HILLVIEW HIGH SCHOOL

PORTABLE CLASSROOMS

TUSTIN UNIFIED SCHOOL DISTRICT

SPECIFICATIONS

SEPTEMBER 22, 2022

studiowc
ARCHITECTURE + ENGINEERING
515 Encinitas Boulevard, Suite 201, Encinitas, CA 92024
Ph. 760.753.6800 Fax 760.552.7541

00 00 00

PROCUREMENT AND CONTRACTING REQUIREMENTS

TUSTIN UNIFIED SCHOOL DISTRICT

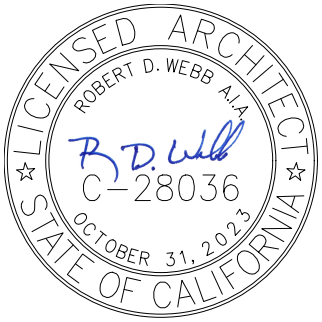
HILLVIEW HIGH SCHOOL
RELOCATABLE ADDITION
TUSTIN UNIFIED SCHOOL DISTRICT

STATE OF CALIFORNIA Department of General Services DIVISION OF THE STATE ARCHITECT San Diego Regional Office 10920 Via Frontera, Suite 300, San Diego, CA 92127 Phone: (858) 674-5400	PROJECT TRACKING NO.: 73643-197 DSA APPLICATION NO.: STAMP DATE:

STUDIOWC

515 Encinitas Boulevard, Suite 201, Encinitas, CA 92024

(760) 753-6800

ARCHITECT: STUDIOWC _____ Robert D. Webb, Architect, C-28036	
ELECTRICAL ENGINEER: FBA Engineering _____ Steven Zajicek, Engineer, E-10372	

END OF PROJECT TITLE PAGE

HILLVIEW HIGH SCHOOL
RELOCATABLE ADDITION
TUSTIN UNIFIED SCHOOL DISTRICT

01 00 00

GENERAL REQUIREMENTS

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Project: Relocatable Addition at Hillview High School for Tustin Unified School District.

B. Description of Work: Install relocated 24x40 portable building from Beckman High School, on wood foundations with associated site and electrical scope. Upgrades to existing men's, women's, boys, and girls restroom facilities and parking lot as indicated in the Contract Documents prepared by StudioWC.

1.02 PERFORMANCE REQUIREMENTS

A. All work shall conform to 2019, Title 24, California Building Code (CBC).

B. Changes to the approved Drawings and Specifications shall be made by addenda or a construction change document (CCD) approved by the Division of the State Architect, Office of Regulation Services, as required by Section 4-338, Part 1, Title 24, California Building Code.

1.03 WORK UNDER OTHER CONTRACTS

A. No work is planned or scheduled to be performed by the Owner's own forces.

1.04 WORK SEQUENCE

A. Work is to be conducted in a single phase based on a single lump-sum contract. The contract closeout procedure as specified in Section 01 77 00 - Closeout Procedures shall be completed within this period. Normal inclement weather for the various seasons of the year shall not be grounds for extensions of contract time, and the Contractor shall take this into account when formulating his Construction Schedule. By submitting a Bid and entering into this Contract, Contractor certifies that he has adequate resources and is fully capable of completing the Work within the allotted time.

1.05 CONTRACTOR USE OF PREMISES

A. During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises is limited only by the Owner's right to perform construction operations with its own forces or to employ separate contractors on portions of the project.

B. Limit use of the premises to construction activities in areas indicated; allow for Owner occupancy and use by the public.

1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

C. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

D. Use of the Existing Buildings: Maintain the existing buildings in a weather-tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1.06 OCCUPANCY

A. At each phase of completion, the Owner will occupy the Project in the manner outlined in Section 01 77 00 - Closeout Procedures, and as set forth in the General Conditions. Refer to General Conditions of the contract, Article 1.02. B. (Occupancy) and Article 1.02.C.(Completion) for occupancy and completion conditions.

Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. A Certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy.

2. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.

3. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION
(Not Applicable)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Administrative and procedural requirements governing the Contractor's Applications for Payment.

B. Related Work:

1. The Construction Progress Schedule is included in Section 01 32 16 and shall be coordinated with the work of this Section.

2. PROJECT RECORD DOCUMENTS: All requirements for record documents, Specification Section 01 78 39, shall be completed to the Owner's satisfaction prior to Owner's processing of each month's Application for Payment.

1.02 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with preparation of the Network Analysis Schedule.

B. Submit the Schedule of Values to the Architect at the earliest feasible date, but in no case later than (7) seven days before the date scheduled for submittal of the initial Application for Payment. Include with initial submission a projected monthly payment request schedule for total cost of project, for Owner's cash flow planning.

C. Acceptance of the Schedule of Values by the Architect and the District is required prior to approval and payment of the first application for payment.

D. Format and Content: The Project Manual Table of Contents may be used as a general guide to format the Schedule of Values; specific item numbers may be sequentially numerical.

1. The Schedule of Values shall be a detailed breakdown of the price to provide and install each item of work and material on the project.

2. Each line item on the Schedule of Values shall be presented to allow the Architect to easily find that item of work within the construction during his review of the construction operations and evaluate whether that line item is 100% complete or not.

3. Each line item of the Schedule of Values shall be given a value by the Contractor that, in the opinion of the Contractor, best represents the value of that work, and if required to present evidence of his opinion, the Contractor will be able to substantiate the value by the use of supplier, subcontractor written quotations, labor wages/rates, hourly estimates and/or by industry recognized cost estimating references.

4. Each line item of the Schedule of Values shall be in such detail and coordinated with other line items of work and with the contractor's Construction Schedule, that when making application for payment each month, each line item depicts a portion of work that can be completed within one month's pay period, reviewed by the Inspector and the Architect; if that line item is 100% complete,

recommended to the Owner for payment. If, in the opinion of the Architect, the line item is not 100% complete, the line item will not be recommended for payment.

5. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed. Each sheet of the Schedule of Values shall be titled and numbered sequentially.

   a. Line Item Number

   b. Description of Item.

   c. Quantity.

   d. Unit of Measure.

   e. Unit Price.

   f. Value of Line Item.

   g. Line Item Value Request this month.

   h. Line Item Value previously completed.

   i. At the bottom of each sheet, the Total Amount of Columns f, g, and shall be tabulated and carried forward on each page and the TOTAL AMOUNT presented at the end.

E. Round amounts off to the nearest whole Dollar; the total shall equal the Contract Sum.

F. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.03 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

1. The initial Application for Payment, the Application for Payment at the time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is the 15th day of each month. The period of construction Work covered by each Application for Payment is the period ending 15 days prior to the date for each progress payment and starting the day following the end of the preceding period.

C. Payment Application Forms: Use AIA Document G702 and the form of Schedule of Values accepted by the Architect and approved by the District.

D. Application Preparation: Complete each entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.

1. Entries shall match data on the Network Analysis Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Owner-approved Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit three (3) executed copies of each Application for Payment to the Architect by means of ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

F. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics lien from entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, and related to the Work covered by the payment.

1. Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period covered by the Application.

2. Submit final Application for Payment with or precede by final waivers from entity involved with performance of Work covered by the application who could lawfully be entitled to a lien.

G. Initial Application for Payment: Administrative actions and submittals that must precede submittal of the first Application for Payment include the following:

1. List of subcontractors.

2. Schedule of Values.

3. Contractor's Construction Schedule.

4. Schedule of unit prices, if applicable.

5. Submittal Schedule.

6. Copies of permits as may be required to start the Work (encroachment permits, etc., may be obtained as necessary for sequence of construction).

7. Copies of authorizations and licenses from governing authorities for performance of the Work.

8. Initial progress report.

9. Report of pre-construction meeting

10. Certificates of insurance and insurance policies.

11. Performance and payment bonds.

Note: Each preceding item shall be submitted to the Architect, accepted by the Architect and approved by the Owner prior to the certification and approval of the first payment to the Contractor.

H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect Certificates of Partial Substantial Completion issued previously for Owner

occupancy of designated portions of the Work. Administrative actions and submittals that shall proceed or coincide with this application include:

1. Occupancy permits and similar approvals.
2. Warranties (guarantees) and maintenance agreements.
3. Test/adjust/balance records.
4. Maintenance instructions.
5. Meter readings.
6. Start-up performance reports.
7. Change-over information related to Owner's occupancy, use, operation and maintenance.
8. Final cleaning.
9. Application for reduction of retainage, and consent of surety.
10. Advice on shifting insurance coverages.
11. Final progress photographs.
12. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion. Each work item value shall be listed and the total amount deducted from amounts owed over and above the retention.

I. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Written assurance that unsettled claims will be settled.
4. Written assurance that Work not complete and accepted will be completed without undue delay.
5. Transmittal of required Project construction records to Owner.
6. Certified property survey.
7. Proof that taxes fees and similar obligations have been paid.
8. Removal of temporary facilities and services.
9. Removal of surplus materials, rubbish and similar elements.
10. Change of door locks to Owner's access.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION

Attachments: Application and Certification for Payment – Form G702
Continuation Sheet – Form G702

APPLICATION AND CERTIFICATE FOR PAYMENT (G702

TO: <SCHOOL DISTRICT> SCHOOL DISTRICT

PROJECT:

APPLICATION NO:

PERIOD TO:

PROJECT NO:

CONTRACT DATE:

CONTRACT FOR:

DISTRIBUTION TO:

- ☐ OWNER
- ☐ ARCHITECT
- ☐ CONTRATOR
- ☐ FIELD
- ☐ OTHER

PHONE:

FROM:

VIA ARCHITECT:

PHONE:

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made fro payment, as shown below, in connection with the Contract Continuation Sheet, AIA Document G703, is attached.

1. ORIGINAL CONTRACT SUM	**$**	
2. Net Change by Change Orders & Extras	**$**	
3. CONTRACT SUM TO DATE (Line 1 + Line 2)	**$**	
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)	**$**	
5. RETAINAGE:		
a. ____ % of Completed Work …$_____		
b. ____ % of Stored Material …..$_____		
Total Retainage (Line 5a + 5b)		
Total in Column I of G703	**$**	
6. TOTAL EARNED LESS RETAINAGE (Line 4 less Line 5 Total)	**$**	
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)	**$**	
8. CURRENT PAYMENT DUE	**$**	
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	**$**	

CHANGE ORDER SUMMARY		
Total changes approved in Previous months by Owner	**$**	
Total approved this month	**$**	
NET CHANGES by Change Order	**$**	

State of: _____ County of _____ .

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

Notary Public: _____ My Commission Expires:

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ **Date:** _____

INSPECTOR:

By: _____ **Date:** _____

OWNER:

By: _____ **Date:** _____

AMOUNT CERTIFIED ……..……..$ _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

ARCHITECT:

By: _____ **Date:** _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

CONTINUATION SHEET (G703)

PROJECT: APPLICATION NO: CONTRACT DATE:

PERIOD TO: CONTRACT FOR:

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED		MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G+C)	BALANCE TO FINISH (C-G)	RETAINAGE
			FROM PREVIOUS APPLICATIONS (D+E)	THIS PERIOD					
	TOTAL PAGE 1								

SECTION 01 31 13

PROJECT COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Administrative and supervisory requirements required to ensure orderly progress and timely completion of the Work.

B. Related Work Described Elsewhere:

1. Additional requirements for coordination are included on Contract Drawings and other Sections of the Specifications. It is intended that all work provided under this Contract shall be complete except where otherwise specified or shown. Any drawing, document, or section, by itself, is not a complete description of the work. Cross references to related work, where given, are provided as a convenience and shall not limit the applicability of other requirements specified or shown unless specifically stated.

1.02 QUALITY ASSURANCE

A. Familiarity With Contract Documents:

1. Contractor and all Subcontractors shall conduct a study necessary to become completely familiar with all requirements. Applicable requirements indicated or described in the Contract Documents, and the publications referred to, are a part of the Work required as though repeated in each such Section.

2. In the event discrepancies or conflicts are encountered, notify the Architect immediately. Where there is discrepancy between different parts of the contract documents, including referenced codes and standards, the documents requiring the higher quality, the greater quantity, or the more difficult work shall govern, unless determined otherwise by the Architect.

3. Promptly distribute required information to entities concerned and ensure the needed actions are taken.

B. Reporting: Unless otherwise noted by the Contractor in his transmittals, all of the Contractor's data transmittals to the Architect for the Architect's review will be construed as stipulating that the Contractor has thoroughly and completely reviewed and coordinated the data prior to transmittal.

C. Interfacing: It shall be solely the responsibility of the Contractor to make sure that each Subcontractor completes in a timely manner the assigned work and that all interfaces are prepared, connected, and function as required.

1.03 REQUEST FOR INFORMATION

A. The General Contractor shall plan, schedule, coordinate and sequence Work so Requests for Information (RFI), if necessary, may be submitted to the Architect in a timely manner so as not to delay progress of Work. Submission of and responses to RFI(s) with copies to Owner, shall be transmitted via email.

B. Telephone conversations requesting information shall be confirmed in writing for prompt reply of all RFIs. Contractor shall coordinate the timing of email and telephone conversations to be made with the Architect's office between the hours of 8:00 a.m. and

noon, Monday through Friday.

C. RFIs will be unanswered until Contractor submits a "Construction Schedule". "Construction Schedule" shall be based on Specification Section arrangement and establish starting and ending dates for Work in each section. "Construction Schedule" shall be updated monthly and delivered to Architect and Owner at "Request for Payment".

D. If "Construction Schedule" is not received by Architect and Owner by that date, Architect's response to pending RFI(s) will be delayed by the same number of days as the days the "Construction Schedule" is late.

E. Architect shall have the same time period to respond to RFI(s) as "shop drawing review period". When the response to a Request for Information is already contained or included within contract documents, or is based on referenced standards, or is based on established and common construction practices, Contractor shall reimburse the Architect at the following hourly rates:

Principal	$200.00/hour
Associate Architect/Project Manager	$150.00/hour
Project Architect	$ 95.00/hour
Revit/CADD	$ 85.00/hour
Job Captain	$ 75.00/hour
Draftsperson	$ 65.00/hour
Support Staff	$ 55.00/hour

If RFI requires Architect's Consultant(s) acknowledgment, Contractor shall reimburse consultant(s), at the same hourly rates for consultant's staff; Contractor shall also pay to the Architect, a percentage for overhead and profit to the consultant's fee, equal to the markup the General Contractor adds to "Change Orders" from his "Subcontractors".

F. Contractor shall be billed at "Request for Payment" meeting, and payment is due on the 10th day of the following month. If payment is not received by Architect by that date, Architect's response to pending RFI's will be delayed by the same number of days as the days the payment check for RFI services is late.

G. No damages for delay due to RFI response beyond allotted time will be allowed, unless Contractor can show that RFI was not foreseeable with proper planning, scheduling, coordination, and sequencing and the Architect's late response delayed timely purchase or delivery of equipment or material, or limited construction personnel from proceeding with their task(s), within previously listed "Construction Schedule" activity period(s).

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

3.01 PLANNING THE WORK

A. By thorough advance planning of activities, coordinate the following in addition to other coordination activities required:

1. Materials, services, and equipment purchasing.

2. Shipping.

3. Receipt and storage at the site.

4. Installation, including interface with related items.

5. Inspection and testing, to the extent required under the Contract.

6. Assistance in initial start-up and operational tests.

7. Completion of the Work, including removal and disposal of Contractor's surplus material and equipment, and final cleaning of structures and sites.

3.02 COORDINATION

A. Coordinate construction activities included under various Sections of these Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work.

3.03 GENERAL INSTALLATION PROVISIONS

A. Coordination methods used by the Contractor are at the Contractor's option, except that the Architect may disapprove Work completed by the Contractor or data submitted by the Contractor when, in the Architect's judgment, coordination has been inadequate to ensure the specified quality.

B. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

END OF SECTION

Attachment: Request for Information – Form RFI

REQUEST FOR INFORMATION (RFI)

SCHOOL NAME - PROJECT NAME

NOTE: AN RFI IS A REQUEST FOR INFORMATION ONLY. IF A REPLY TO AN RFI REQUIRES ADDITIONAL SERVICES BY A DESIGN CONSULTANT, OR WILL CHANGE SCOPE OF WORK OR CONTRACT TIME, SUBMIT PROPOSAL REQUEST IN ACCORDANCE WITH SECTION 01 25 00.

RFI #: _____

To: _____ Date: _____

Architect: _____ Project No.: _____

Address: _____ Drawing Ref.: _____

Phone: _____ Fax: _____ Spec. Sect. Ref.: _____

Email: _____

☐ POSSIBLE COST IMPACT ☐ TIME IMPACT ☐ PRIORITY ATTENTION REQUIRED

Subject:

INFORMATION REQUESTED: (Attach additional sheets as required)

PLEASE RESPOND BY: _____ TRANSMITTED BY: _____

RESPONSE: (Attach additional sheets as required)

RESPONDED BY:

Name: ________________________ Company: __________________________ Date: _______________

SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Prior to commencement of the Work, a Preconstruction Conference will be held to discuss procedures to be followed during the progress of the Work.

B. Location: A convenient site for all parties designed by the District.

C. Attending the Preconstruction Conference shall be:

1. District Representative
2. District's Project Representative
3. Architect
4. District's and Architect's Consultants
5. Contractor
6. Contractor's Superintendent
7. Major listed Subcontractors
8. Others as appropriate

1.02 PROPOSED PROGRESS MEETINGS

A. Schedule and hold weekly meetings or as required by the District Representative.

1. Agenda to be prepared and submitted 48 hours prior to meeting.

B. Location: A convenient site for all parties designed by the District.

C. Attending Progress Meetings shall be:

1. Contractor and/or fully delegated Representative
2. Contractor's Superintendent
3. Subcontractors, as appropriate to the Agenda.
4. Others, as appropriate to the Agenda.
5. Inspector of Construction
6. District Representative
7. Architect

D. The Architect will record and distribute Meeting Minutes to the attendees. Attendees taking exception to anything in the meeting notes shall state same in writing, directed to the Architect within (5) five working days following receipt of meeting notes.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Manually prepared construction schedule based on Gantt (bar) Charts. Prepare and maintain schedules and issue reports to assure adequate planning and execution of the Work. Complete Work within the number of calendar days allowed in the Contract. Schedule shall be in sufficient detail to assist the Architect in appraising the reasonableness of the proposed schedule and to evaluate progress of the Work.

1.02 DEFINITIONS

A. Day: As used throughout the Contract, the work "day" means "calendar day" unless otherwise indicated.

B. Adverse weather that is normal for the area and the season shall be taken into account in the Construction Schedule.

1.03 QUALITY ASSURANCE

A. Qualifications of Scheduling Personnel: Employ a project scheduler thoroughly trained and experienced in compiling construction schedule data and in preparation of periodic reports.

B. Reliance Upon Accepted Schedule:

1. The construction schedule, as accepted by the Architect, shall be an integral part of the contract and will establish interim Contract completion dates for various activities.

2. Should any activity fail to be completed within (15) fifteen days after the stipulated schedule date, the Owner shall have the right to order the Contractor to expedite completion of the activity by whatever means the Owner deems appropriate and necessary, without additional compensation to the Contractor, and as set forth in the General Conditions of the Contract.

3. Should any activity be 30 or more days behind schedule, the Owner shall have the right to perform the activity or have the activity performed by whatever method the Owner may deem appropriate, and as set forth in the General Conditions of the Contract.

4. Costs incurred by the Owner in connection with expediting construction shall be deducted from the Contract amount.

5. Failure by the Owner to exercise the option to either order the Contractor to expedite an activity or to expedite the activity by other means, will not be considered a precedent for any other activities nor a waiver of the Owner's rights to exercise his rights on subsequent occasions.

1.04 SUBMITTALS

A. Submittal Procedure: Refer to Section 01 33 00 – Submittal Procedures and to Section 01 25 00 – Substitution Procedures.

B. Preliminary Analysis: Within (10) ten days after receipt of notice to proceed, submit one reproducible copy and four prints of a preliminary Construction Schedule.

C. Construction Schedule: Within (30) thirty days after receipt of notice to proceed, submit one reproducible and four prints of the initial construction schedule.

D. Periodic Reports: On the first working day of each month following submittal of the initial construction schedule, submit four prints of the updated Construction Schedule.

PART 2 - PRODUCTS

2.01 CONSTRUCTION ANALYSIS

A. Graphically show the order and interdependence of activities necessary to complete the Work, and the sequence in which each activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all subcontractors whose work is shown on the diagram. Show all activities on the diagram. Each activity shall indicate work item breakdown noting duration and responsibility for each item, including, but not necessarily limited to:

1. Project mobilization.

2. Submittal and review of shop drawings and samples.

3. Procurement of equipment and critical materials.

4. Fabrication of special material and equipment. Installation and testing of each by item and by system.

5. Final Cleanup.

6. Final inspection and testing.

7. Activities by the Architect that affect progress, required dates for completion, or both, for each part of the work.

PART 3 - EXECUTION

3.01 PRELIMINARY ANALYSIS

A. Prepare a Preliminary Construction Schedule:

1. Show all activities of the Contractor under this Contract for the period between receipt of notice to proceed and submittal of initial construction schedule.

2. Show the Contractor's general approach to remainder of the Work.

3. Show cost of all activities scheduled for performance before submittal and review of the Construction Schedule.

3.02 INITIAL CONSTRUCTION SCHEDULE

A. Update the Preliminary Construction Analysis for use as the initial Construction Schedule:

1. Clearly indicate the critical path and slack where it occurs.

2. Meet with the Architect and review contents of proposed Construction Schedule.
3. Make all revisions required by the Architect.

3.03 PERIODIC REPORTS

A. On a monthly basis as specified above, submit updated Construction Schedule:

1. Indicate "actual" progress in percent completion for each activity.

2. Provide written narrative summary of revisions causing delay in the program. Explain corrective actions taken or proposed.

B. Revise accepted construction schedule only when revisions are reviewed and approved in advance by the Architect.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined by manufacturer's name and catalog number, reference to recognized industry and government standards, or description of required attributes and performance.

2. To help ensure that the specified products are furnished and installed in accordance with design intent, submit design product and data in advance for review by the Architect. Review by the Architect and the design consultants in no way relieves the contractor or subcontractor or supplier from providing the products or construction as described in the Contract Documents.

3. Make submittals required by the Contract Documents. Revise and resubmit when requested to establish compliance with the specified requirements.

B. Related Work Described Elsewhere: Additional requirements for submittals are described in other Sections of these Specifications and the General Conditions.

C. Submittals shall be organized by specification section number.

D. Submittals shall be complete. All items indicated in each submittal section shall be contained within the submittal and identified by the Part, Section and subsection. **INCOMPLETE SUBMITTALS WILL BE REJECTED AND ANY DELAY WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.**

1.02 QUALITY ASSURANCE

A. Coordination of Submittals: Prior to each submittal, review and coordinate each item being submitted and verify that each item and the submittal conform with the requirements of the Contract Documents. **By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.**

B. Certificates of Compliance:

1. Certify that materials used in the Work comply with specified provisions thereof. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials if, after tests are performed on selected samples, the material is found not to meet specified requirements.

2. Show on each certification the name and location of the Work, name and address of Contractor, quantity and date or dates of shipment or delivery to which the certificate applies, and name of the manufacturing or fabricating company. Certification shall be in the form of letter or company-standard forms containing required data. Certificates shall be signed by an officer of the manufacturing or fabricating company.

3. In addition to the above information, laboratory test reports submitted shall show the date or dates of testing, the specified requirements of which testing was performed, and results of the test or tests.

1.03 SUBMITTALS

A. Contractor shall submit all shop drawings, samples, requests for substitutions, mix designs, and other items, in accordance with this Section. Submit schedule per Section 01 32 16, Construction Progress Schedule, indicating timing of all required submittals.

B. Prior to submittal of the Contractor's first application for payment, submit a schedule of all submittals required by the Contract Documents.

C. Submittals shall be submitted per the following time schedule for the following specific items. Failure to submit by these dates will be considered sufficient grounds to delay Architect's certification of Contractor's Application for Payment until these items are received in proper order.

1. Within (**10) ten calendar days** after Award of Contract:

a. **All Requests for Substitutions:** After this date, no further requests for substitution will be considered, and Contractor shall be obligated to provide the specified products - **NO EXCEPTIONS.**

2. Within (**15) fifteen calendar days** after Notice to Proceed:

a. Concrete mix design, steel connectors to be embedded in concrete foundations and slabs, materials for underground site plumbing, sewer, storm drainage, and underground site electrical.

3. Within (**20) twenty calendar days** after Notice to Proceed:

a. Hollow metal, door hardware, fire alarm system, fire sprinkler system, glu-lam beams and other structural lumber, structural steel, miscellaneous structural connectors, mechanical, plumbing and electrical materials, and equipment and fixtures.

b. All materials requiring a color selection by the Owner and Architect.

c. All casework.

4. Within (**30) thirty calendar days** after Notice to Proceed:

a. All other items not specifically mentioned in 1, 2 and 3 above.

D. Provide required submittals for the following products to interface with other portions of the Work. Submit data to verify compliance only.

1. For products specified only by reference standard, select product meeting that standard, by manufacturer.

2. For products specified by naming several products or manufacturers, select one of the products or manufacturers named.

3. For products specified by naming one or more products or manufacturers and stating "or other approved', or "or approved equivalent", or other such wording on drawings or within specifications sections, submit a request for substitutions for product or manufacturer which is not specifically named, but only after submitting bid on specified products and systems.

PART 2 - PRODUCTS

2.01 SHOP DRAWINGS AND COORDINATION DRAWINGS

A. Scale and Measurements: Make shop drawings to a scale sufficiently large to shown pertinent aspects of the item and its method of connection to the Work.

B. Type of Prints Required: Submit shop drawings in the black and white PDF (Bluebeam Revu compatible) format.

C. Reproduction of Reviewed Shop Drawings: Printing and distribution of reviewed shop drawings for the Architect's use will be by the Architect.

D. Review comments of the Architect will be shown in Blue Beam Review. The Contractor shall make and distribute copies required for his purposes.

