or white. Access aisle markings may extend beyond the minimum required length. CBC Section 11B-502.3.3
4. Access aisles (parking spaces as well - similar application) shall not overlap the vehicular way. CBC Section 11B-502.3.4
5. A vertical clearance of 8'-2" minimum shall be provided for accessible parking spaces, access aisles, and vehicular routes serving them. CBC Section 11B-502.5

F. At least one passenger loading zone shall be provided in every continuous 100 linear feet of loading zone space, or fraction thereof, complying with CBC Sections 11B-209 and 11B-503 as follows:

1. Vehicle pull-up spaces shall be 8'x20' minimum . Access aisles shall be 5'x20' minimum and shall be adjacent and parallel to the vehicular pull-up spaces. They shall be at the same level with slopes not steeper than 1:48 in any direction. CBC Section 11B-503.4
2. Access aisles for passenger drop-off and loading zone shall be marked with a painted borderline around their perimeter. The area within the borderlines shall be marked with hatched lines a maximum of 36" on center in a color contrasting with that of the aisle surface. CBC Section 11B-503.3
3. A vertical clearance of 9'-6" minimum shall be provided for vehicle pull-up spaces, access aisles, and a vehicular route serving them connecting a vehicular entrance and a vehicular exit. CBC Section 11B-503.5

G. Bus loading zones and bus stops shall comply with CBC Sections 11B-209 and 11B-810.2 as follows:

1. Boarding and alighting areas shall be of 8' x 5' minimum, with 8' measured perpendicular to the curb or vehicle roadway edge, and with 5' measured parallel to the vehicle roadway. Slopes in 8' direction shall be 1:48 maximum. Slopes in 5' direction shall be the same as that of the roadway, to the maximum extent practicable. CBC Figure 11B-810.2.2
2. Bus shelters shall provide a minimum 30" x 48" clear floor or ground space (36" x 48" or 36" x 60" as applicable in an alcove), with slopes not steeper than 1:48 in any direction, entirely within the shelter complying with CBC Section 11B-305.

H. Bus shelters shall be connected by an accessible route complying with CBC Section 11B-402 to a boarding and alighting area complying with CBC Section 11B-810.2. CBC Figure 11B-810.3

1.6 SUBMITTALS

A. Section 01 30 00 - Submittals: Requirements for submittals.

B. Product Data: Submit paint formulation for each type of paint.

C. Manufacturer's Installation Instructions: Submit instructions for application temperatures, eradication requirements, application rate, line thickness, and any other data on proper installation.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with State of California Public Work's standard.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five years experience.

B. Applicator: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 40 00 - Quality Control: Requirements for transporting, handling, storing, and protecting products.

B. Comply with AASHTO M309 for paint storage life, packaging and marking requirements. Invert containers several days prior to use when paint has been stored more than 2 months. Minimize exposure to air when transferring paint. Seal drums and tanks when not in use.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

B. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.

C. Do not apply paint when temperatures are expected to fall below 60 degrees F for 24 hours after application.

D. Volatile Organic Content (VOC). Do not exceed State or Environmental Protection Agency maximum VOC on traffic paint.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Provide chlorinated rubber-alkyd type, 3" wide white color, except at parking spaces for the disabled, which shall be blue in color equal to Color No. 15090 per Federal Standard 595c. Fire lane striping shall be red.
   1. Pavement-Marking Paint: MPI #32, alkyd traffic-marking paint.
   2. Glass Beads: AASHTO M 247, Type 1 made of 100 percent recycled glass.
   3. VOC Content: Pavement markings used on building interior shall have a VOC content of 150 gIL or less.

B. Manufacturers:
   1. Kelly-Moore Paint Company, "Traffic Paint".
   2. Mercury Paint Company, "Traffic Paint".
   3. PPG, "Traffic and Zone Marking Paint".
   4. Substitutions: Under provisions of Section 01 60 00.

C. Parking spaces for the disabled shall be marked according to CBC Section 11B-502.

D. Tactile warning lines shall be in conformance to CBC Section 11B-502.

2.2 EQUIPMENT

A. For application of crosswalks, intersections, stop lines, legends and other miscellaneous items by walk behind stripers, hand spray or stencil trucks, apply with equipment meeting requirements of this section. Do not use hand brushes or rollers.

2.3 TACTILE DETECTABLE WARNING DEVICES

A. Prefabricated high impact plastic truncated dome tiles, yellow in color equal to Color No. 33538 per Federal Standard 595c, conforming to the requirements of CBC Section 11B-705.1.

B. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-case contract. Such constraint shall not be required for detectable warning surfaces at curb raps, islands, or cut-through medians.

C. Manufacturers:

   1. Armor-Tile Tactile Systems
      Phone: 800-682-2525 Website: https://armor-tile.com
      a. Cast in place detectable warning paver, Model ADA-C 3660W
      b. Surface applied diamond-hard vitrified polymer composite tile, Model ADA-S-3660W

   2. Substitutions: Under provisions of Section 01 60 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Do not apply paint to paving surfaces until paving has cured for 28 days.

C. Beginning of installation means acceptance of existing surfaces.

3.2 PREPARATION

A. Surface Preparation.
   1. Clean and dry paved surface prior to painting.
   2. Blow or sweep surface free of dirt, debris, oil, grease or gasoline.
   3. Spot location of final pavement markings as specified and as indicated on Drawings.
   4. Notify Construction Manager after placing pavement spots and minimum 3 days prior to applying traffic lines and markings.

3.3 EXISTING WORK

A. Remove existing markings in an acceptable manner. Do not remove existing pavement markings by painting over with blank paint. Remove by methods that will cause least damage to pavement structure or pavement surface. Satisfactorily repair any pavement or surface damage caused by removal methods.

B. Clean and repair existing remaining and reinstalled lines and legends.

3.4 APPLICATION

A. Agitate paint for 1-15 minutes prior to application to ensure even distribution of paint pigment.

B. Dispense paint at Manufacturer's recommended temperature to provide opaque coverage when dry.

C. Lay out line markings and other painting in accordance with Drawings. Lines shall be 4 inches wide unless otherwise noted on drawings. Parking stalls for the disabled shall be marked according to CBC Section 11B-502.

D. Prevent splattering and over spray when applying markings.

E. Protect markings from traffic until track free. When vehicle crosses a marking and tracks it or when splattering or over spray occurs, eradicate affected marking and resultant tracking and apply new markings.

F. Collect and legally dispose of residues from painting operations.

3.5 APPLICATION TOLERANCES

A. Section 01 40 00 - Quality Control: Tolerances.

B. Maximum Variation from Wet Paint Line Width: Plus or minus 1/8 inch.

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Control: Field inspecting, testing, adjusting, and balancing.

B. Inspect for incorrect location, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

C. Repair lines and markings, which after application and curing do not meet following criteria:
   1. Incorrect Location: Remove and replace incorrectly placed patterns.
   2. Insufficient Thickness, Line Width or Paint Coverage: Prepare defective material by acceptably grinding or blast cleaning to remove substantial amount of beads and to roughen marking surface. Remove loose particles and debris. Apply new markings on cleaned surface in accordance with this Section.
   3. Uncured or Discolored Material, Insufficient Bonding: Remove defective markings in accordance with this Section and clean pavement surface one foot beyond affected area. Apply new markings on cleaned surface in accordance with this Section.

D. Replace defective pavement markings as specified throughout warranted period. Replace markings damaged by anti-skid materials, chemical deicers or other loss of marking material regardless of cause.

E. Replace failed or defective markings in entire section of defective markings within 30 days after notification when the following exists during warranty period:

1. Marking is discolored or exhibits pigment loss, and is determined to be unacceptable.

F. Replace pavement marking material under warranty using original or better type material. Continue warranty to end of original period even when replacement materials have been installed as specified.

G. When eradication of existing paint lines is necessary, eradicate by shot blast or water blast method. Do not gouge or groove pavement more than 1/16 inch during removal. Limit area of removal to area of marking plus 1 inch on all sides. Prevent damage to transverse and longitudinal joint sealers, and repair any damage according to industry standard.

3.7 PROTECTION OF FINISHED WORK

A. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free. Follow Manufacturer's recommendations. Barrier cones will be considered satisfactory protection for materials requiring more than 2 minutes dry time.

3.8 TACTILE DETECTABLE WARNING DEVICES

A. Install truncated dome tiles as indicated on Drawings.

B. Anchor permanently in place in accordance with manufacturer's directions.

C. Detectable warning surfaces:
1. Detectable warning surfaces shall comply with **CBC Section 11B-705.1**.
2. Detectable warning surfaces at transit boarding platform edges, bus stops, hazardous vehicular areas, reflecting pools, and track crossings shall be yellow and approximate **FS 33538 of Federal Standard 595C**. Detectable warning surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contract with that of the adjacent walking suefaces. The materialused to provide visual contract shall be integral part of the surface. **CBC Section 11B-705.1.1.3**
3. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands or cut-through medians. **CBC Section 11B-705.1.1.4**.

END OF SECTION