2.02 MANUFACTURERS' LITERATURE

A. General: Where submitted literature from manufacturers includes data not pertinent to the submittal, indicate which portion of the contents is being submitted for review. Submittals not clearly marked will be returned without review.

B. Number of Copies Required: One digital PDF (Bluebeam Revu compatible) copy.

C. The Contractor shall make and distribute copies required for his purposes.

2.03 SAMPLES

A. Accuracy of Samples: Precise article proposed to be furnished shall be labeled with a submittal number, and project name.

B. Number of Samples Required: Submit quantity required to be returned plus one each retained by the Architect, the Inspector, DSA, and the Owner, unless otherwise noted.

C. Reuse of Samples: In situations accepted by the Architect, the Architect's retained sample may be used in the construction as one of the installed items.

D. Size of Samples: Samples shall be 6" x 6", or manufactured width by 12 inches, unless otherwise required by the pertinent Specification section.

2.04 COLORS AND PATTERNS

A. When the precise color and pattern is not specifically described in the Contract Documents, and whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts to the Architect for review and selection. Submit data to verify compliance only. If the color is specifically described in the Contract, submit only that color for verification and approval. Digital color submissions are acceptable within the submittal document, however, physical samples must be delivered within one day of date of submittal.

PART 3 - EXECUTION

3.01 IDENTIFICATION OF SUBMITTALS

A. General: Consecutively number submittals within the respective specification section. Accompany each submittal with transmittal cover letters attached to the end of this Section. Fill out each transmittal cover letter completely, number sequentially, include specification section, name of supplier or installer, and contact person and telephone number.

B. Internal Identification: On the first page of each copy of each submittal, and elsewhere as required for positive identification, indicate the submittal number.

C. Resubmittals: When material is resubmitted, transmit under a new letter of transmittal and with same submittal number plus a "alphabetic" suffix indicating it's a re-submittal, e.g. 05500-1A, 05500-1B.

D. Submittal Log: Maintain submittal log for the duration of the Contract. Show current status of submittals, with columns showing "approved", "approved as corrected", etc, to match Architect's categories. Make the submittal log available for the Architect's review upon request. Log shall be available and will be reviewed at each project meeting.

3.02 COORDINATION OF SUBMITTALS

A. The Contractor's Project Engineer shall be responsible to coordinate and review all submittals prior to forwarding to Architect. All submittals shall be stamped with Contractor's stamp, signed and dated, stating:

1. Contractor has reviewed submittal for compliance with requirements of the Contract Documents.

2. Contractor has reviewed submittal for proper interfacing with other trades.

B. General: Prior to making submittals, coordinate materials including, but not necessarily limited to:

1. Determine and verify interface conditions, catalog numbers, and similar data,

2. Coordinate with other trades as required,

3. Clearly indicate deviations from requirements of the Contract Documents. Deviations which are <u>not</u> clearly called out as a deviation and which subsequently become a part of an approved submittal can under no circumstances be considered legitimate grounds for an additive change order.

C. Grouping of Submittals: Make submittals in groups containing associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying and the Contractor shall be strictly liable for occasioned delays.

D. Color selections for materials in the same space or same elevation shall be submitted at one time. "Piece meal" submission of the color samples or charts is unacceptable and will be returned awaiting a "complete" submission.

3.03 TIMING OF SUBMITTALS

A. General: Make submittals far enough in advance of dates scheduled for installation to provide time required for reviews; for possible revisions and resubmittals; and for placing orders and securing delivery, and as otherwise required by Part 1.03 of this Section.

B. Architect's Review Time: In scheduling, allow at least 20 calendar days for review by the Architect following his receipt of the submittal or as otherwise may be required under each Specification section. Allow an additional 10 days for reviews involving Architect's consultants or as otherwise may be required under each Specification section.

C. Delays: Delays caused by tardiness in making submittals or resubmittals will not be an acceptable basis for extension of the Contract completion time.

3.04 ARCHITECT'S REVIEW

A. General: Corrections or comments made on Shop Drawings during his review **shall not relieve the Contractor from compliance with requirements of the Drawings and Specifications.** This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of other trades and performing his work in a safe and satisfactory manner.

1. Authority to Proceed: The notations "Furnish as Submitted" or "Furnish as Corrected" authorize the Contractor to proceed with fabrication, purchase, or both or the items so noted, subject to the revisions, if any, required by the Architect's review comments.

2. Revisions: The notation "Revise and Resubmit" or "Submit Specified Item" means make revisions required by the Architect and resubmit. If the Contractor considers required revision to be a change, he shall so notify the Architect as provided for under "Changes" or "Changes in the Work" in the General Conditions. Show each drawing revision by number, date, and subject in a revision block on the drawing. Make only those revisions directed by or accepted by the Architect.

3. Rejection: The notation "Rejected" means the submission does not meet requirements of project contract documents. Make new submission meeting project contract documents.

END OF SECTION

Attachment: Contractor’s Form - Shop Drawings / Submittal Transmittal Letter
Cover Sheet referenced herewith.

SHOP DRAWINGS / SUBMITTAL TRANSMITTAL LETTER

School: Project: District: DSA Application No.:	Specification Section: Submittal No.: Submittal Description: Date:

Contractor: **Address:** **Phone No.:** **Contact:**	**Subcontractor:** **Address:** **Phone No.:** **Contact:**

FIRM NAME
Address
Phone No.

SUBMITTAL HISTORY
ARCHITECT/ENGINEER'S SHOP DRAWING STAMP
REMARKS:

SECTION 01 35 16

ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Special procedures required for alteration work.

1.02 SCHEDULING

A. Before commencing alteration or demolition work, submit for review by the Architect and approval of the Owner, a Schedule showing the commencement, the order and the completion dates for the various parts of this work.

B. Before starting work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the existing building, notify the Architect and the Owner 72 hours in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.

1.03 PROTECTION

A. Make such explorations and probes as are necessary to ascertain required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent damage to existing construction.

B. Provide, erect, and maintain catch platforms, lights, barriers, weather protection, warning signs, and other items as required for proper protection of the public, occupants of the building, workmen engaged in demolition operations, and adjacent construction.

C. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until protection is provided by new construction.

D. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and new work is being done, connections made, materials handled, or equipment moved.

E. Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster and similar debris. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.

F. Provide adequate fire protection in accordance with local Fire Authority and with Section 01 50 00, Temporary Facilities and Controls.

G. Do not close or obstruct walkways, passageways or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.

H. Be responsible for damage to the existing structure or contents by reason of the insufficiency of protection provided.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials and workmanship employed in the alterations, unless otherwise shown or specified, shall conform to that of the original work, or to new construction as specified elsewhere in these specifications.

B. If interior finish materials, or existing surfaces to be removed are indicated to be re-used in areas necessary to match existing surfaces. Care in removal and stockpiling shall be exercised to ensure re-use.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Perform demolition, removal and alteration work with due care, including shoring and bracing. Be responsible for damage which may be caused by such work to part or parts of existing structures or items designated for re-use. Perform patching, restoration, and new work in accordance with applicable technical sections of the Specifications.

B. Materials and items designated to become the property of the Owner shall be as shown. Remove such items with care, under the supervision of the trade responsible for reinstallation; protect and store until required. Replace material and item damaged in its removal with approved similar and equal new material.

C. Materials and items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property. Storage or sale of removed items on site will not be permitted.

D. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the building.

E. Where alterations occur, or new and old work join, cut, remove, patch, repair or refinish the adjacent surfaces or so much thereof as is required by the involved conditions, and leave in as a good a condition as existed prior to the commencing of the work. The alteration work shall be performed by the various respective trades which normally perform the particular items of Work.

F. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease, loose paint, etc. before refinishing.

G. Where existing equipment and fixtures are indicated to be re-used, repair such equipment and fixtures and refinish to put in excellent working order. Refinish as directed.

H. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.

I. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing built-up roofing. Cut and remove insulation. Provide temporary weathertight protection as required until new roofing and flashings are applied.

J. Should any existing conditions, such as deterioration or non-complying construction, be discovered which is not covered by the DSA approved documents, wherein the finished

work will not comply with the current Title 24, California Building Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work, shall be submitted to, and approved by DSA, before proceeding with the repair work.

3.02 CLEANING UP

A. Remove debris as the work progresses. Maintain the premises in a neat and clean condition.

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 SUMMARY

A. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and methods for testing and reporting on the pertinent characteristics.

B. Provide materials and workmanship which meet or exceed the specifically named code or standard.

C. Deliver to the Architect required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested by the Architect and will generally be required to be copies of a certified report of tests conducted by a testing agency acceptable for that purpose to the Architect.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Specific naming of codes or standards occurs on the Drawings and in other Sections of these Specifications. Comply with laws, ordinances, and regulations of authorities having jurisdiction. Proof of compliance with laws, ordinances, and regulations shall be by the signed approval of the respective authorities having jurisdiction. Costs relative thereto shall be borne by the Contractor.

1.03 QUALITY ASSURANCE

A. Familiarity with Pertinent Codes and Standards: Verify the requirements of the specifically named codes and standards as well as requirements mandated by law, ordinance and authority. Verify that the items procured and installed in this Work meet or exceed the specified requirements.

B. Rejection of Noncomplying Items: The Architect reserves the right to reject items incorporated into the Work which fail to meet such minimum requirements.

1.04 APPLICABLE CODES

A. Work of the project shall conform to the following list of the **2019, Title 24, California Code of Regulations (CCR),** a List of Codes, copies of which shall be maintained at the job site by the Contractor throughout the duration of the work.

B. **Partial List of Applicable Codes as of January 1, 2020**:

1. **2019 California Building Standards Administrative Code** (CAC), Part 1, Title 24, California Code of Regulations (CCR).**

2. **2019 California Building Code** (CBC), Part 2, Title 24, California Code of Regulations (CCR) [2018 International Building Code (IBC) Volumes 1-2 and 2019 California Amendments].

3. **2019 California Electrical Code** (CEC), Part 3, Title 24, California Code of Regulations (CCR) [2017 National Electrical Code and 201 California Amendments].

4. **2019 California Mechanical Code** (CMC), Part 4, Title 24, California Code of Regulations (CCR) [2018 Uniform Mechanical Code and 2019 California Amendments].

5. **2019 California Plumbing Code** (CPC), Part 5, Title 24, California Code of Regulations (CCR) [2018 Uniform Plumbing Code and 2019 California Amendments].

6. **2019 California Energy Code**, Part 6, Title 24, California Code of Regulations (CCR).

7. **2019 California Historical Building Code**, Part 8, Title 24, California Code of Regulations (CCR).

8. **2019 California Fire Code** (CFC), Part 9, Title 24, California Code of Regulations (CCR) [2018 International Fire Code and 2019 California Amendments].

9. **2019 California Existing Building Code**, Part 10, Title 24, California Code of Regulations (CCR).

10. **2019 California Green Building Standards Code**, Part 11, Title 24, California Code of Regulations (CCR).

11. **2019 California Reference Standards Code**, Part 12, Title 24, California Code of Regulations (CCR).

12. Title 19, CCR, Public Safety, State Fire Marshal Regulations.

13. 2016 ASME A17.1 (w/A17.1a/CSA B44a-08 addenda) Safety Code for Elevators and Escalators.

C. **Partial List of Applicable Standards**:

Reference code section for NFPA Standards, 2019 CBC (SFM)

NFPA 13	Automatic Sprinkler Systems, 2016 Edition (CA Amended)
NFPA 14	Standpipes and Hose Systems, 2016 Edition (CA Amended)
NFPA 17	Dry Chemical Extinguishing Systems, 2017 Edition
NFPA 17a	Wet Chemical Extinguishing Systems, 2017 Edition
NFPA 20	Stationary Pumps for Fire Protection, 2016 Edition
NFPA 22	Water Tanks for Private Fire Protection, 2018 Edition
NFPA 24	Private Fire Service Mains & their Appurtenances, 2016 Edition
NFPA 25	Standard for Inspection, Testing & Maintenance of Water-based Fire Protection Systems, 2017 Edition

NFPA 37	Installation & Use of Stationary Combustion Engines & Gas Turbines, 2018 Edition
NFPA 72	National Fire Alarm & Signaling Code, 2019 Edition (CA Amended)
NFPA 80	Fire Doors and Other Opening Protectives, 2019 Edition
NFPA 92	Standard for Smoke Control Systems, 2018 Edition
NFPA 101	Life Safety Code, 2018 Edition
NFPA 110	Emergency & Standard Power Systems, 2019 Edition
NFPA 170	Standard for Fire Safety & Emergency Symbols, 2018 Edition
NFPA 221	Standard for High Challenge Fire Walls, Fire Walls & Fire Barrier Walls, 2018 Edition
NFPA 253	Critical Radiant Flux of Floor Covering Systems using a Radiant Heat Energy Source, 2019 Edition
NFPA 2001	Clean Agent Fire Extinguishing Systems, 2018 Edition
ICC 300	ICC Standards on Bleachers, Folding and Telescoping Seating and Grandstands, 2017 Edition
ICC-ES AC77	Acceptance Criteria for Smoke Containment Systems used with Fire-Resistance-Rated Elevator Hoistway Doors & Frames,
SFM Std. 12-10-1	Power Operated Exit Doors, 2019 Edition
SFM Std. 12-10-2	Single-Point Latching or Locking Devices, 2019 Edition
SFM Std. 12-10-3	Emergency Exit & Panic Hardware, 2019 Edition
SFM Std. 12-7A	Materials and Construction Methods for Exterior Wildfire Exposure, 2019 Edition
UBC Std. 15-2	Test Standard for Determining the Fire Retardancy of Roof-Covering Materials
UL 38	Manual Signaling Boxes for Fire Alarm Systems, 2008 Edition
UL 268	Smoke Detectors for Fire Protective Signaling Systems, 2009 Edition
UL 268A	Smoke Detectors Duct Applications, 2016 Edition
UL 294	Access Control Systems Units, 2018 Edition
UL 300	Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment, 2019 Edition
UL 305	Standard for Panic Hardware, 2012 Edition
UL 346	Waterflow Indicators for Fire Protective Signaling Systems, 2016 Edition

UL 464	Audible Signal Devices for Fire Alarm & Signaling Systems, including Accessories, 2016 Edition
UL 521	Heat Detectors for Fire Protective Signaling Systems, 1999 Edition (Amended with Revision through July 20, 2005)
UL 864	Control Units and Accessories for Fire Alarm Systems, 2014 Edition
UL 2034	Single & Multiple Station Carbon Monoxide Alarms, 2017 Edition

Reference code section for NFPA Standards – 2019 CBC (SFM) Chapter 35. See Chapter 35 for State of California amendments to NFPA Standards

**** California Administrative Code, Part 1, Chapter 10, Administrative Regulations for the California Energy Commission (CEC).**

1.05 REFERENCE STANDARDS

A. Standards referenced in the Specifications are usually referred to by the abbreviation of the organization's name and the designation of the document (e.g., ASTM A36). Documents in common use may be referred to by their own designation (e.g., the California Electrical Code is published by the National Fire Protection Association as NFPA-70 but is referred to as CEC, and is part of a series of documents or standards referred to as the National Fire Code). References are to the latest issue of the publication available on the date stipulated for the receipt of bids.

STANDARDS ORGANIZATIONS

AA	Aluminum Association
AAMA	American Architectural Manufacturer's Association
ASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AISC	American Institute of Steel Construction
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute, Inc.
APA	APA-The Engineered Wood Association
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials

AWPA	American Wood Protection Association
AWPB	American Wood Preservers' Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
CBC	California Building Code, 2019
CDA	Copper Development Association
CEC	California Electrical Code
CEQA	California Environmental Quality Act
CGA	Compressed Gas Association
CISPI	Cast Iron Soil Pipe Institute
CMC	California Mechanical Code - See IAPMO
CPC	California Plumbing Code - See IAPMO
CPSC	Consumer Product Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard of U.S. Dept. of Commerce
CTIOA	Ceramic Tile Institute of America (former CTI)
CSMA	Chemical Specialties Manufacturing Association
FGMA	Flat Glass Marketing Association
FM	Factory Mutual Global (former FMS)
FS	Federal Specification
GA	Gypsum Association
HI	Hydraulic Institute
HRI	Hydraulics Research Institute
IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council (former ICBO)
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society of North America

MIL-STD	Military Specifications (former MIL)
ML/SFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers
NIST	National Institute of Standards and Technology (former NBS)
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
N FLUID PA	National Fluid Power Association
NFPA	National Fire Protection Association
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWWDA	National Wood Window and Door Association
PS	Voluntary Product Standard (of NIST former NBS)
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SSPC	The Society for Protective Coatings (former SSPC)
TCNA	Tile Council of North America, Inc. (former TCA)
TSIB	Technical Services Information Bureau (former WLPDIA)
UL	Underwriters Laboratories, Inc.
WI	Woodwork Institute (former WIC)
TITLE	Title 24, California Code of Regulations, Part 1, 2, 3, 4, 5, 6, 8, & 9
TITLE	Title 19, California Code of Regulations

1.06 REFERENCE COPIES

A. A minimum of one copy of Codes, Regulations, and Standards referenced in the drawings or the specifications, or applicable to the work, shall be furnished to the Owner's Representative at least (2) two weeks prior to the commencement of work affected by such codes, regulations or standards.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION
(Not Applicable)

END OF SECTION

SECTION 01 45 23

TESTING AND INSPECTING SERVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Cooperate with the Owner's selected testing agency, the Owner's assigned Inspector, and others responsible for testing and inspecting the Work, and assist the Owner by coordinating such testing and inspecting services as specified in this Section and/or elsewhere in the Contract Documents.

B. Related Work Specified Elsewhere:

1. Requirements for testing may be required in other Sections of these Specifications.

2. Where no testing requirements are specified or required by reference standards or authorities having jurisdiction, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described herein.

C. Work Not Included:

1. The Owner will select a pre-qualified independent testing laboratory and Inspector as approved by the Division of the State Architect (DSA), Department of General Services, Architect and Structural Engineer.

2. The Owner will pay for initial services of the testing laboratory as further described hereinafter.

1.02 QUALITY ASSURANCE

A. The Owner will select an independent testing laboratory to conduct the tests. Selection of the material required to be tested shall be by the laboratory or the Owner's representative and not by the Contractor.

B. Qualifications of Testing Laboratory: The testing laboratory, approved by DSA, shall be qualified to the Owner's acceptance in accordance with ASTM E329. The testing laboratory shall be qualified by the Division of the State Architect.

C. Codes and Standards: Testing, when required, will be in accordance with pertinent codes and regulations and with selected standards of the American Society for Testing and Materials and other organizations or agencies which publish recognized codes, standards, or tests. Refer to Article 3.04 - Required Testing of this Section.

1.03 TEST REPORT DISTRIBUTION

A. Promptly process and distribute required copies of test reports and related instructions to ensure necessary retesting and/or replacement of materials with the least possible delay in progress of the Work.

B. One copy of Test Reports shall be forwarded to the Project Inspector by the testing agency. Such reports shall include tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported.

The reports shall show that the material or materials were sampled and tested in accordance with the requirements of Title 24 and with the approved specifications. Test reports shall show the specified design strength. They shall also state whether or not the material or materials tested comply with requirements.

C. Each Testing Agency shall submit to the Division of the State Architect a verified report in duplicate covering tests which are 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, including tests up to that time, and at the completion of the project. For additional information, refer to DSA PR13-01.

1.04 PAYMENT FOR TESTING SERVICES

A. Initial Services: The Owner will pay for initial testing and inspection except as specifically modified herein- after or as specified otherwise in technical sections, provided the results of inspection indicate compliance with the Contract Documents.

B. Retesting: When initial tests or inspection indicate noncompliance with the Contract Documents, subsequent retesting or re-inspection occasioned by the noncompliance shall be performed by the same testing laboratory or Inspector and the costs thereof will be deducted by the Owner from the Contract Sum. Retesting and re-inspection will continue until test or inspection results indicate compliance.

C. Code Compliance Testing: Inspections and tests required by codes or ordinances, or by authorities having jurisdiction and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Owner, but backcharged to the Contractor in case of retesting due to non-compliance.

D. Specified Inspections and Tests: Tests and inspections specified in the Specifications, directly or by reference, shall be coordinated by the Contractor at his expense and paid for by the Owner. Corrections of noncompliance and test failures shall be paid for by the Owner but shall be backcharged to the Contractor. Re-inspection and retesting shall be in accordance with paragraph 1.04-B.

E. Contractor's Convenience Testing: Inspecting or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of and at the expense of the Contractor.

1.05 INSPECTION BY THE OWNER

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

B. The Owner shall have the right to reject materials and workmanship which are defective, and 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 rejected work and charge the expense to the Contractor.

C. 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 work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish necessary facilities, labor and materials. If such work is found to be defective in respect due to fault of the Contractor or his subcontractor, he shall defray 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 will be allowed the Contractor.

1.06 OWNER'S INSPECTOR

A. An Inspector employed by the Owner, approved by DSA in accordance with the requirements of the State of California Administrative Code, Title 24, Part 1, and qualified in accordance with Division of the State Architect will be assigned to the work. Reference DSA IR A-7 and IR A-8 for project Inspector certification and approval and duties and performance rating by DSA. The inspector duties are specifically defined in Title 24, Part 1, Section 4-342, reprinted herein:

" 4-342 Duties of the Project Inspector

(a) **General.** The project inspector shall act under the direction of the architect or registered engineer and under the supervision of the enforcement agency.

(b) **Duties.** The general duties of the project inspector in fulfilling project inspection responsibilities are as follows:

1. **Continuous inspection requirement.** The project inspector must have actual personal knowledge obtained by personal and continuous inspection of the work of construction in all stages of its progress that the requirements of the approved plans and specifications are being completely executed.

Continuous inspection means complete inspection of every part of the work. Work, such as concrete work or masonry work which can be inspected only as it is placed, shall require the constant presence of the inspector. Other types of work which can be completely inspected after the work is installed may be carried on while the inspector is not present. In any case, the inspector must personally inspect every part of the work. In no case shall the inspector have or assume any duties that will prevent the inspector from giving continuous inspection.DSA may require verification from the project inspector of time spent at the construction site during all phases of the work.

The project inspector may obtain personal knowledge of the work of construction, either on-site or off-site, performed under the inspection of special inspectors and/or assistant inspectors (Section 4-333). The project inspector may obtain personal knowledge that materials used in the construction conform to the DSA approved documents by verifying test reports performed by DSA accepted testing facilities, verifying materials certifications shipped with the materials, or other means as specified in the DSA approved documents and referenced codes and standards. The project inspector shall be responsible for monitoring the work of the special inspectors and testing laboratories to ensure that the testing program is satisfactorily completed. The project inspector shall be responsible for supervising the work of all assistant inspectors in accordance with Section 4-333(d). The exercise of reasonable diligence to obtain the facts shall be required.

2. **Relations with the architect or engineer.** Any uncertainties in the inspector's comprehension of the plans and specifications or inconsistencies or seeming errors in the approved construction documents shall be reported promptly to the architect or registered engineer for interpretation and instructions. In no case shall the instruction of the architect or registered engineer be construed to cause work to be done which is not in conformity with the DSA approved documents.

3. **Job file.** The project inspector shall always keep and maintain a file on the job with all of the following:

   A. DSA approved plans and specifications including DSA approved addenda and all construction change documents.

   B. Applicable parts of the edition of Title 24, C.C.R. referred to in the plans and specifications, and any pertinent reference standards.

   C. DSA approved statement of structural tests and special inspections.

   D. Copies of the project inspector's semi-monthly reports.

   E. Copies of all deviation notices and a log of all deviation notices. The log shall reference all applicable details and specification sections related to nonconforming materials and workmanship including field change documents, change orders, addenda and deferred submittals. The log shall describe all corrective actions taken whether performed in accordance with DSA approved documents or not, the current status of each deviation issue and the resolution for each issue.

   F. Log documenting all significant communications with the design professionals, contractors, DSA representatives and other persons involved in the project. Significant communications include, but are not limited to, interpretations, clarifications or directions from the design professionals, issues identified by DSA representatives, directives from the school district, and start notices from the contractor.

   G. Laboratory test and inspection reports.

   H. Contractor's request for information (RFI) and responses to the RFIs.

   I. Interpretations and clarifications from the design professional in general responsible charge.

   J. Special inspection reports.

   K. Concrete placing operation records showing the time and date of placing concrete and the time and date of removal of forms in each portion of the structure.

   L. Welding operation records including identification marks of welders, lists of defective welds, manner of correction of defects,

etc.

M. Pile driving operation records including penetration under the last 10 blows for each pile when piles are driven for foundations.

N. Verified reports for all persons required by this code for file verified reports.

O. Any other applicable documents required to provide a complete record of construction.

The job file shall be kept on the job site until the completion of the project and shall be readily accessible to DSA personnel during site visits. A copy of the job file shall be made available to DSA upon request. The job file, with exception of building codes and reference standards, shall be made a part of the permanent school district records.

4. **Project inspector's semimonthly reports.** The project inspector shall keep the architect or registered engineer thoroughly informed as to the progress of the work by making semimonthly reports in writing as required in Section 4-337.

5. **Notifications to DSA.** The project inspectors shall notify DSA by email at the following times:

   A. When construction work on the project is started or restarted if previously suspended per Item D below.

   B. At least 48 hours in advance of the time when foundation trenches will be complete, ready for footing forms.

   C. At least 48 hours in advance of the first placement of foundation concrete and 24 hours in advance of any subsequent and significant concrete placement.

   D. When all work on the project is suspended for a period of more than one month.

6. **Deviations.** The project inspector shall notify the contractor, in writing, of any deviations from the approved plans and specifications which are not immediately corrected by the contractor when brought to the contractor's attention. Copies of such notice shall be forwarded immediately to the architect or registered engineer, and to DSA.

   Failure on the part of the project inspector to notify the contractor of deviations from the approved plans and specifications shall in no way relieve the contractor of any responsibility to complete the work covered by his or her contract in accordance with the approved plans and specifications and all laws and regulations.

7. **Inspector verified reports.** The project inspector shall make and submit directly to DSA verified reports (see Section 4-336). The project inspector shall prepare and deliver to DSA detailed statements of fact regarding materials, operations, etc., when requested.

8. **Performance of duties.** The inspector shall perform all duties and render all services with honestly. Inspectors who fail to carry out their

duties in an ethical manner or who engage in illegal activities may be subject to disciplinary action as defined in Section 4-342(d).

(c) **Violations.** Failure, refusal or neglect on the part of the inspector to notify the contractor of any work which does not comply with the requirements of the approved plans and specifications, or failure, refusal or neglect to report immediately, in writing, any such violation to the architect or registered engineer, to the school board, and to DSA shall constitute a violation of the Act and shall be cause for DSA to take action which may result in withdrawal of the inspector's approval. The State Architect or designee may take appropriate action as described in Section 4-342(d) when any of the following conditions exist:

1. The inspector has failed to fulfill any of the relevant requirements of this code.

2. The inspector has been convicted of a crime considered to be substantially related to the qualifications, functions or duties of an inspector in a manner consistent with the public health, safety or welfare.

(d) **Disciplinary actions.** Failure to satisfactorily perform inspector duties identified in this code may be cause for DSA to take action(s) which included but are not limited to the following:

1. Requiring the inspector to meet with DSA in the regional office for counseling.

2. Requiring the inspector to attend training classes.

3. Withdrawal of the inspector's approval for the project.

4. Downgrading of the inspector's class of certification.

5. Suspension of the inspector's certification.

6. Withdrawal of the inspector's certification.

(e) **Notice of disciplinary actions.** Notice of disciplinary action shall specify the grounds for the actions taken.

(f) **Criteria for reinstatement.** When considering reversal of any disciplinary action taken pursuant to Section 4-342(d), the State Architect or designee evaluating the reinstatement of an inspector's approval for a project, or certification, may consider the following criteria:

1. Nature and severity of the act(s) or offense(s).

2. The time that has elapsed since the commission of the act(s) or offense(s).

3. If applicable, evidence of expungement proceedings pursuant to Section 1203.4 of the Penal Code.

(g) **Filing an appeal.**

1. The State Architect or his/her designee has the discretion to immediately order that approval of a project inspector for a project, or certification, be temporarily invalidated or to seek additional information, pending a final determination by the State Architect or his/her designee pursuant to Section 4-342©. The decision to temporarily invalidate approval of a project inspector for a project, or certification, will be made on a case by case basis, as necessary to ensure public health, safety and welfare.

2. The State Architect or his/her designee shall provide the appellant with written notice that their approval for a project, or certification, has been temporarily invalidated as of a specific date or is subject to suspension or denial pursuant to Section 4-342(d), pending a final determination. The written notice shall include the reasons for the action being taken or investigated, as applicable, and provide a summary of the facts and allegations. Service of the written notice of the proposed action shall be confirmed by certified mail.

3. Written notice of the final determination by the State Architect or his/her designee shall be confirmed by certified mail within 60 days from the initial written notification. The time to render his/her determination may be extended an additional 30 days, as necessary, to consider any additional supporting documentation provided to the State Architect relevant to the issue being investigated.

4. An appeal of an action by the State Architect or his/her designee to suspend approval of a project inspector for a project, or certification, or to deny renewal of a certification must be filed in wiring with DSA within 60 days of the date posted on the certified service of the written notice of the final determination from the State Architect. Unless a hearing is specifically requested as provided in Section 4-342(g)6 the appeal will be based on an analysis of the materials available.

5. Within 60 days from the date of receipt of the appeal the State Architect or his/her designee shall render his/her determination on the appeal. The time to render the determination may be extended an additional 30 days, as necessary to conclude any research or investigation required, at the discretion of the State Architect or his/her designee.

6. Should an individual submit a written request for a hearing, the State Architect may designate an appropriate hearing officer to conduct the hearing. Written notice of the date and time of the hearing and the reasons for the action being taken or investigated, as applicable, shall be provided to the appellant. The hearing shall be limited in scope to the actions stated in the written notice. The appellant may bring a representative of his/her choice.

7. The appellant shall be notified in writing of the determination made by State Architect or his/her designee regarding the appeal. Service of the written notice of the decision shall be confirmed by certified mail.

8. Any appeal of a decision rendered by the State Architect or his/her designee to rescind approval for a project or certification may be appealed to the Superior Court.

Authority: Education Code Sections 17310 and 81142.

Reference: Education Code Sections 17309, 17311, 81141 and 81143. **"**

B. The work of construction in stages of progress shall be subject to the personal continuous observation of the Inspector as continuous observation is defined by Title 24. He shall have free access to 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 obligation to fulfill this Contract.

1.07 OWNER'S OTHER PERSONNEL

A. From time to time, other personnel in the employ of the Owner may inspect the Work when the Work is in progress but shall have no authority to direct the Contractor or request changes in the Work except as may be provided elsewhere in the Contract Documents.

1.08 REPRESENTATIVE OF THE DIVISION OF THE STATE ARCHITECT

A. Architect shall have access to the site in accordance with Title 24.

B. Field Engineers and Inspectors from DSA. Structural Safety Section, Fire & Life Safety Review and Access Compliance shall have access to the site in accordance with Title 24.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 COOPERATION WITH TESTING LABORATORY AND INSPECTORS

A. Inspectors and representatives of the testing laboratory shall have access to the work. Provide facilities for such access in order that the testing, inspection, and the obtaining of samples may be done properly.

B. Contractor shall deliver material specimens to the Owner's testing lab, which must by terms of the Contract be tested prior to inclusion in the Project, at least (45) forty five days prior to scheduled delivery to the job site.

C. 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.

3.02 TAKING SPECIMENS

A. Field specimens and samples for testing, unless otherwise provided in these Contract Documents, shall be selected and taken by the Testing Laboratory or Inspector and not the Contractor. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory. Soil samples for approval of import fill shall be delivered to the Testing Laboratory by the Contractor, as directed by the Testing Laboratory.

3.03 SCHEDULES FOR TESTING

A. Establishing Schedule:

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.

2. Provide required time within the Construction Schedule.

B. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate such changes of schedule with the testing laboratory as required.

C. Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedules, but is prevented from testing or taking specimens due to incompleteness of the work, extra charges for testing attributable to the delay may be back-charged to the Contractor and will be deducted by the Owner from the Contract Sum.

3.04 REQUIRED TESTING

All Testing and Inspection requirements shall comply with the Stamped Approved DSA-103, in accordance with California Building Code, Title 24, Part 2.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: General requirements for delivery, storage, and handling of materials and equipment applicable to the product sections of this specification and necessary for the construction of the Project.

B. Related Sections:

1. Section 01 25 00 – Substitution Procedures
2. Section 01 33 00 – Submittal Procedures

1.02 GENERAL

A. Material and Equipment Incorporated into the Work:

1. Conform to applicable specification and standards.
2. Comply with size, make, type, and quality specified.

B. Manufactured and Fabricated Products:

1. Design, fabricate and assemble in accordance with the best engineering and shop practices.

2. Manufacture like parts of duplicate units to standard sizes and gages for interchangeability.

3. Two or more items of the same kind shall be identical, by the same manufacturer.

C. Reused Materials: Where the contract documents indicate that existing materials may be reused, such materials shall be cleaned and reincorporated in the work.

1. Materials to be reused shall be approved for reuse by the Inspector.

D. Supplementary materials not specifically described in each Section, but required for a complete and proper installation of the Work, shall be new, first quality of their respective kinds, and subject to review and acceptance by the District.

1.03 DELIVERY

A. Arrange deliveries of products in accordance with construction schedules and in ample time to facilitate inspection prior to installation. Notify the Inspector of Record, in writing, when items are delivered to the site, so he may inspect and verify quality and quantities delivered are as intended.

B. Coordinate deliveries to avoid conflict with work and conditions at site, taking into consideration:

1. Work of the Contractors, or Owner.
2. Limitations of storage space.
3. Availability of equipment and personnel for handling products.

4. Owner's use of premises.

C. Deliver products in undamaged condition in original containers or packaging, and with identifying labels intact and legible.

D. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts, and to facilitate assembly.

E. Immediately on delivery, inspect shipment to ensure:

1. Product complies with requirements of Contract Documents and reviewed submittals.

2. Quantities are correct.

3. Containers and packages are intact, and labels are legible.

4. Products are undamaged and properly protected.

F. The District reserves the right to observe delivered materials, to review the accompanying bills of lading, and to reject the following:

1. Materials not identifiable as accepted products of the accepted manufacturer.

2. Materials exhibiting shelf-lives in excess of those stipulated by the manufacturer.

3. Materials not bearing the appropriate label of Underwriters Laboratories (UL), where applicable.

4. Materials in opened or excessively damaged containers.

5. Materials exhibiting evidence of moisture, organic matter, or other adulterants.

G. In the event of damage or rejection by the District for stipulated cause, immediately make repairs and replacements necessary to the acceptance of the Architect and at no additional cost to the Owner.

1.04 STORAGE

A. Payment will not be made by the Owner for materials stored off-site, until such time as the materials are incorporated into the Work.

B. Store products immediately on delivery, store in accordance with manufacturer's instructions and as further required by the Owner's Storm Water Pollution Prevention Plan and protect until installed in the Work.

C. Store products subject to damage by elements in weather tight enclosures.

1. Maintain temperatures within limits recommended by manufacturer's instructions.
2. Provide humidity control for sensitive products, as required by manufacturer.
3. Store unpacked products in a manner accessible for inspection.

D. Exterior Storage:

1. Provide substantial platforms, blocking, or skids to support fabricated products above ground and prevent soiling or staining.

a. Cover products subject to discoloration or deterioration from exposure to the elements, with impervious sheet coverings. Provide adequate

ventilation to avoid condensation.

b. Comply with requirements of Owner's, Storm Water Pollution Prevention Plan.

2. Store loose granular materials on solid paved surfaces or provide plywood platforms to prevent mixing with foreign matter.

a. Provide surface drainage to prevent flow or ponding of rainwater.
b. Prevent mixing of refuse or chemically injurious materials or liquids.
c. Comply with requirements of Owner's Storm Water Prevention Plan.

1.05 MAINTENANCE OF STORAGE

A. Maintain periodic system of inspection of stored products on scheduled basis to assure that:

1. State of storage facilities is adequate to provide required conditions.
2. Required environmental conditions are maintained on a continuing basis.
3. Surfaces of products exposed to elements are not adversely affected.

B. Mechanical and electrical equipment which requires servicing during long term storage shall have complete manufacturer's instructions for servicing accompanying each item, with notice of enclosed instructions shown on exterior of package.

1.06 PROTECTION AFTER INSTALLATION

A. Provide protection of installed products to prevent damage from subsequent operations. Remove protection materials when no longer needed, prior to completion of work.

B. Control traffic to prevent damage to equipment and surfaces.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION
(Not Applicable)

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Administrative and procedural requirements for cutting and patching.

B. Related Work Specified Elsewhere:

1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.

2. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 26 through Division 28, Sections for other requirements and limitations applicable to cutting and patching plumbing, mechanical and electrical installations.

1.02 SUBMITTALS

A. Before commencing alteration or demolition work, submit for review by the Architect and approval of the Owner, a Schedule showing the commencement, the order and the completion dates for the various parts of this work. Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.

2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.

3. List products to be used and firms or entities that will perform Work.

4. Indicate dates when cutting and patching is to be performed.

B. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted. Before starting work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the existing building, notify the Architect and the Owner 72 hours in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.

C. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure. All cutting of structural elements subject to acceptance of the Structural Engineer and approval of the Division of the State Architect prior to execution.

D. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory. Subject to approval by the Division of the State Architect.

E. All cutting and patching of existing hard scape or landscaping for installation or modification, shall be reinstalled in kind. When new utilities are shown or utility modifications are shown on the plans and specific cutting and patching notes are not shown, the contractor shall assume that the existing hardscape shall be saw cut, material removed and disposed, trenches prepared in accordance with local water district or county regulations, and all existing hardscape shall be returned to existing condition or better.

1.03 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut or notch any structural elements unless specifically detailed on the Drawings.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

D. If possible, retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:

Processed concrete finishes
Stonework and stone masonry
Ornamental metal
Matched-veneer woodwork
Preformed metal panels
Window wall system
Stucco and ornamental plaster
Acoustical ceilings
Terrazzo
Finished wood flooring
Carpeting
Aggregate wall coating
Wall covering
Swimming pool finishes
HVAC enclosures, cabinets or covers

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use materials that are identical to existing materials. Materials and workmanship employed in the alterations, unless otherwise shown or specified, shall conform to that of the original work, or to new construction as specified elsewhere in these specifications. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

B. It is intended that interior finish materials, or existing surfaces to be removed, be re-used insofar as reasonable in areas necessary to match existing surfaces. Care in removal and stockpiling shall be exercised to ensure re-use.

PART 3 - EXECUTION

3.01 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

B. Before proceeding, meet at the site with entities involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Make such explorations and probes as are necessary to ascertain required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent damage to existing construction.

C. Provide, erect, and maintain catch platforms, lights barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, workmen engaged in demolition operations, and adjacent construction.

D. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.

E. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and new work is being done, connections made, materials handled, or equipment moved.

F. Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster and similar debris. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.

G. Provide adequate fire protection in accordance with local Fire Departments, and with Section 01 50 00.

H. Do not close or obstruct walkways, passageways or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.

I. Be responsible for damage to the existing structure or contents by reason of the insufficiency of protection provided.

J. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

2. Take precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill. Provide pilot holes at corners and do not overcut.

4. Comply with requirements of applicable Sections of Division 2 where cutting and patching requires excavating and backfilling.

5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specific tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.

2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.

4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

D. Perform demolition, removal and alteration work with due care, including shoring,

bracing, etc. Be responsible for damage which may be caused by such work to part or parts of existing structures or items designated for re-use. Perform patching, restoration and new work in accordance with applicable technical sections of the Specifications.

E. Materials and/or items designated to become the property of the Owner shall be as shown. Remove such items with care, under the supervision of the trade responsible for reinstallation; protect and store until required. Replace material and/or item damaged in its removal with approved similar and equal new material.

F. Materials and/or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property. Storage or sale of removed items on site will not be permitted.

G. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the building.

H. Where alterations occur, or new and old work join, cut, remove, patch, repair or refinish the adjacent surfaces or so much thereof as is required by the involved conditions, and leave in as a good a condition as existed prior to the commencing of the work. The alteration work shall be performed by the various respective trades which normally perform the particular items of work.

I. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease, loose paint, etc. before refinishing.

J. Where existing equipment and fixtures are indicated to be re-used, repair such equipment and fixtures and refinish to put in perfect working order. Refinish as directed.

K. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.

L. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing built-up roofing. Cut and remove insulation, etc. Provide temporary weathertight protection as required until new roofing and flashings are applied.

3.04 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Cleaning throughout the construction period, and final project cleaning after acceptance tour "**Punch List**" has been completed.

B. Related Work Described Elsewhere: In addition to standards specified herein, comply with requirements for cleaning as described in other sections of these Specifications.

1.02 QUALITY ASSURANCE

A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards: In addition to the requirements specified herein, comply with pertinent requirements of authorities having jurisdiction.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

A. Provide required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.02 COMPATIBILITY

A. Use cleaning materials and equipment which are compatible with the surfaces being cleaned, as recommended by the manufacturer of the material to be cleaned.

B. Do not power wash concrete/masonry surfaces.

PART 3 - EXECUTION

3.01 PROGRESS CLEANING

A. General:

1. Retain stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.

2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this work. Debris shall be removed from the site and disposed of in a lawful manner. Disposal receipts or dump tickets shall be furnished to Architect upon request.

3. At least twice each month, and more often if necessary, remove scrap, debris, and waste material from the job site.

4. Provide adequate storage for items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove items to the place designated for their storage. Combustible waste shall be removed from the site. Flammable waste shall be kept in sealed metal containers until removed from the site.

2. Weekly, and more often if necessary, inspect, arrangements of materials stored on the site; restack, tidy, or otherwise service arrangements to meet the requirements specified above.

3. Maintain the site in a neat and orderly condition.

C. Structures:

1. Weekly, and more often if necessary, inspect the structures and pick up scrap, debris, and waste material. Remove items to the place designated for their storage.

2. Weekly, and more often if necessary, sweep interior spaces clean.

a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and a handheld broom, i.e., "broom-clean".

3. As required preparatory to installation of succeeding materials, clean the structures of pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the required cleanliness.

4. Following the installation of finish floor materials, clean the finish floor daily and more often if necessary, and while work is being performed in the space in which finish materials have been installed.

a. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor material, i.e., "vacuum clean".

3.02 FINAL CLEANING

A. Definition: Except as otherwise specifically provided, "clean", for the purpose of the Article, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials, i.e., "scrub and polish clean".

B. General: Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste, conduct final progress cleaning as described above.

C. Site: Unless otherwise specifically directed by the Architect, water and broom clean paved areas on the site and public paved areas directly adjacent to the site. Remove resultant debris.

D. Structures:

1. Exterior: In areas affected by the work under this contract, visually inspect exterior surfaces and remove traces of soil, waste material, smudges, and other foreign matter. Remove traces of splashed material from adjacent surfaces. If

necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure.

In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to the Owner.

2. Interior: In areas affected by the work under this contract, visually inspect interior surfaces and remove traces of soil waste material, smudges, and other foreign matter. Remove traces of splashed materials from adjacent surfaces. Remove paint drippings, spots, stains, and dirt from finished surfaces. Use only the cleaning materials and equipment instructed by the manufacturer of the surface material.

3. Glass: Clean glass inside and outside.

4. Polished surfaces: On surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished. Glossy surfaces shall be cleaned and shined as intended by the manufacturer.

E. Timing: Schedule final cleaning after the **Final Punch List** has been completed by the Architect to enable the Owner to accept a completely clean project.

3.03 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be determined by the Architect in accordance with the General Conditions of the Contract.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Operations and submittals required to establish Substantial Completions, Project Acceptance, and filing of Notice of Completion.

B. Contract Completion Date is the day established by the Agreement, the Special Conditions, and the Notice to Proceed as the calendar date by which all Work must be completed in accordance with the Contract Documents. Once established, the Contract Completion Date can only be altered by Change Order. If Work is not complete in accordance with the Contract Documents by the Contract Completion Date, Contractor is obligated to pay liquidated damages to the Owner. In accordance with the terms of the Contract.

C. Substantial Completion: The Date of Substantial Completion is the date on which the Architect certifies to the Owner that construction is sufficiently complete, in accordance with the Contract Documents, that the District may occupy the Project for the use intended, and all agencies and authorities have provided written acceptance of the portions of the Work over which they have jurisdiction.

D. Project Acceptance: The District will accept completion of the Contract after the entire Work shall have been completed to the satisfaction of the District and after issuance of the Certificate of Substantial Completion. The Work may only be accepted as complete by formal action of the Governing Board of the School District. Acceptance of the Project by the Governing Board establishes the formal and official Completion Date for the Project, to be compared against the Contract Completion Date. Project Acceptance must occur prior to Contract Completion Date to preclude assessment of liquidated damages.

E. Notice of Completion: The date of record for the Notice of Completion shall be the date stamped on the Notice by the County Recorder at the time the County Recorder registers the Notice (note: this is normally not the same date as the date the Owner actually files the Notice of Completion with the Recorder office).

1.02 CLOSEOUT SCHEDULE AND PROCEDURE

A. Requirements Preparatory to Project Acceptance:

1. Contractor shall deliver certifications 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. Entire site shall be thoroughly cleaned of all construction debris.

4. Record drawings shall be completed, signed by Contractor and Inspector and submitted to Architect as specified in Section 01 78 39 – Project Record Documents.

5. Guarantees and warranties shall be submitted to Architect as specified in General conditions and Section 01 78 30 – Warranties.

6. Contractor's Final Verified Report (Form DSA-6) and other Reports and Affidavits required by the Division of State Architect shall be submitted.

7. Operating and maintenance data shall be submitted and instruction sessions completed as outlined in Section 01 78 23 – Operating and Maintenance Data and as required in CBC 2019 Section 110.3.10.2.

8. Contractor to provide a copy of cleaning and maintenance recommendations for countertops to the underneath side of furniture, in addition to requirements listed above and outlined in Section 01 78 23 – Operating and Maintenance Data.

B. Project Acceptance Requirements, Division of the State Architect:

1. Upon completion of construction of the project, the following reports are required to be submitted before the Division of the State Architect will issue a certification of compliance letter for the work:

   a. A copy of the Notice of Completion filed by the School District.

   b. Final Verified Report Form DSA 6 AE and DSA 6 C certifying all work is 100% complete from the Architect, Structural Engineer, Mechanical Engineer and the Electrical Engineer. Final retention payment shall not be released until DSA 6 C is uploaded into the DSA project file.

   c. Contractor’s Documents and Field Reports:

      1) Final Verified Report Form DSA 6 C, certifying all work is 100% complete, from the Contractors (or Contractors), the Inspector of Record, and Special Inspector(s).

      2) Verified Reports of Testing and Inspection as specified on the approved drawings an specifications (i.e., Final Laboratory Report, Welding, Glued-laminated Timber, etc.).

      3) Weighmaster’s Certificate (if required by approved drawings and specifications).

      4) If responsibility was changed in any area during construction, the change must be supported by appropriate documentation and termination reports filed by the individuals originally charged with responsibility.

C. Procedure for Project Acceptance:

1. Contractor shall complete all Work as required by the Contract Documents, to the best standards of the industry and the trades involved. It shall be the Contractor's responsibility to provide a new, complete, properly operating, professionally finished, detailed, cleaned, high-quality project. There shall be no loose, untrue, or ill-fitting materials, unsightly gaps, voids, or holes, misalignments, mis-adjustments, shoddy workmanship, or damaged, missing, inoperable, or incomplete work. Work shall be free of smudges, spots, stains, dirt, nicks, tears, cracks, scratches, paint runs, flaws, over sprays, and all other unsightly blemishes.

2. Completion lists and correction lists for items described in the paragraph above, as opposed to short lists of a few minor corrective items that may have inadvertently been missed by the Contractor, shall be the responsibility of the Contractor, and not the Architect, Inspector, or District. By entering into this

Contract, Contractor agrees that quality control is the responsibility of the Contractor. "Punch" list generated by the Architect is under no circumstances to be considered a vehicle to compel subcontractors to complete contract work.

3. Contractor shall prepare a comprehensive and complete list of corrective items for himself and his subcontractors and shall verify that these items have been corrected prior to notifying the Architect of completion. Copies of the Contractor's list(s) shall be made available to the Architect and Inspector upon request.

4. Contractor shall notify the Architect *in writing* when Contractor, with concurrence of Inspector, feels the project is one-hundred percent complete and is ready to leave the Project. Architect shall then commence the construction review and prepare a "Punch List", or list of minor corrective items to be issued to Contractor. For convenience, reviews may be phased for various portions of the work, as each distinct portion becomes one hundred percent (100%) complete.

5. Architect will arrange for Engineering Consultants to make their construction reviews, to be completed before Architect will make his construction review. Contractor and his principal superintendent, authorized to act in behalf of the Contractor, as well as principal subcontractors that the Architect may request to be present, shall accompany the Architect/Engineers during the construction reviews.

6. Excessive amounts of corrective ("punch list") items, as judged by the Architect, shall be grounds to terminate the construction review until such time as the Contractor is deemed sufficiently complete to once again start the review. As a rule of thumb, more than four minor items per typical room will be considered excessive.

7. If Owner elects to occupy the Project after the Contract Completion Date, but before the Contractor has completed the Work, Architect must make a comprehensive construction review prior to Owner's occupancy. Contractor shall reimburse Architect and Engineers for their time in conducting such review, and for the time of their clerical staffs in preparing the review documents, at the Architect's/Engineer's standard hourly rates for extra services. Contractor will be billed at the time of Contractor's Application for Payment. Payments to the Architect not received within 30 days will be deducted from subsequent Contractor's Applications for Payment in accordance with the General Conditions.

8. After completion of "Punch List" work, Contractor shall notify Architect in writing to perform an acceptance tour. Notice shall be issued at least seven (7) days in advance of the time the acceptance tour is to be performed.

9. Contractor and his principal superintendent, authorized to act in behalf of Contractor, as well as principal subcontractors that Architect may request to be present, shall accompany Architect and Inspector on acceptance tour.

    a. If work has been completed in accordance with Contract Documents, and no further corrective measures are required, Architect will issue a Certificate of Substantial Completion, and recommend that Owner accept Project and file Notice of Completion.

    b. If work is judged to be substantially completed in accordance with Contract Documents, and only a few corrective measures are required, Architect will issue a Certificate of Substantial Completion, (Article 64 of

the General Conditions), and recommend that Owner conditionally accept Project and file Notice of Completion. Owner may conditionally accept project and withhold amount for completion per Article 64 of the General Conditions, Contractor shall issue a written notice of intent to complete the corrective measures by a specific named date agreed to by District.

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 corrective measures and then call for another project acceptance tour following procedure outlined above. Contractor will compensate Architect and Inspector for additional acceptance tour and deduct amount paid from final payment to Contractor.

10. After Substantial Completion, Contractor shall issue an Application for Payment in accordance with Specification Section 01 29 00, Part 1.03, H. All administrative actions and submittals, including conditions, outlined therein outlined must be complete prior to Owner's release of payment, **and MUST BE COMPLETED PRIOR TO AGENDIZING FOR PROJECT ACCEPTANCE BY THE OWNER'S GOVERNING BOARD.**

11. Upon Contractor completing all administrative actions and submittals, and meeting all conditions, Owner will agendize acceptance of the Work for the next official meeting of the Governing Board. Official action by the Governing Board shall constitute Project Acceptance. Upon acceptance, Contractor shall immediately remove trailers and other remaining temporary facilities.

12. District shall file Notice of Completion with the County Recorder as soon as practicable following Project Acceptance. The date of record for the Notice of Completion shall be the date stamped on the Notice by the Recorder at the time the County Recorder registers the Notice.

13. The date stamped on the Notice of Completion by the County Recorder shall be the date for commencement of all warranties and guarantees, and the date the Owner becomes responsible for security, maintenance, heating and cooling, utilities, damage to the work (unless done by Contractor's forces working on corrective items), and insurance.

Contractor shall remain responsible for these items prior to this date.

The Owner will inform the Contractor by letter immediately after receiving confirmation in writing from the Recorder's office of registration of the Notice of Completion. Contractor is hereby notified that the process of registering, stamping, and receipt of confirmation from the County has been known to take as much as four weeks from the time of filing.

14. Upon acceptance of Project by Owner, Contractor shall submit his request for final payment in accordance with Specification Section 01 29 00 – Payment Procedures, Part 1.03, I. Payment of retention will not be made by Owner until 35 days after Notice of Completion has been registered by the County Recorder.

In addition, retention payment will not be made until Contractor has filed the required Form DSA 6 with Division of the State Architect, with copy to the Architect.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION
(Not Applicable)

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY:

A. Related Documents: Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specifications Sections, apply to this section, and including all Technical Specifications Sections, and the Operating and Maintenance Requirements of Division 26 through Division 28.

B. Section Includes:

1. Compilation of product data and related information appropriate for Owner's maintenance and operation of products and equipment furnished under the Contract per CBC Section 110.3.10.2.

2. Instruction of Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.02 SUBMITTAL PROCEDURES

A. Preliminary: Submit one copy of proposed manuals to Architect at least fifteen (15) days prior to final inspection or acceptance.

B. Final: Following the indoctrination and instruction of the Owner's operating and maintenance personnel, review proposed revisions to the manual with the Architect.

1. Submit three copies of accepted data in final form ten (10) days after final inspection. Approval of submittal is a pre-requisite at Substantial Completion prior to Owner's agendizing project for acceptance by the Governing Board.

PART 2 - PRODUCTS

2.01 FORMAT

A. Size: Minimum 4 inch, three-ring binders for 8-1/2" x 11" punched pages, completely clear plastic covered for insertion of labels on spines and covers.

B. Provide identifying tabbed pages. Classify by Division and by Section. All tabbing shall be in numerical order.

C. Drawings:

1. Provide reinforced punched binder tab. Bind drawings with text.
2. Fan fold larger drawings to size of text pages, for easy foldout.

D. Cover: Identify each volume with typed or printed label, List:

1. Title of Project
2. Identity of separate structures as applicable.
3. Identity of general subject matter covered in the manual.

E. Spine: Identify each volume with typed or printed label stating OPERATING AND MAINTENANCE INSTRUCTIONS, GUARANTEES AND SERVICE CONTRACTS and the following information:

1. Title of Project.
2. Divisions and Sections included within volume.
3. Volume number (i.e. "1 of 4")

PART 3 - EXECUTION

3.01 CONTENT OF MANUAL

A. Table of Contents:

1. List of each product indexed to the content of the volume.

2. List with each product the name, address, and the telephone number of:

a. Subcontractor and installer.
b. Maintenance contractor, as appropriate.
c. Local sources of supply for parts and replacement.

B. Product Data: Annotate each sheet to clearly identify the data applicable to the installation. Delete references to inapplicable information.

C. Drawings:

1. Supplement product data with Drawings as necessary to illustrate the following:

a. Relationship of component parts of equipment and systems.
b. Control and flow diagrams.

2. Do not include Project Record Drawings as maintenance drawings.

D. Instructions: Provide written text, as required to supplement product data for the particular installation.

E. Warranties, Guaranties, Bonds, and Service Contracts: Include a copy of each warranty, guaranty, bond, and service contract issued.

1. Provide information sheet for Owner's personnel describing the following:

a. Proper procedures in the event of failure or emergencies.

b. Circumstances under which the validity of warranties, guaranties, or bonds might be compromised.

3.02 MANUAL FOR MATERIALS AND FINISHES

A. Instructions for Care and Maintenance: Include Manufacturer's data as follows:

1. Recommendations for types of cleaning agents and methods.

2. Cautions against cleaning agents and methods which are detrimental to the product.

3. Recommended schedule for cleaning and maintenance.

B. Energy Conservation Features:

1. Provide a list of energy conservation features, materials, components, and mechanical devices installed in the building.

3.03 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content, for each unit of mechanical equipment and system, as appropriate:

1. Description of unit and component parts:

a. Function, normal operating characteristics, and limiting conditions.
b. Performance curves, engineering data, and tests.
c. Complete nomenclature and commercial number of replaceable parts.

2. Operating Procedures:

a. Start-up, break-in, routine, and normal operating instructions.
b. Regulation, control, stopping, shut-down, and emergency instructions.
c. Summer and winter operating instructions.

3. Maintenance Procedures:

a. Routine operations.
b. Guide to "trouble-shooting".
c. Disassembly, repair, and reassembly.
d. Alignment, adjusting, and checking.

4. Servicing and lubrication schedule including list of lubricants required.

5. Manufacturers’ printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacture's parts list, illustrations, assembly drawings, and diagrams required for maintenance, including:

a. Predicted life of parts subject to wear.
b. Items recommended to be stocked as spare parts.

8. Control diagrams by manufacturer of controls as installed in project.

9. Coordination drawings and color-coded piping diagrams.

10. Charts of valve tag numbers, with the location and function of each valve.

B. Content, for each electric and electronic system as appropriate.

1. Description of system and component parts:

a. Function, normal operating characteristics, and limiting conditions.
b. Performance curves, engineering data, and tests.
c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panelboards:

a. Electrical service.

b. Controls.
c. Communications.

3. As-installed color-coded wiring diagrams.

4. Operating procedures:

a. Routine and normal operating instructions.
b. Sequences required.
c. Special operating instructions.

5. Maintenance procedures:

a. Routine operations.
b. Guide to "trouble-shooting."
c. Disassembly, repair and reassembly.
d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

3.04 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment, and systems installed in project.

1. Provide services of factory trained instructors from the manufacturer of each major item of equipment or system.

2. Provide for each instruction session or "in-service", a DVD Camcorder operator and **DVD Camcorder** to record the session. DVD recordings shall be clearly labeled as to project, subject, and date. Submit DVDs in triplicate.

B. Operating and maintenance manual shall constitute the basis of instruction.

1. Review contents of manual with personnel in full detail to explain all aspects of operation and maintenance.

2. Review instructions on how to efficiently use state required energy conservation features, materials, components, and mechanical devices.

END OF SECTION

SECTION 01 78 30

WARRANTIES, GUARANTEES, AND BONDS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: General requirements for written warranties, guaranties, and bonds required by the Contract Documents.

B. Referenced Sections:

1. Section 01 77 00 – Closeout Procedures: Submittal of Final Verified Reports and Notice of Completion, as a condition of project acceptance and payment.

2. Section 01 78 39 – Project Record Documents as a condition of project acceptance and payment.

3. Section 01 78 23 – Operation and Maintenance Data: Incorporation of warranties, guaranties, and bonds into instruction manuals.

C. **Approval of the warranties, guaranties, and bonds by the Owner is a prerequisite to payment at Substantial Completion and agendizing for acceptance by the Governing Board of the Owner.**

1.02 TIME PERIOD

A. Deliver manufacturers' warranties, guaranties, and bonds required by Contract Documents, with Owner named as beneficiary. Where manufacturers' warranty or guaranty extends for a longer time period than the Contractor's warranty and guaranty, deliver manufacturer's warranties or guaranties in same manner.

1.03 WARRANTY/GUARANTY FORM

A. Submit written warranties and guaranties, except manufacturer's standard printed warranties and guaranties, on the Contractor's, subcontractors', material suppliers', or manufacturers' own letterhead, addressed to Owner, in the form attached to this Section.

B. Submit warranties and guaranties in duplicate, and in the form indicated, signed by cognizant entities, and by Contractor in every case, with modifications as approved by Owner to suit the conditions pertaining to the warranty or guaranty.

1.04 SUBMITTALS

A. Collect and assemble written warranties and guaranties into bound booklet form, and deliver bound books to Architect for delivery to Owner for final review and approval.

1. See Sections 01 77 00 and 01 78 23 for additional submittal requirements.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION

ATTACHMENT: Warranty/Guaranty Form

THIS PAGE LEFT BLANK FOR PRINTING PURPOSES

WARRANTY/GUARANTY FORM

FOR _____ WORK

We, the undersigned, do hereby warranty and guaranty that the parts of the work described above which we have furnished or installed for:

(PROJECT NAME)

are in accordance with the Contract Documents and that all said work as installed will fulfill or exceed all the Warranty and Guaranty requirements. We agree to repair or replace work installed by us, together with any other work which is displaced or damaged by so doing, that proves to be defective in workmanship, material, or operation within a period of _____ ( ) year(s) from the date Notice of Completion is registered with the San Diego County Recorder, ordinary wear and tear and unusual neglect or abuse excepted.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time period determined by the Owner, after notification in writing, we, the undersigned, all collectively and separately, hereby authorize the Owner to have said defective work repaired and/or replaced and made good, and agree to pay to the Owner upon demand all moneys that the Owner may expend in making good said defective work, including all collection cost and reasonable attorney fees.

Date: _____ _____

(Subcontractor, Sub-subcontractor, Manufacturer or Supplier)

By:_____

Title: _____

State License No: _____

Local Representative: For maintenance, repair, or replacement service, contact:

Name: _____

Address: _____

Phone Number _____

THIS PAGE LEFT BLANK FOR PRINTING PURPOSES

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for Record Documents.

B. Throughout progress of the work of the contract, maintain an accurate record of changes in the Contract Documents, as described below.

C. Upon completion of the work of this Contract, transfer the recorded changes to a set of Record Documents, as described herewith.

1.02 QUALITY ASSURANCE

A. General: Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as accepted in advance by the Architect.

B. Accuracy of Records: Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of drawings and other documents where such entry is required to properly show the change. Accuracy of records shall be such that future searches for items shown in the Contract Documents may reasonably rely on information obtained from the accepted Record Documents.

C. Timing of Entries: Make entries within 24 hours after receipt of information.

1.03 PAYMENT WITHHELD

A. The Architect reserves the right to withhold certification of payment requests for failure on the part of the Contractor to maintain Record Drawings in conformance with this Section.

1.04 SUBMITTALS

A. General: The Architect's review of the current status of Record Documents will be a prerequisite to the Architect's review of requests for progress payment and request for final payment under the contract.

B. Progress Submittals: Prior to submitting each request for progress payment, secure the Architect’s review of the Record Documents as currently maintained.

C. Final Submittal: Prior to submitting request for final payment, submit the final Record Documents to the Architect and secure his acceptance.

1.05 PRODUCT HANDLING

A. Maintain the job set of Record Documents protected from deterioration and from loss and damage until completion of the work and transfer of the recorded data to the final Record Documents.

B. In the event of loss of recorded data, use means necessary to again secure the data to the Architect's acceptance; such means shall include, if necessary in the opinion of the Architect, removal and replacement of concealing materials and, in such case, replacements shall be to the standards originally specified in the Contract Documents.

PART 2 - PRODUCTS

2.01 RECORD DOCUMENTS

A. Job Set: Secure from the Owner, at no charge to the Contractor, one complete set of Documents comprising the Contract.

B. Contractor shall provide the architect a pdf copy of all as-builts after the project is completed. As-builts shall include all posted CCDs and RFIs and any other documents issued during construction. As-builts shall be maintained during construction on a daily basis. Any adjustments in location of any item on the plans shall be accurately recorded on the as-built plans.

C. Before commencing backfilling of utilities or any other underground pipes, ducts, conduits, or structures, take photographs showing relationship of below ground utilities to structure(s) or other physical reference point. Provide three-ring binder containing 3-1/2" x 5" mounted and numbered prints of photos, plus the negatives, categorized by locations and indicating utilities shown. Provide a photo(s) of all connections, crossings, stubs, or other critical points. If the Contractor neglects to take such photographs, Contractor shall uncover, at the Contractor's expense, the area(s) so neglected in order to provide the requisite photos.

Provide a hard copy and pdf copy composite Utility Site Plan with the number of each photograph placed on the plan at the location the photo was taken from, and a mark indicating which way the camera was pointed. All numbers and marks shall be in ink, and shall be clear, legible, and neatly done. Photo binder and photo plan shall be considered part of the Record Documents.

D. Survey file, in both PDF format and CAD format with all improvements indicated and certified that all items are constructed to line and grade in accordance with the approved plans.

PART 3 – EXECUTION

3.01 MAINTENANCE OF JOB SET

A. Identification: Upon receipt of the job set, identify each of the documents with a title "RECORD DOCUMENTS-JOB SET".

B. Preservation:

1. Considering the contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set for the review of the Architect.

2. Use the job set for no purpose other than entry of new data and for review by the Architect, until start of transfer of data to final Record Documents.

3. Maintain the job set at the site of work as that site is designated by the Architect.

C. Making Entries on Drawings: Using an erasable colored pencil (not ink nor indelible pencil), clearly describe the change by note and by graphic line, as required. Date entries. Call attention to the entry by a "cloud" around the area or areas affected. In the event of overlapping changes, different colors may be used for each of the changes. In the event of superseding changes to any area of the drawing, erase only that portion of

the preceding change that is affected by the subsequent change before entering the subsequent change.

D. Making Entries on Other Documents:

1. Where changes are caused by directives issued by the Architect, clearly indicate the change by note in ink, colored pencil, or rubber stamp, and reference Division of the State Architect approved addenda and change orders.

2. Where changes are caused by Contractor originated proposals reviewed by the Architect, including inadvertent errors by the Contractor which have been accepted by the Architect, clearly indicate the change by note in erasable colored pencil.

3. Make entries in the pertinent documents as reviewed by the Architect.

4. Reference specifications section 01 77 00, Closeout Procedures, 1.02 (Closeout Schedule and Procedure) paragraph 4. Project Acceptance Requirements, Division of the State Architect for list of documents required at closeout.

E. Conversion of Schematic Layouts:

1. In most cases on the Drawings, arrangement of conduits and circuits, piping, ducts, and other similar items, is shown schematically and is not intended to portray precise physical layout. Final physical arrangement shall be as determined by the Contractor, subject to the Architect's review. However, design of future modifications of the facility may require accurate information as to the final physical arrangement of items and location of utilities which are shown only schematically on the Drawings.

2. Show on the job set of record Drawings, by dimension accurate to within 1 inch, the centerline of each run of items such as are described in the preceding paragraph above. Clearly identify the item by accurate note such as "cast-iron drain", "galvanized water pipe", etc. Show, by symbol or note, the vertical location of the item ("under slab", "in ceiling plenum", "exposed", etc.). Make identification sufficiently descriptive that it may be related reliably to the Specifications.

3. The Architect may waive the requirements for conversion of schematic layouts where, in the Architect's judgment, such conversion serves no beneficial purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Architect.

4. Timing of Entries: Be alert to changes in the work from how it is shown in the Contract Documents: Promptly, and in no case later than 24 hours after the change has occurred and been made known to the Contractor, make the entry or entries required.

F. Accuracy of Entries: Use means necessary, including proper instruments or tools for measurement, to determine actual locations of the installed items.

3.02 FINAL RECORD DOCUMENTS

A. General: The purpose of the final Record Documents is to provide factual information regarding the work, both concealed and visible, which will enable future modification of design to proceed without lengthy and expensive site measurement, investigation, and examination.

B. Review of Recorded Data Prior to Transfer: Following receipt of the pdf (Blue Beam Review compatible) as-builts described here-in-above, and prior to start of transfer of recorded data thereto, secure a review by the Architect of recorded data. Make required revisions.

C. Transfer of Data to Drawings: Carefully transfer change data shown on the job set of Record Drawings to corresponding sepias, coordinating the changes as required, and clearly indicating at each affected detail and other drawing the full description of changes made during construction and the actual location of items described above. Call attention to each entry by drawing a cloud around the area or areas affected. Make change entries on the as-builts neatly, consistently, and in ink or crisp black pencil.

D. Transfer of Data to Other Documents: If the documents other than drawings have been kept clean successfully during progress of the work, and if entries have been sufficiently orderly thereon and reviewed by the Architect, the job set of those documents (other than drawings) will be accepted by the Architect as the final portion of the record documents. If any such document is not so accepted by the Architect, secure a new copy of that document from the Architect at the Architect's usual charge for reproduction carefully transfer the change data to the new copy and obtain the acceptance of the Architect.

E. Review and Approval: Submit the completed total set of Record Documents in both hard copy and in pdf format to the Architect as described above. Participate in review meeting or meetings as required by the Architect, make required changes in the Record Documents, and promptly deliver the final Record Documents to the Architect.

3.03 CHANGES SUBSEQUENT TO ACCEPTANCE

A. The Contractor shall have no responsibility for recording changes in the work subsequent to acceptance of the work by the Owner, except for changes resulting from replacements, repairs, and alterations made by the Contractor as a part of his guarantee. No changes will be allowed without approval of the Division of the State Architect.

END OF SECTION

02 00 00

SITE WORK

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Project site and building demolition work to prepare for addition of new improvements, as indicated on the Drawings and specified herein. General and Special Conditions and Division 1 specification sections apply to this section.

B. Related Sections:

1. Section 01 73 29, Cutting and Patching
2. Section 01 77 00, Closeout Procedures

1.02 DEFINITIONS

A. “Remove”: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner’s property.

B. “Removed and Salvaged”: Items to remain the Owner’s property shall be removed, cleaned, and packed or crated to protect against damage.

1. Identify contents of containers and deliver to Owner’s designated storage area.

C. “Existing to Remain” Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

D. “Remove and Reinstall”: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.

E. Salvaged Materials (not wanted by Owner): Items which the Owner does not want and is of salvable value to Contractor may be removed from structure as work progresses. Owner and CBC require a minimum of 50% (by weight) of all non-hazardous construction materials be recycled, composted and/or salvaged. Salvage shall conform to the following:

1. Contractor shall submit salvage plan showing how all materials are to be sorted, salvaged and recycled. Plan must include all final destinations for each type of material.

2. Salvaged items must be transported from site as they are removed, unless materials are to be reused on site.

3. Storage or sale of removed items on site will not be permitted, unless materials are to be reused on site.

4. Contractor shall provide certification for all salvaged materials. Certifications may take the form of receipts from recycling facilities, manufacturers, or any other legitimate form of certification. Certification types shall be outlined in salvage plan and approved by Owner.

1.03 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition by the Contractor(s) in a legal disposal area appropriate to the materials being disposed.

1.04 SUBMITTALS

A. Submit each item in this Article according to the Conditions of the Contract and Specifications Section 01 33 00, unless otherwise indicated.

B. Proposed Dust Control Measures.

C. Proposed Noise Control Measures.

D. Schedule of demolition activities indicating the following:

1. Detailed sequence of demolition, salvage, and removal work, with starting and ending dates for each activity.

2. Dates for shutoff, capping, and continuation of utility services.

E. Salvage Plan - Inventory of items to be removed and salvaged. Salvage plan shall show how all materials are to be sorted, salvaged and recycled. Plan must include all final destinations for each type of material.

F. Inventory of items to be removed and salvaged and deliver to Owner's designated storage area.

G. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and improvements that might be misconstrued as damage caused by demolition operations.

H. Record drawings at project closeout according to Specification Section 01 77 00 - Closeout Procedures shall identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Pre-demolition Conference: Conduct conference at Project site with Owner, Architect and Construction Manager.

1.06 PROJECT CONDITIONS

A. Building, where partial wall will be demolished, will be vacated and its use discontinued before start of the Work.

B. Conditions, existing at time of inspection for bidding purpose, will be maintained by Owner as far as practical.

C. Hazardous Materials: If applicable, a Hazardous Materials Study was performed on site and a specification for removal of said materials is incorporated into the project documents.

1.07 SCHEDULING

A. Arrange demolition and salvage schedule so as not to interfere with Owner's on-site operations.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicted to determine extent of demolition required.

C. Inventory and record the conditions of items to be removed and reinstalled and items to be removed and salvaged.

D. Survey condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.

E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.02 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

B. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner, and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

C. Provide not less than 72 hours notice to Owner if shutdown of service is required during changeover.

D. Utility Requirements: Refer to Division 26 sections for shutting-off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by

governing regulations.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

C. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to remain.

1. Strengthen or add new supports when required during progress of demolition.

3.04 EXPLOSIVES

A. The use of explosives will not be permitted.

3.05 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

1. Do not create hazardous or objectionable conditions, such as flooding, and pollution, when using water.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.06 DEMOLITION

A. Demolish partial building wall, concrete and/or asphalt paving, interior finishes, fixtures and accessories, as required to prepare for new construction, and remove from the site.

B. Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

C. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.

D. Fill below-grade areas and voids resulting from demolition of building elements and pavements and soil materials according to requirements specified in Section 31 20 00 – Earth Moving and/or geotechnical report.

E. Promptly repair damages to adjacent facilities caused by demolition operations.

3.07 DISPOSAL OF DEMOLISHED MATERIALS

A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning demolished materials is not allowed.

C. Transport demolished materials off Owner's property and legally dispose of these materials.

END OF SECTION

05 00 00

METALS

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Completion of miscellaneous metal fabrications such as angles, plates, sheet goods, castings, railings, nosings, ladders, and stairs as indicated on the drawings and specified herein.

B. Substrates to which fabrications are to be attached or embedded.

C. Related Sections:

1. Finish painting: see Section 09 90 00.

1.02 REFERENCE STANDARDS

A. In addition to mandatory compliance with governing bodies and codes having jurisdiction over the project, provide materials complying with the following standards and industry recommendations: ASTM A36, A47, A48, A53, A108, A283, A307, A312, A314, A325, A475, A500, A554, A653, A743, A1008 A1011, B108, B209, B221, SSPC, NAAMM, AND AA.

B. Materials shall conform to CBC, Title 24, Part 2, Chapter 22A.

1.03 SUBMITTALS

A. Submit fabrication shop drawings on items to be provided.

B. Where other than mill finishes are specified, provide samples of required finish which will be reviewed for color, texture, style, and finish.

C. Submit mill test reports and chemical analyses of materials bearing heat numbers not required to be tested, in accordance with other sections of these specifications.

D. Submit testing results in accordance with other sections of these specifications.

1. Provide one tensile, and elongation test, and one bend or flattening test for each five tons or fraction, of each shape and size, for unidentified material.

2. The Owner reserves the right to reject materials, installed or not, which exhibit defects or do not pass inspections or tests.

E. Scrap collection and recycling plan: Contractor shall prepare and submit a scrap collection and recycling plan for all miscellaneous and structural steel.

1.04 SOURCE QUALITY CONTROL

A. Inspection and Testing:

1. Testing for steel, welding and fabrication shall be in accordance with California

Building Code (CBC), Title 24, Part 2, Section 1705A.2.

2. Welding inspection shall be in accordance with Title 24, Part 2, Section 1705A.2.

3. Shop Welding: Ensure that shop welding is performed in an approved, licensed shop. Continuous inspection shall be required as noted in Table 1705A.2.

4. Field Welding: Stress-carrying welds are to be inspected by a qualified welding inspector. Inspections will be paid for by Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Structural steel shall comply with ASTM A6 and requirements of Title 24, Part 2, Chapter 22A.

B. Steel Plates, Shapes and Bars: ASTM A36.

C. Steel Plates to be Bent or Cold-Formed: ASTM A283, Grade C.

D. Steel Bars and Bar-Sized Shapes: ASTM A36.

E. Steel Tubing (Cold-Formed, Welded or Seamless): ASTM A500, Grade B.

F. Cold-Finished Steel Bars: ASTM A108, grade selected by fabricator.

G. Cold-Rolled Carbon Steel Sheets: ASTM A1011.

H. Galvanized Carbon Steel Sheets: ASTM A653, G90 zinc coating.

I. Gray Iron Castings: ASTM A48, Class 30.

J. Malleable Iron Castings: ASTM A47, grade as selected.

K. Steel Pipe: ASTM A53, type as selected, Grade B, black finish, standard weight Schedule 40.

L. Steel Wire Rope: ASTM A475, zinc coated steel wire strand, size and number of wires required, common grade with Class B zinc coating.

M. Expanded Aluminum Grating: ASTM B209, alloy 5052.

N. Aluminum Extrusions: ASTM B221, alloy 6063-T5 except alloy 6063-T6 for pipe.

O. Aluminum Sheet or Plate: ASTM B209, alloy 6061-T6, mill finish.

P. Aluminum Castings: ASTM B108, alloy 214.

Q. Stainless Steel Castings: ASTM A743, CF8 or CF20.

R. Stainless Steel Pipe: ASTM A312.

S. Stainless Steel Tube: ASTM A554, Type 302/304.

T. Stainless Steel Bars: ASTM A314, Type 302/304.

U. Shop Primer: Tnemec Series 10, or other approved.

V. Field Galvanizing: Provide ZRC, or other approved.

W. Arc Welding Electrodes: ASTM A743.

X. Bolts and Nuts: ASTM A307

2.02 FABRICATION

A. Verify actual field dimensions prior to fabrication.

B. Fabricate items with joints neatly fitted and properly secured.

C. Fit and shop assemble in largest practical sections for delivery to site.

D. Welding shall comply with CBC Title 24, Part 2, Section 1705A.2. Employ certified welders in accordance with AWS D1.1 and D1.3. Grind exposed welds smooth and flush with adjacent finished surfaces. Defective welds must be cut out and replaced per AWS D1.1.

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

F. Make exposed joints flush butt type hair-line joints where mechanically fastened.

G. Supply components required for proper anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless otherwise specified or shown.

H. Thoroughly clean surfaces of rust, scale, grease and foreign matter prior to prime painting and galvanizing.

I. Galvanize all exterior miscellaneous ferrous metal fabrications. Prime and paint, where directed in other specifications or in plans. Do not shop prime surfaces in direct contact with concrete or other cementitious materials or requiring field welding. Shop prime in two coats. Provide minimum G90 galvanized coating where galvanizing is required. In locations where field welding has been completed, zinc coat all surfaces prior to priming and painting.

2.03 MANUFACTURED UNITS

A. Railings and handrails**: 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 1 ½” 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 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 ¼" minimum and 2" maximum.

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

6. Handrails shall not rotate within their fittings.

7. 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.

8. The orientation of at least one handrail shall be in the direction of the stair run, perpendicular to the direction of the stair nosing, and shall not reduce the minimum required width of the stair. **CBC Section 22B-505.2.1**

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

B. Ladders: Meet or exceed OSHA.

1. Steel: As Detailed on Drawings - 2 1/2-inches by 3/8-inch side rails and braces; 3/4-inch round rungs. Galvanized after fabrication.

C. Galvanized Railings for Stairs and Ramps: Provide nominal diameter extra strong steel, galvanized 1-1/4" inch diameter with actual 1.66" inch outside diameter unless otherwise noted per American Institute of Steel Construction. (Wall handrail and guardrail mounted 1-1/2" clear from side walls.)

1. All welded joints and surfaces shall be ground smooth, no sharp or abrasive corners, edges or surfaces. Wall surfaces adjacent to handrail shall be smooth.

2. Handrail brackets shall mount to the bottom of the handrail. The vertical arm of the bracket shall provide a minimum 1-1/2 inches (38 mm) clearance from the top surface of the horizontal surface of the bracket that attaches to the wall.

3. 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.

4. Clearance between handrail gripping surfaces and adjacent surfaces shall be 1-1/2" 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.

5. 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 1-1/2" minimum below the bottom of the handrail gripping surface.

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

7. Handrail gripping surfaces with a non-circular cross section shall have an outside dimension of 4” minimum and 6-1/4” maximum, and a cross-sectional dimension of 2-1/4” maximum.

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

9. Handrails shall not rotate within their fittings.

10. 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 or ramps.

11. A 2” minimum high curb or 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 barrier shall be continuous and uninterrupted along the length of the ramp, per **CBC Section 11B-405.9.2**.

D. Equipment Support System: Provide Unistrut, or other approved.

1. Main Runner: P5500 channel at 8-foot centers.
2. 1/2-inch hanging rods at 48 inches on centers and hanger clamps.
3. Cross Runner: P3000 channel at 4-foot centers.
4. P3047 "U" shaped fittings.
5. Provide and size pipe clamps as required.
6. Provide hardware and accessories as required.

E. Bollards: Galvanized extra heavy weight (Schedule 80) steel pipe set in a concrete foundation and filled solid with 2000 psi concrete as specified in Section 03 30 00.

F. Treads, Risers, and Nosings: **CBC Section 11B-504**

1. Interior stairs shall have the upper approach and lower tread marked by a stripe providing clear visual contrast. Exterior stairs shall have the upper approach and all treads marked by a stripe providing clear visual contrast.

2. The stripe providing clear visual contrast shall be a minimum of 21 “ wide to a maximum of 4” wide placed parallel to, and not more than 1” from, the nose of the step or upper approach. The stripe shall extend the full width of the step or upper approach and shall be of material that is a least as slip resistant as the other treads of the stair. A painted stripe shall be acceptable. Groves shall not be used to satisfy this requirement.

3. The radius of curvature at the leading edge of the tread shall be no greater than ½”. Nosings that project beyond risers shall have the underside of the leading edge curved or beveled. The maximum angle for a riser to slope under the tread shall be 30 degrees from vertical. Nosings shall extend 1 ¼” maximum over the tread below.

4. Treads shall be 11” deep minimum. Risers shall be 7” high maximum and 4” high minimum. All steps on a flight of stairs shall have uniform riser heights and

uniform tread depths. Open risers are not permitted.

5. Design is based on Spectra Safety Treads manufactured by Wooster Products, Inc., or equal. Profiles and types shall be as detailed, or as follows:

   a. Solid Concrete Stair: Type WP3C with blanked-out anchor Steel Pan Concrete Filled Stairs: Type WP3J, or, other Architect approved product for type of construction.

6. Provide at exterior stairs not scheduled to receive other finish.

7. Treads and Nosings: Provide 2-inch contrasting color warning stripe 1 inch maximum from edge of nosing of each exterior stair and top and bottom nosing only at interior stairs. Color shall be as selected by the Architect.

8. Install nosings flush with top of traffic surface. Nosings shall terminate no more than 4-inches from ends of steps for poured concrete stairs and full length of steps less 1/8-inch clearance at concrete filled steel pan stairs.

9. Interior stairs shall have the upper approach and lower tread marked by a stripe providing clear visual contrast. Exterior stairs shall have the upper approach and all treads marked by a stripe to provide clear visual contrast.

10. The stripe providing clear visual contrast shall be a minimum of 2” wide to a maximum of 4” wide, placed parallel to, and not more than 1” from, the nose of the step or upper approach. The stripe shall extend the full width of the step or upper approach and shall be of a material that is at least as slip-resistant as the other treads of the stair. A painted stripe shall be acceptable. Groves shall not be used to satisfy this requirement.

11. The radius of curvature at the leading edge of the tread shall be no greater than ½”. Nosings that project beyond the risers shall have the underside of the leading edge curved or beveled. The maximum angle for a riser to slope under the tread shall be 30 degrees from vertical. Nosings shall extend 1-1/4” maximum over the tread below.

12. Treads shall be 11” deep minimum. Risers shall be 7” high maximum and 4” high minimum. All steps on a flight of stairs shall have uniform riser heights and uniform tread depths. Open risers are not permitted.

G. Trench Covers, Expansion and Seismic Joint Covers:

1. Acceptable Manufacturers:

   a. Construction Specialties, Inc., a member of the C/S Group, Los Angeles.
   b. MM Systems Corporation, Pendergrass, Georgia.
   c. Balco USA, Inc., Wichita, Kansas.

2. Joint Covers: Equal to C/S AFW Series extruded aluminum finished to match predominant adjacent material. Provide compatible shapes and configurations at intersecting floor, wall, and ceiling conditions where required.

3. Trench Cover: Equal to MM Systems, Model No. Architect to specify. Trench cover plate recessed for VCT Flooring.

4. Install work in accordance with manufacturer's recommendations. Runs shall be in continuous lengths without butt joints.

H. Floor Door: Provide exterior type single-leaf, extruded aluminum floor door, equal to Dur-Red Products, Model No. SEA, 24-inches by 24-inches in size.

1. Door Leaf: 1/4-inch thick diamond pattern floor plate with reinforcing strips, to support 150 pounds per square foot.

2. Frame: 1/4-inch thick extruded aluminum angle frame, fully welded, with anchor straps.

3. Hardware: 1/4-inch thick heavy stamped hinge bolted to frame, torsion bars, one-point latch, inside and outside handles, and automatic hold-open arm with vinyl grip.

4. Finish: Prime coat applied to aluminum frame and leaf.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Surface Conditions: Inspect surfaces and work in place by others and verify that such work is in a condition appropriate to receive work of this section. Do not apply or install work of this section until unsatisfactory work of others is in a condition which will ensure the correct installation of materials and products of this section.

3.02 INSTALLATION

A. Obtain approval of Architect prior to site cutting or making adjustments which are not part of intended work or are not shown on shop drawings.

B. Install items square and level, accurately fitted and free from distortion and defects.

C. Make provisions for erection stresses by temporary bracing. Keep work in alignment.

D. Replace items damaged during installation.

E. Perform field welding in accordance with AWS D1.1.

F. After installation, touch-up field welds and scratched and damaged paint, or coated surfaces. Use primer and paint consistent with shop finish.

G. Supply and assist with setting items requiring to be cast into concrete, or embedded in masonry, complete with necessary setting templates.

H. Stairs:

1. Ensure that stair stringer supports are square or rectangular steel tubing or steel channels.

2. Unless shown otherwise, treads are to be pan type, with galvanized coating.

3. Where required, provide support sleeves for handrails.
4. Provide adequate strength and stiffness to limit deflection on every stair tread

and landing such that when a 300-pound person places entire weight on stair tread or landing, deflection is limited to 1/8-inch maximum at point.

5. Prime paint surfaces of stair assembly after fabrication, and grind smooth welds as specified.

6. Secure handrails to stair and steel supports where shown, at top or bottom with screws or welds, and achieve a lateral resistance as required by California Building Code (CBC).

3.03 CLEANING

A. Clean site after work of this section.

B. Remove weld splatters.

C. Use galvanizing repair coating specified, then re-prime areas of materials damaged during installation and other construction activities and leave in condition for subsequent finish painting or application of additional finish materials provided by others.

END OF SECTION

09 00 00

FINISHES

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 09 51 00

ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes furnishing and installing acoustical lay-in units and suspension systems.

B. Related Sections:

1. Electrical work, Division 26 00 00.

1.02 CODES AND REFERENCE STANDARDS

A. Acoustical panels and tile shall be listed by Underwriter's laboratories, Inc. for flame spread rating specified herein.

B. Acoustical ceiling assemblies shall comply with the seismic design requirements of Title 24, California Building Code (CBC), Chapter 25 and Sections 803.9, 1615.1 and DSA IR 25-1 and 25-2.

C. Acoustical panels shall be made in accordance with ASTM C423 sound absorption coefficients by reverberation room method in the type E mounting described in ASTM E795 and tested per accreditation program for ASTM C423.

1.03 SUBMITTALS

A. Submit shop drawings for review. Show sizes and locations of grids, locations of hanger wires, methods of attachment to supporting structure, and locations and framing conditions for mechanical and electrical equipment within or attached on ceiling.

B. Secure permits for seismic conditions. Show lateral bracing, suspension members, and other information necessary on shop drawings to secure these permits.

C. Submit samples of acoustical materials and suspension systems for review.

D. Recycled Content Certification.

E. Submit acoustical test reports from an independent acoustical testing Laboratory.

1.04 EXTRA MATERIALS

A. Leave extra ceiling panels for Owner's use, equal to 10 percent of total number of units used on project, but in no case less than two full boxes of each pattern.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project in original unopened packages bearing the manufacturer's name, brand designation, and label verifying compliance with these specifications. Store materials in properly protected and dry storage area.

B. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed.

1.06 PROJECT CONDITIONS

A. Maintain a uniform temperature of not less than 60 degrees F. nor more than 85 degrees F. and a relative humidity of not more than 70 percent continuously from 24 hours before installation until 24 hours after completion of work.

1.07 SCHEDULING

A. Wet operations such as plastering, concrete and masonry work shall be completed and dry before installation of acoustical ceilings. Mechanical, electrical and other work above the ceiling line shall be completed and approved prior to start of acoustical ceiling installation.

1.08 SUSTAINABILITY

A. Submit the following credit certificates/letter from the manufacturer (LEED for Schools):
EA Credit 1
MR Credit 2
MR Credit 4
MR Credit 5
MR Credit 6
MR Credit 7
IEQ Credit 4, 4.1 to 4.6
IEQ Credit 8.1, 8.2
IEQ Prerequisite 3
IEQ Credit 9

PART 2 - PRODUCTS

2.01 GENERAL

A. Acoustical materials shall be as specified herein.

B. Use Code Approved Seismic Clip to allow for 7/8” wall angle in lieu of 2” wall angle. USG ACM7 Seismic Clip with USG M7 wall angle. With aluminum capped grids, use aluminum capped wall angle, USG M7A.

2.02 ACT-1 CEILING (2' x 4')

A. Ceiling Grid: 24" x 48" with 15/16-inch wide grid.

B. Ceiling Tile Pattern: Armstrong, School Zone Fine Fissured, or equal, 24" x 48" x 3/4" Color: White. If budget allows – use Dune, No. 1773 or Ultima, No. 1915

C. Surface Burning Characteristics (Flame Spread and Smoke Developed): Class A (Flame spread 25 or under) UL labeled per ASTM E1264. Smoke developed shall be no greater than 450 when tested in accordance with CBC Chapter 8, Section 803.

D. **2' x 4' Acoustical Lay-in Ceiling Suspension System:**

1. Suspension system shall conform to the heavy-duty classification of ASTM C635 and shall be 24" x 48" x 15/16" steel system. Minimum pre-consumer recycled content of 23% and post-consumer recycled content of 68%

2. Main runners, cross tees, spacer bars, variable placement tees, grid adapters and wall moldings shall be of cold-rolled hot-dipped galvanized steel.

3. Finish shall be white baked-on vinyl painted finish.

4. Provide suspension system of one of the following manufacturers:

a. Armstrong World Industries, Inc.
Prelude XL Heavy Duty System
Main Runner – Prelude XL –7301 Heavy Duty
Cross Runner – Prelude XL – XL7340

b. USG Corporation
Donn® DX® Heavy Duty System
Main Runner – DX-26 Heavy Duty
Cross Runner – DX-422

c. Chicago Metallic Corporation
Series 1200
Main Runner – 200 Heavy Duty
Cross Runner – 1274

2.03 ACT-2 CEILING (2'X 2')

A. Ceiling Grid: 24" x 24" with 9/16-inch wide grid, beveled tegular.

B. Ceiling Tile Pattern: Armstrong, Ultima Open Plan, 24" x 48" x 3/4", or equal

C. Surface Burning Characteristics (Flame Spread and Smoke Developed): Class A (Flame spread 25 or under) UL labeled. Smoke density shall be no greater than 450 when tested in accordance with Title 24, California Building Code (CBC), 2016, Chapter 8.

D. 2 x 2 Acoustic Lay-In Ceiling Suspension System:

1. Suspension system shall conform to the heavy-duty classification of ASTM C635, and shall be 24" x 24" X 9/16" steel system. Minimum pre-consumer recycled content of 23% and post-consumer recycled content of 68%

2. Main runners, cross tees, spacer bars, variable placement tees, grid adapters and wall moldings shall be of cold-rolled hot-dipped galvanized steel.

3. Finish shall be white baked-on vinyl finish.

4. Provide suspension system of one of the following manufacturers:

a. Armstrong World Industries, Inc.,
Prelude XL Heavy Duty System
Main Runner – 7301 Heavy Duty
Cross Runner – XL7328 / XL7340

b. USG Corporation
Donn® DX® Heavy Duty System
Main Runner – DX-26 Heavy Duty
Cross Runner – DX-216/424

c. Chicago Metallic Corporation
Series 1200
Main Runner – 200 Heavy Duty
Cross Runner – 1252/1274

2.04 ACT-3 CEILING - ADHESIVE APPLIED-12 x 12 ACOUSTICAL TILES

A. Tiles: Armstrong Concealed, Fine Fissured Tile 592, 3/4" x 12" x 12", beveled edge, Mineral Fiber Fissured Tile, NRC .65-.75. Natural Fissured Design by U.S.G. or approved equal.

B. Surface Burning Characteristics (Flame Spread and Smoke Developed): Class A (Flame spread 25 or under) UL labeled. Smoke density shall be no greater than 450 when tested in accordance with Title 24, California Building Code (CBC), 2019, Chapter 8.

C. Acoustical ceiling tiles shall be glued to gypsum wallboard with approved manufacturer's adhesive recommendations.

2.05 ACT-4 CEILING - MOISTURE RESISTANT 2 x 4 LAY-IN CEILING

A. Acoustic Tile: 24" x 48" x 3/4" Armstrong Clean Room Mylar. Surface burning characteristics: Class A Flame Spread (25 or under) UL labeled. Smoke density shall be no greater than 450 when tested in accordance with Title 24, California Building Code (CBC), 2019, Chapter 8.

1. Lay-in-boards shall feature scrubbable surface with HumiGuard Plus, sag resistance, and Bioblock Paint that inhibits the growth of mold and mildew.

B. Surface Burning Characteristics (Flame Spread and Smoke Developed): Class A (Flame spread 25 or under) UL labeled. Smoke density shall be no greater than 450 when tested in accordance with Title 24, California Building Code (CBC), 2019, Chapter 8.

C. 2' x 4' Acoustical Lay-in-Ceiling Suspension System:

1. Suspension system shall conform to the heavy-duty classification of ASTM C635 and shall be 24" x 48" x 15/16" steel system. Minimum pre-consumer recycled content of 23% and post-consumer recycled content of 68%.

2. Main runners, cross tees, spacer bars, variable placement tees grid adapters and wall moldings shall be of cold-rolled hot-dipped galvanized steel.

3. Finish shall be white baked-on vinyl finish.

4. Provide suspension system of one of the following manufacturers.

a. Armstrong World Industries, Inc.
Prelude XL Heavy Duty System
Main Runner –Prelude XL - 7301 Heavy Duty
Cross Runner– Prelude XL - XL7340

b. USG Corporation

Donn® DX® Heavy Duty System
Main Runner – DX-26 Heavy Duty
Cross Runner – DX-422

c. Chicago Metallic Corporation
Series 1200
Main Runner – 200 Heavy Duty
Cross Runner – 1274

PART 3 - EXECUTION

3.01 GENERAL

A. Examination of surfaces and conditions affecting proper installation of the materials, and reporting defects in materials or surfaces to which acoustical tile is applied. Commencement of work will signify acceptance of above indicated materials and surfaces as satisfactory.

3.02 INSTALLATION

A. Layout work in accordance with reviewed and approved shop drawings. Adjust spacing of runners to achieve intent of drawings.

B. Secure perimeter acoustical moldings to walls at maximum 2 foot intervals, with power driven studs for cementitious substrates, and with screws at 16-inch intervals at stud walls. Provide moldings at perimeters of penetrations and room areas. Attach border units for clean finish and tight appearance.

C. Unless shown otherwise, ensure that installed tiles are square within each room area, in continuous lines parallel to walls, symmetrical about centerline of room area.

D. Drill holes for pipes. Tiles cut from sides to permit penetration and installation of other construction will not be acceptable.

3.03 SUSPENSION SYSTEM INSTALLATION
(Division of the State Architect Interpretation of Regulations, IR 25-1 and 25-2)

A. 12-gauge (minimum) hanger wires may be used for up to and including 4'-0" x 4'-0" grid spacing. Splices will not be permitted in hanger wires unless specifically approved by DSA/Structural Safety Section.

B. Provide hanger wires within 8 inches of the ends of main and cross runners or at one-quarter of the length of the end tee, whichever is least at the perimeter of the ceiling area.

C. Provide trapeze or other supplementary support members at obstructions to maintain hanger spacing. Provide additional hangers, struts or braces as required at ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than one in six out of plumb are to have counter braced wires.

D. Ceiling grid members may be attached to not more than two adjacent walls. Ceiling grid members should be at least 1-1/2-inch free of other walls. If walls run diagonally to ceiling grid systems runners, one end of main and cross runners should be free and a minimum of 1/2-inch clear of wall.

E. At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent

lateral spreading. A metal strut or one 16 gage wire with a positive mechanical connection to the runner may be used. Where the perpendicular distance from the wall to the first parallel runner is 12-inches or less, this interlock is not required.

F. Provide in sets of four, No. 12 gage splayed bracing wires oriented 90 degrees from each other and compression strut as indicated in the Drawings, at the following spacing:

1. For school buildings, place sets of splay wires at a spacing not more than 12 feet by 12 feet on center.

2. Provide splay wires at locations not more than one-half the above spacing from each perimeter wall or at the edge of vertical ceiling offsets for both school and hospital buildings.

3. The slope of these wires should not exceed 45 degrees from the plane of the ceiling and should be taut without causing the ceiling to lift. Splices in bracing wires are not permitted without special DSA/Structural Safety Section approval.

G. Fasten hanger wires with not less than three tight turns. Fasten splay wires with four tight turns. Make tight turns within a distance of 1-1/2 inches. Hanger or bracing wire anchors to the structure should be installed in such a manner that the direction of the wire aligns as closely as possible with the direction of the forces acting on the wire.

H. Separate ceiling hanging and bracing wires at least 6 inches from unbraced ducts, pipes, conduit, etc. It is acceptable to attach lightweight items, such as single electrical conduit not exceeding 3/4-inch nominal diameter, to hanger wires using connectors acceptable to DSA/Structural Safety Section.

I. When drilled-in concrete anchors or shot-in anchors are used for hanger wires, one out of ten must be field tested for 200 pounds of tension. When drilled-in concrete anchors are used for bracing wires, one out of two must be field tested for 440 pounds in tension. Shot-in anchors are not permitted for bracing wires. If shot-in or drilled-in anchor fails, adjacent anchors must be tested.

J. Attach light fixtures to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures.

K. Fixtures and air terminals or services supported on intermediate duty grid systems must be independently supported by not less than four taut No. 12 gage wires attached to the structure above.

Flush or recessed light fixtures and air terminals or services weighing 56 pounds or more must be independently supported by not less than four No.12 gage taut wires attached to the structure above regardless of the type of ceiling grid system used. The (4) four taut No.12-gauge wires including their attachment to the structure above must be capable of supporting four times the weight of the unit.

L. Flush or recessed light fixtures and air terminals or services weighing less than 56 pounds, may be supported directly on the runners of a heavy-duty grid system. In addition, they must have a minimum of two (2) 12-gauge slack safety wires attached to the fixture at diagonal corners and anchored to the structure above. All 4 ft. by 4 ft. light fixtures must have slack safety wires at each corner.

M. Support surface mounted light fixtures by at least two positive devices which surround the ceiling runner, and which are supported from the structure above by a No.12 gage wire. Spring clips or clamps that connect only to the runner are not acceptable.

N. Support pendant mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting four times the weight of the fixture.

3.04 LAY-IN PANEL INSTALLATION

A. Install factory pre-fabricated acoustical units manufactured specifically for the drop-in and for the concealed suspension system per manufacturer's specifications and directions.

3.05 CLEANUP

A. Replace loose and damaged tile and panels when directed. Touch-up damaged finish. Leave surfaces clean and free from markings and other disfigurements. Remove debris resulting from the work of this section.

END OF SECTION

SECTION 09 68 00

CARPETING

PART 1 - GENERAL

1.01 SUMMARY

A. Provide installation materials, installation accessories as noted in the Drawings and as specified herein.

B. All Bidders shall quote in accordance the exact specifications as detailed in this document. Any proposed substitutions to this specification must follow strictly to the specifications herein and must be presented for prior approval according to the conditions detailed under Submittals.

1.02 SUBMITTALS

A. Manufacturer shall submit documentation showing a minimum of ten (10) years experience in the manufacture of the product described herein

B. Submit manufacturers product specifications, product testing reports and other required documents referenced within this text.

C. Submit any proposed substitutions for consideration. Reference the substitutions section of this document.

D. Submit two (2) 18" x 18" finished samples of each type of proposed carpet in the quality, pattern and color proposed, if requested by Architect. If samples are not requested, provide accurate simulated color and pattern design files to Architect.

E. Submit at least five (5) names of installations that have been in use for ten (10) years using vinyl backing technology as described in this document. Include contact names and phone numbers.

F. Submit installation shop drawings showing areas to be carpeted, seam locations, moldings, edge strips and details of all special treatments.

G. Prior to carpet delivery submit certified laboratory copies of the reports specified within the Verification of part 2.01 of these specifications.

H. Submit CRI Green Label Certification, plus certification for low VOC.

I. Provide LEED Contributions – Materials Credit 2 and 5 and IEQA Credit 4.1 and 4.3.

I. Provide Face Fiber EPP Certification.

J. Provide Facility ISO 14001 and ISO 9001 and Class 1 Clean Air Certifications.

H. Prior to installation submit the manufacturer’s installation instructions including cleaning equipment type, spot cleaning methods and cleaning cycles.

1.03 SUBSTITUTIONS

A. Reference Specifications, Section 01 33 00 – Submittal Procedures.

1.04 QUALITY ASSURANCE

A. Flooring contractor to be a specialty contractor normally engaged in this type of work and shall have prior experience in the installation of these types of materials.

B. Floor contractor to provide references.

C. Flooring contractor must be certified by the manufacturer.

D. Flooring contractor will be responsible for the proper product installation, including floor preparation, in those areas indicated in the Drawings.

E. Flooring contractor to provide Owner a written warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of one (1) year after job completion.

F. Manufacturer to provide field service experts to assist in project start-up as required by the job. Manufacturer will notify Owner, Architect General Contractor or another designated contact if any installation instructions are not followed.

G. Carpet/ Carpet Tile Flooring: CBC Section 11B-302.2

1. Carpet shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad. It shall have a level loop, textured loop, level-cut loop, level cut pile, or level cut/uncut pile texture. Maximum pile height of 1/2-inch per CBC Section 11B-302.2.

2. Exposed edges shall be fastened to floor surfaces and shall have trim on the entire length. Carpet edges shall comply with CBC Section 11B-303.

1.05 JOB CONDITIONS

A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified in the manufacturer's installation instructions.

B. Sub-floor preparation will include, as required, the removal and repair of the existing floor surface. It is recommended that the sub-floor of a renovation project be inspected prior to the time of bid.

C. All materials used in sub-floor preparation and repair shall be recommended by the carpet manufacturer or shall be chemically and physically compatible with the carpet system being bid.

D. Manufacturer to provide field service experts to assist in project start-up as required by the job. Manufacturer will notify Owner, Architect General Contractor or another designated contact if any installation instructions are not followed.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver all material to the installation site in the manufacturers original packaging. Packaging to contain manufacturers name, product name and identification number and other related information.

B. All materials to be stored in a cool (above 65° F. and below 90° F.), dry locations, safe from damage and soiling. Stack rolls horizontally no higher than three (3) high on a flat surface.

1.07 CARPET WARRANTY

A. Provide a standard, printed warranty from the manufacturer agreeing to repair or replace unsatisfactory work caused by defective materials as detailed below, for a period of **twenty** (20) non-prorated years**.**

All warranty items to be full term, **non pro-rated** for the indicated period. If the product fails to perform as warranted when properly installed and maintained according to procedures, the affected area will be repaired or replaced at the expense of the manufacturer.

1. **Twenty (20)** years against excessive surface wear. (Excessive wear means more than 15% loss of pile fiber weight measured before and after use.)

2. **Twenty (20)** years against edge ravel.

3. **Twenty (20)** years against zippering.

4. **Twenty (20)** years against back delamination. (Back delamination is defined as separation of the secondary backing from the primary backing.)

5. **Twenty (20)** years against resiliency loss. (Resiliency loss means more than 10% loss of backing resiliency calculated using average thickness of the backing of the carpet before and after use.)

6. **Twenty (20)** years against watermarking on any product not 100% loop construction. (Watermarking means an apparent color difference between areas of the same carpet due to permanent pile reversal with random differences in pile lay direction and differences in the amount of light reflected by carpet fibers.)

7. **Twenty (20)** years against excessive static electricity. (Excessive static electricity means more than 3.0 kilovolts at a relative humidity of 20% and a room temperature of 70° F.

8. **Twenty (20)** years against staining and soiling.

D. All warranties to be sole source responsibility of the manufacturer. Second source warranties or warranties that involve parties other than the manufacturer are unacceptable.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Preferred Manufacturer: Tandus/Collins and Aikman.

B. Acceptable Manufacturers: Shaw Group, Mohawk, or equal.

2.02 VERIFICATION OF PERFORMANCE

A. Flammability Requirements: Part 2.03.

B. Face Fiber Characteristics: DuPont, Antron Legacy, type nylon 6.6, hollow filament. See Part 2.03.

C. Stain Inhibiting and Resistance Properties: Permanent DuraTech soil resistance and Stain Inhibitor factory applied to the product, through heat and force activated cohesion creating mechanical polymeric entrapment, during manufacture to resist fiber staining.

D. Backing Characteristics:

1. Vinyl backing, LifeLock, by Tandus, or equal.

2. Power bonded to the carpet face to provide for no delamination.

3. Closed cell, vinyl cushion backing.

4. Backing system to provide a barrier to moisture penetration. No penetration after 10,000 impacts based on dynamic crush testing.

5. Product to provide for a chemically welded seam.

E. Adhesive System Characteristics:

1. Carpet product to be securely attached to the floor in compliance with Americans with Disabilities Act (ADA), Section 302.2. Provide glue-down or firm cushion installation that complies with CBC Section 1124B.3.

2. Product to be installed with Greenbond B-19, by Tandus, or equal.

3. Product to be supplied with a Microencapsulated Tackifier applied to 100% of the back at the time of manufacture.

F. Environmental Impact Characteristics:

1. No detectable levels of Formaldehyde.

2. No detectable levels of 4-PC (40-phenyl-cyclohexene).

3. All products must be decreasing emitters of Volatile Organic Chemicals (VOCs).

4. All products to be below the concentration level of 0.500 mg/cubic meter (based on State of California protocol) at the time of installation).

5. Particle emissions to be below 0.05 mg/cubic meter (based on State of Washington testing).

6. All products comply with the State of California indoor air requirements at the time of installation.

7. Product to be delivered with a recycle bag for use with the plastic film used to protect the Microencapsulated Tackifier.

8. All products must pass the University of Pittsburgh protocol for toxicity being "no more toxic than wood" when burned under the same conditions.

9. All products must be barriers to radon flow. Radon flow to be reduced a minimum of 65% based on barrier characteristics of the products.

10. Product to provide asbestos enclosure properties. (Enclosure means an airtight, impermeable, permanent barrier around ACBM [Asbestos Containing Building Material] to prevent the release of asbestos fibers into the air.)

2.03 CERTIFIED TESTING

A. Certified test reports shall be submitted for all performance assurance specifications listed below.

B. Requirements listed below must be met by all products.

C. All submitted test numbers shall represent average results for production goods.

D. All certified test reports shall be not more than two (2) years old.

E. Required Test Reports:

1. Pill Test (Federal Flame Standard) DOC FF 1-70

2. Flooring Radiant Panel ASTM E648 or NFPA 253 Class 1 (CRF greater than 0.45 Watts/cm.)

3. Smoke Density ASTM E662 or NFPA 258. Less than 450 (corrected flaming and non-flaming mode.

4. Backing Type: Microscopic Cross Section. Composite vinyl.

5. Backing Cellular Make-Up: Microscopic, as manufactured. Closed cell.

6. Backing Cellular make-Up. Microscopic, after 50,000 Phillips Chair Cycles. Closed Cell.

7. VOC Chamber Testing Results: EPA protocol, passing State of Washington.

8. University of Pittsburgh protocol (LC-50) for toxicity being "no more toxic than wood" when burned under the same conditions.

9. Radon Flow Barrier Testing: Certified lab, flow Reduction Barrier minimum 65%.

10. Moisture Barrier (Moisture Penetration Testing) Dynamic Crush Test @ 10.0 psi, no penetration after 10,000 impacts.

11. Air Permeability of Textile Fabrics. No air flow (0.0 cubic ft./minimum.

12. Stain Inhibitor:

a. Stain Test: AATCC 175, Min.3

b. WAQE Shampoo Test: DuPont Test protocol, Min.3

c. Accelerated Soiling: AATCC 123, Min.3

d. Lightfastness (Xenon-300 Hrs) AATCC 16E, Min.3

e. Crockmeter: AATCC 165, Min.3

f. Colorfastness to Water: AATCC 107

2.04 CARPET SPECIFICATION

Construction	Tufted Textured Loop
Width	12' min.
Gauge	1/10", or greater
Pile height average	.197" (ASTM D5823-05a)
Pile yarn weight	26.0 to 29.0 oz./sq.yd. (ASTM D5823-05a)
Fiber system	Antron Legacy Nylon, Beck Dyed, with ENSURE, soil protection, or equal.
Fiber Technology:	Duracolor, or equal, Stain Resistant System, passing GSA requirements for permanent stain resistant carpet.
Dyeing method	Beck dyed
Backing System:	LifeLock or equal.
Primary	Woven Polyporpolene
Fusion Coat	Sealant Vinyl
Backing (ASTM D 1667-70)	Closed Cell Vinyl Cushion Weight: 35.5 oz./sq.yd. Density: 18.5 lbs./cu.ft. Thickness: .156" Compression Set: Max. 10% Compression Deflection Min. 7lbs./sq.in.
Adhesive System	Microencapsulated Tackifiers applied to 100% of material at time of manufacture.
TOTAL FINISED WEIGHT	66.2 oz./sq.yd. +/- 5%
Floor Radiant Panel Test Mean Average Critical Radiant Flux:	(ASTM E 648) .45 w/sq. cm. or higher
Smoke Density (ASTM E 662)	Flaming: Mean average: 450 or lower
Flammability	Passes (DOC FF 1-70)

Style	Quality to match Tandus, Agenda, or equal
Style/Color	To be selected by Architect

Electrostatic propensity 2.2 K.V. or lower

Warranties: 20-year wear, delamination, edge ravel, static, zippering and resiliency.

PART 3 - EXECUTION

3.01 PREPARATION

A. All floors must be inspected and approved by a manufacturing representative and the installation contractor prior to installation of carpet.

B. There will be no exceptions to the provisions stated in the manufacturer's installation instructions.

3.02 INSTALLATIONS

A. Product installation to proceed as specified in the manufacturer's installation instructions.

3.03 CLEANING

A. Remove rubbish, wrappings, debris, trimmings, etc. to be removed form the site and disposed of properly.

B. All usable scraps of carpet should be left for use by the Owner.

C. Vacuum carpet with a beater brush/bar commercial vacuum after installation.

3.04 PROTECTION

A. Carpet to be protected as needed from damage from other trades.

END OF SECTION

SECTION 09 72 00

VINYL WALL COVERINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Wallcovering for fixed walls, including preparation of surfaces.

1. Furnishing wallcovering for operable walls, and vinyl wrapped wall panels provided under other Sections.

B. Related Work:

1. Substrate materials
2. Wall texturing
3. Section 09 29 00 – Gypsum Board.
4. Section 10 25 16 – Operable Walls.

1.02 SUBMITTALS

A. Samples: Provide 12-inch by 12-inch samples of selected wallcovering for review of quality, color, texture and weight. Provide from dye lots to be used on project only.

B. Manufacturer's Instructions:

1. Provide copies of maintenance instructions for wallcovering.

2. Provide recommendation of cleaning materials and application methods, including precautions in use of cleaning materials which may be detrimental to surfaces if improperly applied.

1.03 QUALITY ASSURANCE

A. Three full length panels of each type wallcovering to be used shall be installed in areas selected by Architect. Approved test panels shall be used as standard of quality of appearance and installation for Work.

1. Test panels found deficient by Architect per specification standards or application shall be replaced.

B. Conform to 2016 California Building Code, Title 24, Part 2, Chapter 8 and ASTM E112.

1.04 DELIVERY, STORAGE AND HANDLING

A. Store wallcovering in clean and dry area where temperatures are maintained at 55 degrees F. minimum, with normal humidity. Do not store in an upright position. Do not cross stack wallcovering.

B. Take reasonable precautionary measures to prevent fire hazards with adhesives and solvents.

C. Where toxic materials and both toxic and explosive solvents and adhesives are used, take appropriate precautions and provide proper ventilation.

1.05 PROJECT CONDITIONS

A. Environmental Requirements:

1. Maintain substrate surfaces and ambient temperatures above 60 degrees F. seven days before, during, and after application period.

2. Ensure maximum surface moisture of substrate conforms to wallcovering manufacturer's requirements and does not exceed 5 percent. Surface shall exhibit negative alkalinity.

3. Lighting: Provide a minimum of 80-foot candles per square feet on surfaces to be covered.

4. Provide continuous and adequate ventilation during work and after installation of wallcovering.

5. Install specified materials only when normal temperature and humidity conditions approximate the interior conditions that will exist when the building is occupied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Vinyl wallcovering shall be the product of one manufacturer. Design is based on the use of products manufactured by the following:

1. Koroseal Interior Products Group, a Division of RJF International Corporation, Fairlawn, Ohio.

2. Wallscape, East Brunswick, NJ, (866) 216 4483.

3. Len-Tex Corporation, North Walpole, NH, (603) 445-2342.

2.02 MATERIALS

A. Vinyl Fabric:

1. Vinyl-coated fabric shall comply with Federal Specifications CCC-W-408-A and with the CFFA-W-101-D Quality Standard for Vinyl Coated Fabric Wallcovering. Wall covering shall be Type II, with minimum weight of 20 ounces per lineal yard in 54-inch width. Wall covering shall be Class A rated, when tested in accordance with ASTM E84. Material shall have a flame spread rating of 25 or less, a fuel contributed rating of 10 or less and a smoke density rating of 450 or less.

2. Classrooms: Fabric shall be Koroseal, "_____", or equal. Architect may select up to five different colors for the project. (Architect to select line.)

3. Performing Arts, Administration, and other spaces: Fabric shall be Koroseal, "_____", or equal. Architect may select up to five different colors for the project. (Architect to select line.)

4. Engraving roller die marks, roller repeat marks, glossy surface appearance or other imperfections will be proper basis for TOTAL REJECTION by the Architect, if evidenced in either the submitted samples, or the manufactured materials supplied and delivered to the job.

B. Primer and Adhesives: Provide manufacturer's recommended strippable types that allow for future removal of wall coverings without damage to substrate.

C. Provide Owner with one can of adhesive and additional wall covering equal to 3 percent of each color used.

D. Protective Coating: The vinyl wallcovering shall have a protective coating applied to its surface to minimize migration of stains into the vinyl and, therefore offer stain protection from a variety of staining agents and provide greater ease of cleanability.

2.03 SOURCE QUALITY CONTROL

A. Tests: Perform in accordance with Federal Standard, FED-STD-191A, except as follows:

1. Each roll of material delivered to the job site, must be affixed with U.L. labels, attesting to the maximum ratings specified herein, as determined by the ASTM E84 tunnel test.

2. The vinyl wallcovering shall contain thermo-particulating ingredients, which when exposed to a direct heat of 300 degrees F., emits a colorless and odorless vapor that activates ionization type smoke detectors, when installed according to manufacturer's specifications.
Certified copies of ASTM E603 Standard Guide for Room Fire Experiments must be submitted to the Architect attesting to conformance of materials with this test.

3. Toxicity shall be determined by the National Institute of Standards and Technology (NIST).

4. Adhesive of vinyl coating to the fabric backing, shall be tested in accordance with ASTM D751.

5. Resistance to strong cleaning solutions, shall be tested by immersing one-half of the material into a solution of 1% sodium hydroxide (NaOh) or a common cleanser, for a period of twenty-four (24) hours, then rinsed, dried and observed for possible discoloration.

6. Materials shall have a zone inhibition rating of "0" to resist the growth of mildew and bacteria, as determined by test method ASTM G21.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine the areas and conditions under which wallcovering is to be installed and notify in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in an approved manner.

3.02 PREPARATION

A. Remove wallcovering from packaging and allow acclimatizing to the area of installation 24-hours before application.

B. Remove switchplates, wall plates, escutcheons, and surface-mounted fixtures, where wallcoverings are to be applied.

C. Prime and seal substrates in accordance with the wallcovering manufacturer's printed recommendations for the type of substrate material to be covered.

3.03 INSTALLATION

A. Place wallcovering panels consecutively in the order they are cut from rolls, including filling spaces above or below openings. Hang by reversing alternate strips except on match patterns.

B. Apply adhesive to back of wallcovering and place in accordance with the manufacturer's printed instructions. Install seams vertically and plumb, and at least 6 inches away from corner; horizontal seams will be permitted only where specifically approved by Architect. Place wallcovering continuously over internal and external corners. Overlap seams and double cut to ensure tight closure. Roll, brush, or use a broad knife to remove air bubbles, wrinkles, blisters and other defects. Cut wallcovering evenly to the edges of openings.

C. Trim selvages as required to ensure color uniformity and pattern match at seams.

D. Remove excess adhesive along finished seams and clean well.

E. Install the wallcovering with an intimate substrate bond, smooth; clean, without wrinkles, gaps and overlaps.

F. Replace removed plates and fixtures to verify accuracy of concealment of cut edges.

3.04 CLEANING

A. Upon completion of work, remove surplus materials, rubbish, and debris resulting from this material installation and leave area of work in a neat, clean condition.

3.05 WARRANTY

A. Upon completion of work, contractor shall provide a written five (5) year warranty

END OF SECTION

SECTION 09 90 00

PAINTING AND COATING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Provide materials, labor and equipment necessary for the completion of a completely painted project, including preparation of painted surfaces. Provide finishes based on materials and products scheduled in these specifications and on the drawings. If not otherwise specified, provide prime coat and two finish coats on all exposed to view or weather surfaces. This shall include painting all pigmented exterior plaster (integral color stucco) in not less than three colors. The following miscellaneous items shall also be painted:

1. Areas shown to be painted on the Room Finish Schedule or Exterior and Interior Elevations. Items called out to be painted in Divisions 23 and Division 26. All hollow metal.

2. Exposed site plumbing items, such as PIV's, backflow preventors, exposed pipes and standpipes, fire hydrants, irrigation air relief valve covers, exposed valves, exposed roof drainpipes, etc.

3. Exposed interior mechanical ductwork, piping, and electrical conduits (except in electrical rooms and closets), wall and ceiling access covers, hatches, panel covers, and plates, and exposed cable tray and supports. **Roof top mechanical units that are above the height of the roof parapet, paint to match exterior plaster.**

4. Priming and sealing of gypsum wallboard that is to receive vinyl wall covering.

5. Roof hatches (interior and exterior), exterior galvanized ladders, sheet metal parapet copings on both sides and top. Exposed metal components that arrive on job with only prime finish. Signposts. Decorative metal fence and gates. Metal railings and bollards. Exposed steel connectors, bolts, and plates.

6. Stain and seal exposed wood components.

B. Specific items NOT to be painted or finished: Factory finished items (as opposed to factory primed), chain link fence, volleyball and basketball posts, football goals, chin-up bars, concrete benches, wood casework finished by casework fabricator.

C. Related Work:

1. Section 32 12 16 – Asphalt Paving.
2. Section 09 72 00 – Wall Coverings.
3. Electrical, Division 26.

1.02 REFERENCE STANDARDS

A. Conform to California Air Resources Board (CARB) Rules, especially 1113, Architectural Coatings.

B. Title 19, California Code of Regulations (CCR), Public Safety, State Fire Marshal Regulations

1.03 SUBMITTALS

A. Prepare eight, 8-1/2-inch by 11-inch samples of finishes, to be provided to District's Maintenance and Operations Department. When possible, apply finishes on identical type materials to which they will be applied on job.

B. Identify each sample as to finish formula, color name, reflectance number and sheen name and gloss units.

C. Colors will be selected by Owner and Architect prior to commencement of work, from manufacturer's full range of standard and custom colors.

D. State Fire Marshal, Fire and Life Safety Approval: Flame retardant coatings shall be listed by the California State Fire Marshal's office. A copy of this listing and a material specification sheet shall accompany the submittal.

E. Submittal to be reviewed and signed by District's Maintenance and Operations Department prior to Architects approval.

1.04 QUALITY ASSURANCE

A. Mock-up: Before proceeding with paint application, finish one complete surface of each color scheme required, clearly indicating selected colors, finish texture, materials and workmanship. If approved, sample area will serve as a minimum standard for work throughout.

1.05 MAINTENANCE MATERIALS

A. Leave on premises where directed, not less than one full gallon of each color, of each type of paint, in new unopened containers. Label each container for identification.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver paint materials in sealed original labeled containers bearing manufacturer's name, type of paint, brand name, solids content, color designation and instructions for mixing and/or reducing.

B. Provide adequate storage facilities. Store paint materials at a minimum ambient temperature of 65 degrees F., in well ventilated area.

C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.07 PROJECT CONDITIONS

A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following minimums: gypsum board - 12 percent; cementitious materials - 12 percent.

B. Ensure surface temperatures and surrounding temperatures are above 50 degrees F.,

before applying finishes.

C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 50 degrees F., for 24 hours before, during, and 48 hours after application of finishes.

D. During painting, provide minimum of 25-foot candles of lighting on surfaces to be painted.

1.08 EQUAL PRODUCTS

A. All products specified herein, may be substituted with a product that is equal to better than the product specified. Products must be equal in all ways, including chemical and physical make up, as well as performance.

B. Substitutions will be reviewed by the District and a determination will be made on the acceptability of the product submitted. If a determination is made that the substituted product is not equal, the original project specified herein will be provided at no cost to the owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and coatings manufactured by one of the following companies noted in Section 2.02, D and referrer to cross-reference guide for acceptable alternates.

2.02 PAINT MATERIALS

A. Accessories: Provide linseed oil, turpentine and other materials not specifically specified but required to achieve finishes.

B. Paints and Coatings: Provide ready-mixed type except field catalyzed coatings; pigments fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixtures.

C. Provide paints and coatings with good flowing and brushing properties and capable of drying or curing free of streaks and sags.

D. **Painting**
Provide equivalent paint types according to the following schedule.

Interior

New Drywall (Semi-Gloss Finish)

1st coat	SW ProMar 200 Zero VOC Primer
2nd coat	SW ProMar 200 Zero VOC Semi-Gloss
3rd coat (to cover*)	SW ProMar 200 Zero VOC Semi-Gloss

New Drywall (Low Sheen Finish)

1st coat	SW ProMar 200 Zero VOC Primer
2nd coat	SW ProMar 200 Zero VOC Low-Sheen
3rd coat (to cover*)	SW ProMar 200 Zero VOC Low-Sheen

New Drywall (Eggshell Finish)

1st coat	SW ProMar 200 Zero VOC Primer
2nd coat	SW ProMar 200 Zero VOC Eg-shel
3rd coat (to cover*)	SW ProMar 200 Zero VOC Eg-shel

New Drywall (Microbicidal Eggshell Finish – Locker Rooms, Nurses Office)

1st coat	SW ProMar 200 Zero VOC Primer
2nd coat	SW Paint Shield Microbicidal Eg-shel
3rd coat (to cover*)	SW Paint Shield Microbicidal Eg-shel

New Wood Painted Surfaces (Semi-Gloss Finish)

1st coat	SW Preprite ProBlock Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Steel Door / Door and Window Frames

1st step	GLL Clean & Etch
1st coat	SW ProCryl Acrylic Metal Prime
2nd coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Ferrous Metal (including steel doors and hollow metal frames)

Pretreatment	GLL Clean & Etch
1st coat	SW ProCryl Acrylic Metal Prime
2nd coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Galvanized Metal

Pretreatment	GLL Clean & Etch
1st coat	SW ProCryl Acrylic Metal Prime
2nd coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Ceilings

1st coat	SW ProIndustrial WB Dryfall Flat
2nd coat (to cover*)	SW ProIndustrial WB Dryfall Flat

Previously Painted Drywall and Wood “Wall” Surfaces (Semi-Gloss Finish)

1st coat	SW Preprite ProBlock Primer
2nd coat	SW ProMar 200 Zero VOC Semi-Gloss
3rd coat (to cover*)	SW ProMar 200 Zero VOC Semi-Gloss

Previously Painted Drywall and Wood “Wall” Surfaces (Low Sheen Finish)

1st coat	SW Preprite ProBlock Primer
2nd coat	SW ProMar 200 Zero VOC Low-Sheen
3rd coat (to cover*)	SW ProMar 200 Zero VOC Low-Sheen

Previously Painted Drywall and Wood “Wall” Surfaces – Locker Rooms, Nurses Office, Eggshell Finish)

1st coat	SW Preprite ProBlock Primer
2nd coat	SW Paint Shield Microbicidal Eg-shel
3rd coat (to cover*)	SW Paint Shield Microbicidal Eg-shel

Previously Painted Wood Trim Surfaces (Semi-Gloss Finish)

1st coat	SW Preprite ProBlock Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Previously Painted Wood Trim Surfaces (Low Sheen Finish)
- 1st coat — SW Preprite ProBlock Primer
- 2nd coat — SW ProIndustrial WB Alkyd Urethane Low Sheen
- 3rd coat (to cover*) — SW ProIndustrial WB Alkyd Urethane Low-Sheen

Previously Painted Metal Surfaces (Semi-Gloss Finish)
- 1st coat (spot) — SW ProCryl Acrylic Metal Primer
- 2nd coat — SW ProIndustrial WB Alkyd Urethane Semi-Gloss
- 3rd coat (to cover*) — SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Previously Painted Metal Surfaces (Low Sheen Finish)
- 1st coat (spot) — SW ProCryl Acrylic Metal Prime
- 2nd coat — SW ProIndustrial WB Alkyd Urethane Low-Sheen
- 3rd coat (to cover*) — SW ProIndustrial WB Alkyd Urethane Low-Sheen

Vinyl Covered Walls
- 1st coat — SW Extreme Bonding Primer
- 2nd coat — SW ProMar 200 Zero VOCSemi-Gloss
- 3rd coat (to cover*) — SW ProMar 200 Zero VOC Semi-Gloss

Exterior

New Painted Stucco-Plaster-Concrete (Low Sheen Finish)
- 1st coat — SW Loxon Primer
- 2nd coat — SW A-100 Satin
- 3rd coat (to cover*) — SW A-100 Satin

New Painted Wood (Gloss Finish)
- 1st coat — SW Preprite ProBlock Primer
- 2nd coat — SW ProIndustrial WB Alkyd Urethane Gloss
- 3rd coat (to cover*) — SW ProIndustrial WB Alkyd Urethane Gloss

New Painted Wood (Semi-Gloss Finish)
- 1st coat — SW Preprite ProBlock Primer
- 2nd coat — SW ProIndustrial WB Alkyd Urethane Semi-Gloss
- 3rd coat (to cover*) — SW ProIndustrial WB Alkyd Urethane Semi-Gloss

New Painted Wood (Low Sheen Finish)
- 1st coat — SW Preprite ProBlock Urethane
- 2nd coat — SW A-100 Satin
- 3rd coat (to cover*) — SW A-100 Satin

Previously Painted Stucco-Plaster-Concrete (Low Sheen Finish)
- 1st coat — SW Preprite ProBlock Primer
- 2nd coat — SW A-100 Satin
- 3rd coat (to cover*) — SW A-100 Satin

Previously Painted Wood (Gloss Finish)
- 1st coat — SW Preprite ProBlock Primer
- 2nd coat — SW ProIndustrial WB Alkyd Urethane Gloss
- 3rd coat (to cover*) — SW ProIndustrial WB Alkyd Urethane Gloss

Previously Painted Wood (Semi-Gloss Finish)

1st coat	SW Preprite ProBlock Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Semi-Gloss

Previously Painted Wood (Low Sheen Finish)

1st coat	SW Preprite ProBlock Primer
2nd coat	SW A-100 Satin
3rd coat (to cover*)	SW A-100 Satin

New Steel Doors / Door and Window Frames

1st step	GLL Clean & Etch
1st coat	SW ProCryl Acrylic Metal Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

New Ferrous Metal

1st step	GLL Clean & Etch
1st coat	SW ProCryl Acrylic Metal Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

New Galvanized Metal

Pretreatment	GLL Clean & Etch
1st coat	SW ProCryl Acrylic Metal Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

Previously Painted Steel Doors / Door and Window Frames

1st coat	SW ProCryl Acrylic Metal Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

Previously Painted Ferrous Metal

1st coat	SW ProCryl Acrylic Metal Primer
2ndcoat	SW ProIndustrial WB Alkyd Urethane Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

Previously Painted Galvanized Metal

1st coat	SW ProCryl Acrylic Metal Primer
2nd coat	SW ProIndustrial WB Alkyd Urethane Gloss
3rd coat (to cover*)	SW ProIndustrial WB Alkyd Urethane Gloss

E. **SPECIAL COATINGS (HIGH PERFORMANCE) –** Exterior metal stairs (including handrails, railings and guard rails), roof sheet metal flashing, roof equipment, metal wall louvers and other metal surfaces requiring High Performance Coatings.

Unprimed or shop primed ferrous metal

1st coat	SW Macropoxy 646
2nd coat	SW Macropoxy 646
3rd coat (to cover*)	SW High Solids Polyurethane

Galvanized or Aluminum

1st coat	SW DTM Wash Primer
2nd coat	SW Macropoxy 646
3rd coat (to cover*)	SW High Solids Polyurethane

Previously Painted Metal

1st coat	SW Macropoxy 646
2nd coat	SW Macropoxy 646
3rd coat (to cover*)	SW High Solids Polyurethane

F. **Other** – Wood, metal and concrete steps and ramps attached to buildings indicated will be painted as follows:

Concrete Steps/Ramps

1st coat	SW Armorseal 8100
2nd coat (to cover*)	SW Armorseal 8100 w/ sand
3rd coat	Include yellow stripes

Metal Steps/Ramps

1st coat	SW Macropoxy 646
2nd coat	SW Macropoxy 646
3rd coat (to cover*)	SW High Solids Polyurethane w/ sand
4th coat	Include yellow stripes

Wood Steps/Ramps

1st coat	SW Superdeck 3100 Deck & Dock Elastomeric Coating
2nd coat	SW Superdeck 3100 Deck & Dock Elastomeric Coating *(6310 Anti-Skid added to 2nd coat)* Include yellow stripes

*"to cover" is defined – coverage must meet district's approval
**"spot prime" is defined as priming all bare metal areas

G. **Fire Retardant Coating**: Must meet UBC No. 42-1. UL No. 723, ANSI - 2.5, NFPA 255, State Fire Marshal #C-10000, and ICBO No. 3656.

1. Flamort Flam-Gard clear fire-retardant varnish flame spread less than 75, a clear intumescent fire-protective interior varnish for natural wood finishes. Apply two coats, base coat, 8 gallons per coat per 1000 square feet and one coat, finish coat, 2-1/2 gallons per 1000 square feet. As manufactured by Flamort Company.

2. GLIDDEN: Contact Flame Control Coatings (see attached information).

3. Dunn-Edwards Corp.

4. Frazee Paint Co.

   Note: Provide 12" x 12" samples of each of the systems listed in AD. Fire Retardant Coating above, and Architect will select system to be used, based on finish achieved.

5. Vista Paint: Clear or Fire-Retardant Intumescent Paint. For use on exterior wood surfaces requiring weather protection. Clear product is used over interior surfaces on wood and paneling where natural finish is required.

H. **Anti-Graffiti Coating**

1. Preferred Product: Surpro HDWB: by Surtec, Inc., Surface Technology, 1880 N.

MacArthur Drive, Tracy, CA 95376, Phone: (209) 820-3700.

2. VandlGuard™: by Rainguard International, 1079 Culpepper Drive, Conyers, GA, 30094, Phone: 949-675-2811

I. **Paint Guide**

SURFACES	FRAZEE
Interior	126 Aro-Thane S/G
Interior	129 Aro-Thane L/S
Interior	022 LoGlo
Exterior	215 Royal Supreme
Exterior	146 Aro-Thane Gloss
Exterior	136 Aro-Thane S/G

J. **Primer Guide**

SURFACES	FRAZEE
Interior – New Gypsum Board	Zinsser 123 Primer/Sealer
Interior – New Wood	Zinsser 123 Primer/Sealer
Interior – New Metal Surfaces	C309 Universal Metal Primer
Interior – Previously Painted Gyp Board, Wood	Zinsser 123 Primer/Sealer
Interior – Previously Painted Plaster, Metal	Zinsser 123 Primer/Sealer
Exterior – New and Previously Painted Wood	Zinsser 123 Primer/Sealer
Exterior – New and Previously Painted Stucco, Concrete, and Plaster	Zinsser 123 Primer/Sealer
Exterior – New and Previously Painted Metal	Zinsser 123 Primer/Sealer

PART 3 - EXECUTION

3.01 EXAMINATION

A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing of conditions potentially detrimental to proper application. Do not commence until satisfied that defects and deficiencies in surfaces have been rectified.

3.02 PROTECTION

A. Adequately protect other surfaces from paint and damages. Repair damages as a result of inadequate or unsuitable protection.

B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation areas.

C. Place cotton waste cloths and materials which may constitute a fire hazard in closed metal containers and remove daily from site.

D. Remove or cause to have removed, electrical plates, fittings, fastenings, escutcheons, and hardware prior to painting operations. These items are to be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvents or other harsh cleansers on surfaces which could be damaged by such use of materials.

3.03 PREPARATION OF SURFACES

A. Thoroughly clean surfaces to be painted with hydro-cleaning process to remove chalk, dirt and other deleterious materials where such cleaning methods are practical. Spot prime before application of finish coats.

B. Remove dirt, grease and oil from canvas and cotton covered insulated materials such as pipes and ducts.

C. On surfaces to be cleaned which cannot be hydro cleaned, where possible, wash with solution of TSP and thoroughly rinse.

D. Patch and prime cementitious materials.

E. Remove contamination from gypsum board surfaces and prime to conceal defects. Paint after defects have been remedied.

F. Remove surface contamination and oils from zinc coated/galvanized surfaces, wash with solvent, apply etching primer or as recommended by paint manufacturer and confirmed with metal manufacturer.

G. Remove dirt, loose scale, powder, mortar and other foreign matter from cementitious surfaces which are to be painted or to receive sealer. Remove oil and grease with TSP solution, rinse well and allow to thoroughly dry.

H. Remove stains from cementitious surfaces caused by weathering of corroding materials with a solution of sodium metasilicate after being thoroughly wetted with water. Allow to thoroughly dry.

I. Fill hairline cracks, small holes and imperfections. Smooth off to match adjacent surfaces. Smooth off to match adjacent surfaces. Wash and neutralize high alkali where they occur.

J. Remove grease, rust, scale, dirt and dust from steel and iron surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting or other method necessary, practical and in accordance with Steel Structures Painting Council.

K. Clean non-primed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring welded joints, bolts and nuts are similarly cleaned.

Prime surfaces to indicate defects. Paint after defects have been remedied.

L. Sand and scrape shop primed steel surfaces to remove loose primer, and rust. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare surfaces.

M. Wipe off sanding dust and grit from miscellaneous wood and carpentry items prior to priming. Spot coat knots, pitch steaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Back prime interior and exterior woodwork.

N. Doors:

1. Painting Contractor shall not remove or reinstall any door hardware.

2. Except for door hinges, painting of doors must be completed prior to installation of hardware.

3.04 APPLICATIONS

A. Apply each coat at proper consistency.

B. Each coat of paint is to be slightly darker than preceding coat unless otherwise directed, or finish is clear.

C. Sand lightly between coats to achieve required finish.

D. Do not apply finishes on surfaces that are not sufficiently dry.

E. Allow each coat to dry before following coats are applied.

F. Backprime wood which is to receive paint or enamel paint, with enamel undercoater paint.

G. Prime top and bottom edges of wood doors with enamel undercoater when they are to be painted.

H. Apply flame retardant coating to the wood surface prior to applying stain and/or paint per manufacturer's instructions. Furnish certification of application of flame-retardant coating.

3.05 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to mechanical and electrical sections of these specifications, as well as Drawings, with respect to painting and finishing requirements, color coding, identification banding of equipment, ductwork, piping and conduit.

B. Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.

C. Finish paint primed equipment to colors selected.

D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with a pre-finished coating, or are not exposed-to-view.

E. Replace identification markings on mechanical and electrical equipment when painted

over or spattered.

F. Paint interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sightline. Paint dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels, as applicable.

G. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.

H. Color code equipment, piping, conduit, and exposed ductwork of mechanical and electrical work. Color banding and identification shall include flow arrows, naming, numbering, stenciling, etc.

3.06 CLEANING

A. As work progresses and upon completion, promptly remove paint where spilled, splashed, smeared and splattered.

B. During progress of work, keep premises free from unnecessary accumulations of tools, equipment, surplus materials and debris.

C. Upon completion of work, leave premises neat and clean, to satisfaction of Owner.

END OF SECTION

10 00 00

SPECIALTIES

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Site signs, room identification (door) signs, and code-required informational signs, except electrical light exit signs.

B. Related Work Not Included: Electrical light exit signs.

1.02 SUBMITTALS

A. Provide all submittals in accordance with the requirements of Section 01 33 00.

B. Product Data: Submit manufacturer's technical data related to materials, component dimensions, profiles, finishes, and installation.

C. Shop Drawings: Submit shop drawings for fabrication and erection of site signs. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

1. Submit full-scale layout for each sign larger than 48 inches in any dimension required for review of wording, spacing, and letter design.

D. Samples: Submit sample of each product and material indicating color, finish, pattern, and texture.

1. Submit samples of each color and finish of exposed materials and accessories required for specialty signs.

2. Submit one full-size sample sign of type, style, and color specified, including method of attachment. If accepted, sample will become part of the job.

1.03 QUALITY ASSURANCE

A. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material.

B. Design Data: Design, fabricate, and install exterior signs to withstand a wind pressure of 100 mph on the total sign area in all directions.

C. Mock-up: Construct full-size mock-up, in medium of supplier's choice, of school site sign for approval.

1.04 DELIVERY, STORAGE AND HANDLING

A. Protect signs components and surfaces against damage during transportation and unloading.

1.05 WARRANTY

A. Provide written warranty to maintain, repair and replace products and materials for one year following Notice of Completion date, without additional cost to Owner, as specified in

Section 01 78 30 – Warranties, Guarantees, and Bonds. Provide 20-year life expectancy for legibility, color retention and resistance to climatic elements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products from Best Sign Systems - 1-800-235-2378, or ASI Sign Systems - 800-247-7732, or equal.

2.02 MATERIALS

A. All signage shall conform to CBC, 2019, Title 24, Part 2, Sections 11B-603.2.3, 11B-604.8.1.2, and 11B-703. Tactile exit signage shall be provided per Section 1011.4.

B. Fiberglass - Glass fiber reinforced thermosetting resin – 1/4-inch 2.48 lb/SF.

C. 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-703.5.9
2. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.5.8.

D. Character and Letters:

1. Character Type: Characters on signs shall be raised 1/32-inch (0.794 mm) minimum and shall be Sans Serif uppercase characters accompanied by California Contracted Grade 2 Braille, see Braille symbols paragraph 2.02D.5.

2. Character Size: Raised characters shall be a minimum of 5/8-inch (15.9mm) and a maximum of 2 inches (51 mm) high.

3. Finish and Contrast: Contrast between characters, symbols and their background shall be non-glare finish. Characters and symbols shall contrast with background, either light on a dark background or dark on a light background, per CBC, Title 24, Part 2, Section 11B-703.5.1, Section 11B-703.6.2, and Section 11B-703.7.1.

4. Proportions: Visual characters on signs shall be selected from fonts where the width of the uppercase letters "O" is 60 percent minimum and 110 percent maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15 percent maximum of the height of the character, per CBC 2019, Title 24, Part 2, Sections 11B-703.2.4, 11B-703.2.6, 11B-703.5.4, and 11B-703.7.

   All letters measured must be uppercase. After choosing a type style to test, begin by printing the letters, **I**, **X** and **O** at 1-inch height. Place the template's 1:1 square over the **X** or **O**, whichever is narrower. If the character is not wider than 1 inch, nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the **I** is too broad, and the 1:10 rectangle to see if it is too narrow. If all the tests are passed, the type style is compliant with proportion codes.

5. Braille Symbols: California Contracted Grade 2 Braille shall be used wherever Braille is required in other portions of these standards and per CBC 2019, Title 24, Part 2, Sections 11B-703.3, 11B-703.3.1, and 11B-703.3.2.

D. Signage and Graphics: Raised Characters shall comply with CBC Section 11B-703.2.

1. Depth: It shall be 1/32 inch (0.8mm) minimum above their background and shall be sans serif uppercase and be duplicated in Braille.

2. Height: It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51mm) maximum based on the height of the uppercase letter “I”. CBC Section 11B-703.2.5.

3. Finish and Contrast: Characters and their background shall have a non-glare finish. Background or dark characters on a light background. CBC Section 11B-703.5.1.

4. Proportions: It shall be selected from fonts where the width of the uppercase letter “O” 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 11B-703.2.7 and 11B-703.2.6.

5. Character Spacing: Spacing between individual raised characters shall comply with CBC Section 11B-703.2.7 and 11B-703.2.8.

6. Format: Text shall be in a horizontal format. CBC Section 11B-703.2.9

7. Braille: It shall be contracted (Grade 2) and shall comply with CBC Section 11B-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.

8. Mounting Height: Tactile characters on signs 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. CBC Section and Figure 11B-703.4.1.

9. Mounting Location: A tactile sign shall be located per CBC Section and Figure 11B-703.4.2 as follows:

a. alongside a single door at the latch side.
b. on the inactive leaf at double doors with one active leaf.
c. to the right of the right-hand door at double doors with two active leafs.
d. 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.
e. so that a clear floor space of 18” x 18” minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.

2.03 SIGNS

A. Exterior Room Identification Signs: Equal to Best Sign Systems FG, Graphic Blast®, Format: borderless. Color as selected by Architect from manufacturer's standard colors. Color to contrast building background. Sign material 1/4-inch thick, non-glare, Fiberglass, 6” x 9” (unless detailed otherwise) with 1/2-inch radius rounded corners and beveled edges. Tactile character/symbols shall be raised 1/32-inch from sign face.

All text shall be accompanied by California Contracted (Grade 2) Braille. Provide one (1) sign per exterior door. Each sign to bear a room number and up to 16 letter text.

Unless shown otherwise on the Drawings, room number shall be 2 inches high, text shall be 1 inch high. Letter styles shall be Sans Serf, medium. Signs shall comply with CBC 2019, Title 24, Part 2, Sections 11B-216 and 11B-703.

B. Interior Room Identification Signs: Equal to Best Sign Systems FG, Graphic Blast®, Format- as specified in drawings. Color as selected by Architect from manufacturer's standard colors. Color to contrast building background. Sign material 1/8-inch, non-glare, phenolic ES plastic laminate, 6" x 9" with 1/2-inch radius rounded corners and beveled edges.

Tactile character/symbols shall be raised 1/32-inch from sign face. All text shall be accompanied by California Contracted Grade 2 Braille.

Provide one sign per interior door. Each sign to bear a room number and up to a 16-letter text. Unless shown otherwise on the Drawings, room number shall be 2 inches high, text shall be 3/4- inch high. Letter styles shall be Sans Serf, medium. Signs shall comply with CBC 2019, Title 24, Part 2, Sections 11B-216 and 11B-703.

C. Toilet Room Signs: Equal to Best Sign System FG, Graphic Blast®. Provide 1/4-inch thick, non-glare fiberglass with International symbols for WOMEN and MEN and RESTROOM. Locate 5'-0" above floor to center line of sign. (No Braille or raised Pictograms on door signs.) Sign color to contrast 70% with door leaf.

1. For men provide a door-mounted 12-inch equilateral triangular sign per CBC, Title 24, Part 2, Section 11B-703.7.2.6.1.

2. For women provide a door-mounted 12-inch diameter circular sign per CBC, Title 24, Part 2, Section 11B-703.7.2.6.2.

3. For unisex toilets, provide a door-mounted sign consisting of a circle 1/4-inch thick and 12 inches in diameter with a 1/4-inch thick triangle, 12 inches in diameter, with a vertex pointing upward, superimposed on the circle. Triangle shall contrast in color with circle, and circle shall contrast 70% with door leaf. Entire background color of geometric symbol sign must contrast with door. Sign shall comply with CBC, Title 24, Part 2, Section 11B-703.7.2.6.3.

D. Site Signs

1. Equal to Nelson-Harkins ES200 Series: Baked enamel finish with silk screen copy and Sans Serf medium letter style. Single post and double post construction where indicated on the Drawings. 2"x 2" posts (post design 'A') enclosed with a .090 aluminum double panel background. Where shown on the Drawings, provide Nelson-Harkins RS 250 Series Regulatory Signs with square corners, silk screen copy, and post 2" x 2" Design 'A', mounting PM. If bottom of sign is less than 80 inches above finish grade, edges of sign shall be rounded, minimum radius of 1/8-inch.

OR

1. Equal to Stop Signs and More, Carlsbad, CA., Phone (888) 931-1793. Parking stall signs shall be heavy gauge aluminum .063 gauge for parking, direction, and information. and .080 for stop signs with 3M Engineer Grade Reflective sheeting

and 3M inks. Corners shall be rounded minimum1/2-inch. Posts shall be square tube 2-inch x 2-inch .062 wall thickness extruded aluminum tube.

E. Occupancy Load Sign: Size as indicated on Drawings to match sign per paragraph 2.03B above, reading: “MAXIMUM OCCUPANCY 000 PERSONS”, Verify occupant number with Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Locate signs where indicated on Drawings, and at heights as detailed, or where required by CBC, Title 24, using mounting methods appropriate to application and in compliance with manufacturer's instructions.

B. Install signs level, plumb, and at required height.

C. Interior Wall and Door Mounted Signs:

1. Glass Surfaces or Doors: Use double-sided foam tape and liquid silicone adhesive. At glass surfaces, provide a blank 9" x 9", 1/8-inch sign panel with 1/2-radius corners, at the opposite side of glass. Color to match sign panel.

2. Irregular, Porous, or Vinyl-Covered Surfaces: Use one-way tamper proof screws, painted to match signs, in pre-drilled holes. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.

3. Brick, Masonry, and Concrete Surfaces: Use one-way tamperproof screws, painted to match signs, in pre-drilled holes. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.

D. Exterior Wall and Door Mounted Signs:

1. Wood, or Plaster Surfaces: Use tamper proof screws in pre-drilled holes; one at each corner, and set in liquid silicone adhesive. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.

2. Brick, Masonry, Plaster and Masonry Surfaces: Use tamper proof screws in pre-drilled holes; one at each corner, and set in liquid silicone adhesive. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.

3.02 CLEANING

A. Clean sign and surrounding surfaces to remove all dirt and debris from work of this section.

END OF SECTION

SECTION 10 28 13

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Toilet accessories including attachment devices and required rough-in frames as indicated on the Drawings and specified herein.

B. Related Work:

1. Blocking and unframed mirrors.

1.02 SUBMITTALS

A. Samples: Submit one sample, if requested, of each item and model specified. If approved sample may be incorporated into project.

B. Manufacturer's catalog and data sheets, parts list, and installation requirements for each unit specified.

C. Maintenance, operation instructions and keys required for each type of equipment and lock.

1.03 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. Products by other manufacturers may be provided, if approved equal by Architect.

B. Accessories shall be products of a single manufacturer. Keyed (tumbler lock) accessories shall be keyed alike with the exception of coin receiving boxes on vending equipment.

1.04 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 clean-up of installation.

1.05 GUARANTEE

A. Mirrors guaranteed 15 years against silver spoilage. Accessories guaranteed to be free from defects in workmanship and material for a period of one year, as specified in

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Contract documents are based on Bobrick Washroom Equipment, Inc., and are listed as a standard of quality. Products by other manufacturers may be acceptable if approved equal by Architect in terms of design, function, materials and quality of workmanship.

B. Accessories shall be product of one manufacturer. Keyed accessories shall be keyed alike with exception of coin receiving boxes on vending equipment. Provide recessed accessories at all accessible compartments.

C. Toilet Accessories required to be accessible shall be mounted at heights according to CBC, Title 24, Part 2, Section 11B-213.

D. Dispensing controls must be accessible without pinching, grasping, or twisting of the wrist, per CBC, Title 24, Part 2, Section 11B-309.4

2.02 REFERENCES

A. 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. toe clearance 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. Ambulatory accessible compartments shall be provided where there are six or more toilet compartments, or where the combination of urinals and water closets totals six or more fixtures. Such compartments shall be prided in the same quantity as wheelchair accessible compartments per CBC Section 11B-213.3.1 and shall comply with CBC Section 11B-604.8.2.

4. Door and door hardware for accessible compartments shall be that if the approach is to the latch side of an ambulatory compartment door, clearance between the door side of the compartment and any obstruction shall be 44” minimum. 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 accessible compartment door near the latch.

6. Ambulatory Accessible Toilet Compartment doors shall not swing into the clear floor space or clearance required for any fixture or into the minimum required compartment area. CBC Section 11B-604.8.2.2.

7. Elements of Sanitary facilities shall be mounted at locations in compliance with CBC Sections 11B-602 through 11B-612.

8. Grab bars in 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 ½" between the grab bar and the wall.
   - 1 ½' minimum between the grab bar and projecting objects below and at the ends.
   - 12" minimum between the grab bar and projecting objects above.

C. Following (but not limited to) operable parts (including coin slots) of table room accessories to be mounted within 40 inches (1,016 mm) max above finish floor per CBC 2019, Title 24, Part 2, Section 11B-603.5:

1. Towel dispensers

2. Sanitary napkin dispenser/receptacles

3. Waste receptacles

4. Other similar dispensing and disposal fixtures

5 Bottom of reflective surface of mirrors to be 40 inches (1,0616 mm) maximum above finish floors per CBC, Title 24, Part 2, Section 11B-603.3

2.03 ACCESSORIES

A. Recessed Toilet Tissue Dispenser: Bobrick B-3888

B. Surface Mounted Soap Dispenser: B-2111

C. Recessed Electric Hand Dryer: World Dryer, SLIMdri, single phase 120V, color coated white, surface mounted not to exceed 4" from face of wall.

D. Stainless Steel Welded Frame Mirror: B-165
One-piece channel frame, 1/2" x 1/2" x 3/8" type 430 stainless steel with bright-polished finish and mitered corners. Phillips-head frame screw. No. 1 quality 1/4**"** glass mirror. See Specifications section 08 83 00 for mirror. Mirror corners and back protected by shock-absorbing material. Back is galvanized steel secured to conceal wall hander with theft resistant locking device.

E. Frameless Stainless-Steel Mirrors: B-1556

F. Recessed Napkin Dispenser: B-3706 25

G. Surface Mounted Sanitary Napkin Disposal: B-2706 50

H. Recessed Toilet Seat Cover Dispenser: B-301, Surfaced mounted B-221

Constructed of type 304 Stainless Steel, welded construction. Door shall be equipped with full-length piano hinge and tumbler lock.

I. Stainless Steel Shelf: B-298
Constructed of type 304 Stainless steel. Mounting brackets welded to shelf shall be 16-gauge stainless steel. Shelf shall be 8 inches wide with 3/4-inch return edges. Front edge shall be hemmed for safety.

J. Surface Mounted Paper Towel Dispenser: B-2620

K. Shower Bench: B-5181

Folding shower seat shall be constructed of type 304 stainless steel. Seat shall be ½" thick, solid phenolic with integral slots for water drainage.

L. Grab Bars:

1. 1-1/2 inches diameter, 48 inches length: B-6806x48

2. Same as (1.) above, 36 inches length: B-6806x36

3. Two-wall Shower Grab Bar: B-68616.99

Flanges shall be 1/8" thick stainless-steel plate and each shall have two screw holes for attachment to wall. Flange covers shall be 22-gauge stainless steel and snap over mounting flange to conceal screws.

M. Mop Rack: B-223x36

Constructed of type 304 Stainless Steel, 36 inches in length, and have spring loaded rubber cam holders.

N. Recessed Paper Towel Dispenser and Trash Receptacle Combination: B-43944.

PART 3 - EXECUTION

3.01 INSPECTION

A. Check wall opening for correct dimensions, plumbness of blocking, or frames, and other preparation that would affect installation of accessories.

3.02 INSTALLATION

A. Install manufacturers recommended anchor system for grab bars.

B. Refer to Drawing details for mounting heights.

C. Conceal evidence of drilling, cutting, and fitting on adjacent finishes.

D. 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.

3.03 ADJUSTING

A. Adjust accessories for proper operation.

3.04 CLEANING

A. Clean and polish exposed surfaces prior to final inspection.

3.05 PROTECTION

A. Deliver accessory schedule, keys and parts manual as part of project-closeout documents. For Owner's permanent records, provide two sets of the following items of manufacturer's literature:

1. Technical Data sheets of each item used for the project.

2. Service and Parts Manuals.

3. Name of local representative to be contacted in the event of need of field service or consultation.

END OF SECTION

26 00 00

ELECTRICAL

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 26 05 00

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to, the following:

1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
2. General Provisions and Requirements for electrical work.
3. Division-1.

B. Organization of the Specifications into Divisions, Sections and Articles, and arrangement of Drawings shall not control the Contractor in dividing the Contract Work among Subcontractors or in establishing the extent of work to be performed by any trade.

1.02 GENERAL SUMMARY OF ELECTRICAL WORK

A. The Specifications and Drawings are intended to cover a complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.

B. Refer to the Drawings and Shop Drawings of other trades for additional details, which affect the proper installation of this work. Diagrams and symbols showing electrical connections are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.

C. Before submitting a bid, the Contractor shall become familiar with all features of the Building Drawings and Site Drawings, which may affect the execution of the work. No extra payment will be allowed for failure to obtain this information.

D. If there are omissions or conflicts between the Drawings and Specifications, clarify these points with the Owner's Representative before submitting bid and before commencing work.

E. Provide work and material in conformance with the Manufacturer's published recommendations for respective equipment and systems.

1.03 LOCATIONS OF EQUIPMENT

A. The Drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structure conditions encountered.

B. Where outlets are placed on a wall, locate symmetrically with respect to each other and other features or finishes on the wall.

C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without cost to the Contract, providing the change is ordered before the conduit runs, etc., and work directly connected to same is installed and no extra materials are required.

D. Coordinate and cooperate in every way with other trades in order to avoid interference and assure a satisfactory job.

E. The location of the existing utilities, building, equipment and conduit shown on the Drawings is approximate. Verify exact locations and routing of existing systems by potholing all trench routes prior to digging the trench. Pothole at least 100 feet ahead of the actual trenching to allow space to alter the new conduit routing to accommodate existing conditions.

F. Underground Detection Services Existing Utility Structures

1. Services shall be provided utilizing the latest detection equipment available. Services shall be performed by a company regularly engaged in the business of existing Under-ground Utility Structure Detection for the past 5-years.
2. Prior to excavation the following work shall be performed:

    a. Contractor to mark trenching locations and indicate width and depth.
    b. Locate, by way of vertical and horizontal control dimensions, existing subgrade petroleum product pipes, process piping, conduits, sewer, water, gas, storm drain, electrical, telephone, and irrigation lines in the affected areas of Contract construction work.
    c. Arrange and meet with the Owner's Representative to review existing underground conditions.
    d. The proposed route of each excavation shall be continuously surveyed along the entire excavation path using Ground-Penetrating Radar (GPR) operating from the surface grade. The GPR shall detect and map existing underground metal and non-metal private and public utility lines, pipes, conduits, conductors, etc. The GPR shall identify the horizontal and vertical location of existing underground conditions located at a depth of up to 3 meters below finish grade and located with a vertical and horizontal accuracy within ± 12-inches of actual condition.

3. Exercise extreme caution in excavating and trenching on this site to avoid existing under-ground utilities, and to prevent hazard to personnel and/or damage to existing under-ground utilities or structures. These Drawings and Specifications do not include necessary components for construction safety, which is the responsibility of the Contractor.
4. Repair/replace, without additional cost to the Contract, and to the satisfaction of the Owner any existing work damaged that was identified in the Record Drawings provided; Identified by the Owner’s Representative; Identified by the Underground Detection Services performed; or any existing work damaged as a result of failure to comply with all the Referenced Requirements.
5. The Contractor shall contact Underground Service Alert (USA) of Southern California, at least 48 hours prior to excavation, and shall not excavate until verification has been received from the USA and that public utilities serving the site have been located and marked.

G. The locations of existing underground utilities, where shown on Drawings, are shown diagrammatically and have not been independently verified by the Owner, the Owner’s Representative, the Architect/Engineer. The Owner, the Owner’s Representative, and

the Owner's Architect/Engineer are not responsible for the location of underground utilities or structures, whether or not shown or detailed and installed under this or any other Contracts. The Contractor shall identify each existing utility line prior to excavation and mark the locations on the ground of each existing utility line.

1.04 QUALITY ASSURANCE

A. Work and materials shall be in full accordance with the latest rules and regulations as follows. The following publications shall be included in the Contract Documents Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract definition:

1. California Code of Regulations Title 24.
2. California Part 3 "California Electrical Code" CEC, Title 24 and Title 8 "Division of Industrial Safety".
3. California Building Code - CBC.
4. The California Electrical Code - CEC.
5. The National Life Safety Code.
6. National Fire Protection Agency-NFPA.
7. Underwriter's Laboratory-UL.
8. Other applicable State and Local Government Agencies Laws and Regulations.
9. Electrical Installation Standards National Electrical Contractors Association (NECA) and National Electrical Installation Standards (NEIS):

    a. NECA/NEIS-1: Standard of Practices for Good Workmanship in Electrical Contracting
    b. NECA/NEIS-101: Standard for Installing Steel Conduit (Rigid, IMC, etc.)
    c. NECA/NEIS-111: Recommended Practice Installing Nonmetallic Raceways
    d. NECA/FOA-301: Standards for Installing and Testing Fiber Optic Cables
    e. NECA/NEIS-305: Standard for Fire Alarm System Job Practice
    f. NECA/NEIS-407: Recommended Practice for Installing Panelboards
    g. NECA/NEIS-409: Recommended Practice for Installing and Maintaining Dry-Type Transformers
    h. NECA/BICSI-568: Standards for Installing Commercial Building Telecommunications System

B. All material and equipment shall be new and shall be delivered to the site in unbroken packages. All material and equipment shall be listed and labeled by Underwriters Laboratories or other recognized Testing Laboratories, where such listings are available. Comply with all installation Requirements and restrictions pertaining to such listings.

C. Work and material shown on the Drawings and in the Specifications is new and included in the Contract unless specifically indicated as existing or N.I.C. (not in Contract).

D. Keep a copy of all applicable codes and standards available at the job site at all times for reference while performing work under this Contract. Nothing in Plans or Specifications shall be construed to permit work not conforming to the most stringent of Building Codes.

E. Where a conflict or variation occurs between applicable Codes, Standards and/or the Contract Documents, the provisions of the most restrictive provision shall become the Requirement of the Contract Documents.

1.05 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. General

1. Review of Contractor's submittals is for General Conformance with the design concept of the Project and General Compliance with the information given in the Contract Documents. Any action shown is subject to the Requirements of the Plans and Specifications. Contractor is responsible for quantities; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades and satisfactory performance of their work.
2. The Contractor shall review each submittal in detail for compliance with the Requirements of the Contract Documents prior to submittal. The Contractor shall "Ink Stamp" and sign each item of the submittal with a statement "CERTIFYING THE SUBMITTAL HAS BEEN REVIEWED BY THE CONTRACTOR AND COMPLIES WITH ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS". The Contractor shall clearly and specifically identify each individual proposed substitution, substitution of equal or proposed deviation from the Requirements of the Contract Documents with a statement "THIS ITEM IS A SUBSTITUTION".
   The burden of research, preparation of calculations and the furnishing of adequate and complete Shop Drawings information to demonstrate the suitability of Contractor’s proposed substitutions and suitability of proposed deviations from the Contract Documents is the responsibility of the Contractor.
3. Departure from the submittal procedure will result in resubmittals and delays. Failure of the Contractor to comply with the Submittal Requirements shall render void any acceptance or any approval of the proposed variation. The Contractor shall then be required to provide the equipment or method without variation from the Contract Documents and without additional cost to the Contract.
4. The Contractor at no additional cost or delays to the Contract shall remove any work, material and correct any deficiencies resulting from deviations from the Requirements of the Contract Documents not approved in advance by the Owner prior to commencement of work.
5. Shop Drawings submitted by the Contractor, which are not specifically required for submittal by the Contract Documents, or Contractor Shop Drawings previously reviewed and resubmitted without a written resubmittal request to the Contractor, will not be reviewed, considered, or commented on. The respective Shop Drawing submittal/resubmittal will not be returned to the Contractor and will be destroyed without comment or response to the Contractor. The respective submittal shall be considered null and void as being not in compliance with the Requirements of the Contract Documents.
6. Refer to Division-1 for Additional Requirements.

B. Material Lists and Shop Drawings

1. Submit material list and Equipment Manufacturers for review within 35 days of award of Contract. Give name of Manufacturer and where applicable, brand name, type and/or catalog number of each item. Listing of more than one Manufacturer for any one item of equipment, or listing items "as specified", without both make and model or type designation, is not acceptable. Shop Drawings shall not be submitted before review completion of Manufacturers list. The right is reserved to require submission of samples of any material whether or not particularly mentioned herein.
2. After completion of review of the Material and Equipment Manufacturers list, submit Shop Drawings for review within 90 days after return of the review comments for Contractor Material List, submit all Shop Drawings for review.

Shop Drawings shall be submitted in completed bound groups of materials (i.e., all lighting fixtures or all switchgear, etc.). The Contractor shall verify dimensions of equipment and be satisfied as to fit and that they comply with all Code Requirements relating to clear working space about electrical equipment prior to submitting Shop Drawings for review. Submittals, which are intended to be reviewed as substitution or departure from the Contract Documents, must be specifically noted as such. The Requirements of the Contract Documents shall prevail regardless of the acceptance of the submittal.

3. Shop Drawings shall include catalog data sheets, instruction manuals, Dimensioned Plans, Elevations, Details, Wiring Diagrams and descriptive literature of component parts where applicable. Structural calculations and mounting details, signed by a Structural Engineer registered by the State of California, shall be submitted for all equipment weighing over 400-pounds and shall be in compliance with Title 21 of the California Code of Regulations.
4. Each Shop Drawing item shall be identified with the Specification Section and paragraph numbers, lighting fixture types and Drawing sheet numbers; the specific Shop Drawing is intended to represent. Shop Drawings 11-inches x 17-inches or smaller in size shall be bound in three-ring binders. Divider tabs shall be provided in the three-ring binders identifying and separating each separate Shop Drawing submittal item. Shop Drawings larger than 11-inches x 17-inches, Shop Drawing pages/sheets submittals shall be sequentially numbered with unique alphanumeric numbering system to facilitate correspondence referencing identification of individual sheets.
5. The time required to review and comment on the Contractor's submittals will not be less than 14 calendar days, or more than 21 calendar days after receipt of the submittals at the office of FBA Engineering. The review of Contractor submittals and return to Contractor of submittals with review comments will occur in a timely manner conditioned upon the Contractor complying with all of the following:

    a. The submittals contain complete and accurate information, complying with the Requirements of the Contract Documents.
    b. Contractor's submittals are each marked with Contractor's approval "Stamp", and with Contractor signatures.
    c. The submittals are received in accordance with a written, Shop Drawing submittal schedule for each submittal. The Contractor distributes the schedule not less than 35-day calendar days in advance of the Shop Drawing submittals, and the schedule identifies the calendar dates, the Contractor will deliver the various submittals for review.

6. Shop Drawings shall include the Manufacturers projected days for shipment from the factory of completed equipment, after the Contractor releases the equipment for production. It shall be the responsibility of the Contractor to ensure that all material and equipment is ordered in time to provide an orderly progression of the work. The Contractor shall notify the Owner's Representative of any changes in delivery, which would affect the Project completion date.
7. Submittal Identification

    a. Each submittal shall be dated: with submittal transmission date; sequentially numbered and titled with submittal contents identification and applicable Specification/Drawing references *(i.e., Submittal dated: 05/12/98 Submittal #4 Contents: Branch Circuit Panelboards Sheet #E5.1 and Transformers Specification Section 260500 Paragraph 2.11, etc.)*.
    b. Each resubmittal shall be dated: with original submittal date and resubmittal transmission dates; sequentially numbered with original submittal number and sequential resubmittal revision number and titled

with submittal contents identification and applicable Specifications/ Drawing references *(i.e., Original Submittal Date: 05/12/98 Resubmittal Date: 10/9/98 Original Submittal #4 Resubmittal Revision R2 Contents: Transformer Resubmittal Specification Section-260500 Paragraph 2.11, etc.)*

C. The Contractor shall be responsible for incidental, direct and indirect costs resulting from the Contractor's substitution of; or changes to; the specified Contract Materials and Work.

D. Portable or Detachable Parts: The Contractor shall retain in his possession and shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of Contract Work. These parts shall then be delivered to the Owner's Representative with an itemized receipt.

E. Record Drawings (Additional Requirements)

1. Provide and maintain in good order a complete set of Electrical Contract "Record" prints. Changes to the Contract to be clearly recorded on this set of prints. At the end of the project, transfer all changes to one set of transparencies to be delivered unfolded to the Owner's Representative.
2. The actual location and elevation of all buried lines, boxes, monuments, vaults, stub-outs and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved bench-marks. If any necessary dimensions are omitted from the Record Drawings, the Contractor shall, at the Contractor's own expense, do all excavation required to expose the buried work and to establish the correct locations.
3. The Contractor shall keep the "Record" prints up to date and current with all work performed.
4. Refer to Division-1 for Additional Requirements.

1.06 CLEANING EQUIPMENT, MATERIALS, PREMISES

All parts of the equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish.

1.07 JOB CONDITIONS - PROTECTION

Protect all work, materials, and equipment from damage from any cause whatever and provide adequate and proper storage facilities during the progress of the work. Provide for the safety and good condition of all the work until final acceptance of the work by the Owner and replace all damaged or defective work, materials, and equipment before requesting final acceptance.

1.08 EXCAVATION, CUTTING, BACKFILL AND PATCHING ADDITIONAL REQUIREMENTS

A. General

1. Perform excavation, cutting, backfill, core drilling, directional boring, and patching of the construction work required for the proper installation of the electrical work.
2. Patching shall be of the same material, thickness, workmanship and finish as existing and accurately match surrounding work to the satisfaction of the Owner's Representative.

B. Excavation Temporary Cover

1. Excavations for Contract Work occurring in streets, vehicular drive areas, parking lots, sidewalks or any paved surface; provide temporary steel plating and shoring support for the plates, to completely cover the excavations under one or more of the following conditions:

   a. Excavation shall not remain "open" for more than 4-calendar days; provide temporary plating.
   b. Excavation shall not be "open" over weekends (Saturday, Sunday) or Holidays, provide temporary plating.

2. The temporary plating shall be a minimum of 0.75-inch thickness steel, but in no case shall the thickness be less than required to support AASHO-H20 traffic loading.
3. Provide a minimum of two 100% open lane(s) (10 feet width) for vehicular traffic at all times during construction, for vehicle access to all areas.

1.09 IDENTIFICATION

A. Equipment Nameplates

1. Panelboards, terminal cabinets, circuit breakers, disconnect switches, starters, relays, time switches, contactors, push-button control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.
2. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the Manufacturer with “Electric-Arc-Flash” warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel while energized. The sign shall instruct Personnel to wear the correct Protective Equipment/clothing (PPE) when working “Live” or operating “Live” electrical equipment and circuits.
3. Nameplates shall be engraved laminated phenolic. Shop Drawings with dimensions and format shall be submitted before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.
4. Provide black-on-white laminated plastic nameplates engraved in minimum ¼-inch high letters to correspond with the designations on the Drawings. Provide other or additional information on nameplates where indicated.

B. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions (minimum character size not less than 0.188 inch. Engraving shall indicate circuits and equipment controlled or connected):

1. More than two devices under a common cover-plate.
2. Lock switches.
3. Pilot switches.
4. Switches in locations from which the equipment or circuits controlled cannot be readily seen.
5. Manual motor starting switches.
6. Where so indicated on the Drawings.
7. As required on all control circuit switches, such as heater controls, motor controls, etc.

8. Receptacles other than standard 15-amp 120-volt duplex receptacles; shall indicate circuit voltage, ampere, phase and source circuit number.
9. Where outlets or switches are connected to emergency power circuit; provide panelboard and circuit number engraved on plate.

C. For equipment and access doors or gates to equipment containing or operating on circuits of more than 240 volts nominal, provide red-on-white laminated warning signs engraved in ½-inch high letters to read: "DANGER - 480 *(or applicable voltage)* VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".

D. Wire and Cable Identification

1. Provide identification on individual wire and cable including signal systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and controls circuit.
2. Permanent identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.

   a. Individual wire and cable larger than #6 AWG or 0.25-inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alphanumeric characters, character height 0.25 inch. Attach identification tags with plastic “tie” wraps, minimum of two for each tag. As manufactured by Almetek Industries- “EZTAG” Series; or TECH Products - “EVERLAST” Series.
   b. Individual wire and cable #6 AWG and smaller or smaller than 0.25-inch diameter, shall be provided with water and oil resistant, flexible, self-laminating pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification. As manufactured by: Brady Identification; or 3M; or Panduit.
   c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).

3. Install permanent identification after installation/pulling of wire/cable is complete, to prevent loss or damage to the identification.

E. Cardholders and cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the in-side of panel door. List of circuits shall be typewritten on card. Circuit description shall include name or number of circuits, area, and connected load.

F. Junction and pull boxes shall have covers stenciled with box number when shown on the Drawings, or circuit numbers according to panel schedule. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

1.10 TESTING

A. The Contractor shall obtain an independent Testing Laboratory that will provide all instrumentation and tests on the electrical system and equipment as hereinafter described and further directed by the Owner’s Representative. The test shall be performed after the completion of all electrical systems included in the Contract Scope of Work. All tests shall be recorded and documented and submitted to the Owner’s Representative for review.

1. Test for Phase to Ground and Neutral Condition:

    a. Open main service disconnects.
    b. Isolate the system neutral from ground by removing the neutral disconnects link located in the service switchboard.
    c. Close all submain disconnects.
    d. Close all branch feeder circuit breakers.
    e. Turn all switches to “on” position, unplug all portable equipment from outlet receptacles.
    f. Measure the resistance of each phase to ground and phase too neutral. A properly calibrated "megger" type test instrument shall be used. The test voltage shall be a nominal 500 volts.
    g. Record all readings after one-minute duration and document into a complete report.

2. Isolating Grounds: In the event that low resistance ground neutral connections are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore the resistance values to an accept-able value.

B. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.

1. Perform "fall-of-potential" 3-point tests on the main grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5. when suitable locations for test rods are not available, a low resistance dead earth or reference ground shall be utilized.
2. Perform the 2-point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

C. All Equipment and Personnel required for testing shall be furnished by the Contractor.

D. The testing, calibrating and setting of all ground and ground fault equipment circuit breakers, device protection relays, and meters adjustable settings shall be by an independent Testing Laboratory. Set as recommended by the respective Manufacturer and Coordination Study to be coordinated with other protection devices within the electrical design. Bound and tabulated copies of the test and settings shall be sent to the Owner’s Representative.

E. Ampere and Voltage Measurements

1. Take and record ampere and line voltage measurements under full load on all panel feeders, switchboard and switchgear feeders, motor control centers and motor circuits provided in the Contract. Record measurements at the equipment tested and submit to the Owner’s Representative for review.
2. Ampere voltage readings shall be:

    a. Phase A-B, A-C and B-C.
    b. Phase A-Neutral, B-Neutral and C-Neutral.

3. The ampere and voltage readings shall be not less than 20 minutes duration for each test. Record and submit the measured minimum, maximum and 20-minute average for each ampere and voltage value and test location. Voltage and ampere measurements shall occur at the connected load end of each respective feeder, not at the source of supply end of each feeder.
4. Test equipment shall be accurate within plus or minus 1%.

5. Branch circuit devices 40 amp or less and motor loads 10 horsepower or smaller are excluded from ampere and voltage testing Requirement.
6. If, in the opinion of the Owner's Representative, the voltages and regulations are not met within acceptable limits, make arrangements with the serving utility for proper electrical service. Retest feeder line voltages, and submit to Owner's Representative for review, after the Utility Company has completed corrective actions. Reset "voltage taps" on transformers provided or modified as part of the Contract Work, to adjust line voltages to within acceptable values, as directed by the Owner's Representative.

F. The Contractor shall complete the following work before any electrical equipment is energized.

1. All equipment shall be permanently anchored.
2. All bus connections shall be tightened per Manufacturer's instructions and witnessed by the Owner's Representative.
3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.
4. All feeders shall be connected and identified.
5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasive's over-spray removed, and equipment vacuumed clean. The Owner's Representative shall observe all interiors before covers are installed.
6. All dry wall work and painting shall be completed within areas containing electrical equipment prior to installation of equipment.
7. All doors to electrical equipment rooms shall be provided with locks in order to restrict access to energized equipment.
8. Electrical rooms shall not be used as a storage room after power is energized.
9. The electrical system coordination study shall be complete for circuit breakers, ground relays set, and circuit relay sets, fuses; tested and calibrated accordingly.

1.11 POWER OUTAGES

A. All electrical services in all occupied facilities of the Contract Work are to remain operational during the entire Contract period. Any interruption of the electrical services for the performance of this work shall be at the convenience of the Owner and performed only after consultation with the Owner's Representative. Work involving circuit outages shall be only at such a time and of such a duration as approved in writing. Work involving circuit outages for the work required to connect new equipment and disconnect existing equipment shall be performed at the convenience of the Owner.

B. Contract work involving outages or disruption of normal function in electrical power systems, telephone/communication systems, fire alarms, shall be performed during the following time periods. The Contract Work shall be phased to limit outages in the respective systems to the stated periods:

1. 11:30 p.m. Friday to 11:30 p.m. Sunday of the same weekend. Work shall occur on multiple weekend periods if a single weekend is not sufficient time to complete the work.
2. The Contract work involving outages shall be phased in multiple work time units, to comply with the permitted outage limitations.

C. Work involving system outages to the building fire alarm system shall be performed only after consultation with the Owner and shall be only at such a time and of such duration as approved in writing.

D. Provide overtime work; double shift work; nighttime work; Saturday, Sunday, and holiday work to meet outages schedule.

E. Provide temporary electrical power to meet the Requirements of this Article.

F. Any added costs to Contractor due to necessity of complying with this Article shall be included in the Contract Scope of Work.

G. When electrical work involving power disruptions to existing areas is initiated, the work shall proceed on a continuous basis without stopping until electric power is restored to the affected areas.

H. The Contractor shall request in writing to the Owner's Representative a minimum of 3-weeks in advance, for any proposed electrical outage.

1.12 EQUIPMENT SEISMIC REQUIREMENTS

A. Equipment supports and anchorages provided as part of the Contract shall be designed, constructed and installed in accordance with the earthquake regulations of the California Building Code, Title 24, Section 1632A, and the Uniform Building Code (UBC).

B. Provide equipment anchorage details, coordinated with the equipment mounting provision, prepared, signed and "Stamped" with PE registration by a Civil or Structural Engineer licensed as a Professional Engineer (PE) in the State of California.

C. Mounting recommendations shall be provided by the Manufacturer based upon approved shake table tests used to verify the seismic design of that type of equipment.

D. The Equipment Manufacturer shall certify that the equipment can withstand, and function following the seismic event, including both vertical and lateral required response spectra as specified in California Title 24 and the UBC. Alternatively, the Manufacturer's certification may be based on an approved detailed structural analysis of the assembly, as specified in California Title 24 and the UBC.

E. The Equipment Manufacturer shall document the details necessary for proper seismic mounting, anchorage, and bracing of the equipment for back installation location.

F. Seismic qualification shall be considered achieved when the capability of the provided equipment, as described by the test response spectra, meets or exceeds the required response spectra as specified in California Title 24 and the UBC, for all equipment natural frequencies up to 35Hz.

G. The Seismic Requirements are typical for each equipment item exceeding 100 pounds, including but not limited to the following.

1. Transformers
2. Equipment racks
3. Panels
4. Conduits with ceiling or wall support suspension attachments.

H. Wall Mounted Electrical Equipment

1. Surface Mounted Equipment

a. Provide multiple horizontal sections of metal "C" channels for support and attaching wall mounted equipment to walls. Channels shall provide "turned lips" at longitudinal edges to hold "lock-in" fasteners and shall comply with ANSI-1008 and ASTM-A569 latest revision. The channels

shall be steel hot dip zinc galvanized. As manufactured by Unistrut or Kindorf.

b. The “C” channels shall be positioned horizontally within 3 inches of the top and bottom of each, equipment section cabinet and located behind each equipment vertical section. Provide additional intermediate “C” channels at not less than 36 inches on center between the “top” and “bottom” “C” channel positions, located behind each equipment vertical section.

c. The “C” channels shall be of sufficient length to provide connection to not less than two vertical structural wall framing elements separated by not less than 16 inches; but in no case shall the “C” channel length be less than the width of the respective equipment section.

d. Attach the “C” channels to the wall structural elements after the wall, finish surface, installation (including painting) is complete.

e. Attach the “C” channels with fasteners to the building wall framing structural elements as follows: welded to steel framing; bolted to wood framing; cast in place concrete inserts for masonry and concrete construction; drilled “afterset” expansion anchors for existing masonry and concrete construction.

f. Attach the equipment to the “C” channels with threaded and bolted fasteners to “prelocate” and lock into the channel “turned lips” and channel walls.

1.13 ELECTRICAL WORK CLOSEOUT

A. Prepare the following items and submit to the Owner’s Representative before final acceptance.

1. Two copies of all test results as required under this Section.
2. Two copies of Local and/or State Code Enforcing Authorities Final Inspection Certificates.
3. Copies of Record Drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.
4. Two copies of all receipts transferring portable or detachable parts to the Owner’s Representative when requested.
5. Notify the Owner’s Representative in writing when installation is complete and that a final inspection of this work can be performed. In the event any defect or deficiencies are found during this final inspection they shall be corrected to the satisfaction of the Owner’s Representative before final acceptance can be issued.
6. List of spare fuses and locations identified by equipment name and building designation.
7. Prior to energizing, retighten to the proper torque, each circuit conductor lug landing, each bus bar (phases, neutral and ground) and circuit protection device threaded connections in all switchboards, switchgear, motor control centers, transformers, busways, disconnect switches, motor starters, motor terminals and panelboards, after the equipment is installed/connected and prior to energizing the equipment. The torque values shall comply with Manufacturer's recommendations.

END OF SECTION 26 05 00
080322/1125080

SECTION 26 05 01

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

Submit Product Data Sheets for all outlet boxes, floor boxes, wiring devices, device plates, relays, contactors, timeswitches, and disconnects fuses.

PART 2 - PRODUCTS

2.01 OUTLET AND JUNCTION BOXES

A. General:

1. Flush or concealed outlet boxes and junction boxes.

a. Non-masonry and/or non-concrete locations provide pressed steel boxes. Steel thickness not less than 0.062-inch, hot-dip galvanized. Knockout (KO) type with conduit entrances and quantities size to match conduits shown connecting to respective junction box and outlet box.
b. UL-514 listed and labeled.
c. Minimum required box depth is exclusive of extension-ring depth.
d. Provide all boxes with matching cover plates. Cover plates shall be gasketed water-tight in wet and outdoor locations.
e. Boxes installed in masonry or concrete shall be UL "Concrete-Tight" approved for installation in concrete and shall allow the placing of conduit without displacing reinforcing bars.

2. Provide boxes of proper Code size for the number of wires or conduits passing through or terminating therein. In no case shall box be less than 4.0-inch square by 2.125-inches deep, unless specified elsewhere or noted otherwise on the Drawings. 2.5-inches minimum depth for box width's exceeding 2-gang.
3. Increase the minimum outlet box size to 4.69-inches square by not less than 2.125-inches deep, where one or more of the following conditions occurs:

a. More than two conduits connect to the outlet box.
b. Circuit or Conduit "Homerun" connects to outlet box.

4. Signal, Communication and Low Voltage:

    a. Individual audio/visual, telephone, computer or data outlets: 4.69-inch square by 2.125-inch-deep minimum with two gang extension ring on flush boxes.
    b. Combination signal/telephone/data or computer outlets: 4.69-inch square by 2.125-inch-deep minimum with two-gang wide extension ring on flush boxes.

5. Junction boxes shall be sized to comply with the following:

    a. Code Requirements size based on the conduit quantities, conduit sizes and wire-fill connected to the junction box.
    b. Junction box minimum size shall not be less than 4.69-inches by 4.69-inches by 2.5-inches deep, but not less than size indicated on the Drawings or required by Code.

6. Provide extension rings on flush outlets to finish face of extension ring flush with finished building surfaces. Extension ring shall match outlet box construction and contain "Attachment Mounting-Tabs" for wiring devices. Extension rings shall be "Screw-Attached" to respective outlet box and maintain "Ground" bonding continuity.
7. Outlet boxes installed in outdoor locations, or in wet locations, or in concrete/ masonry, shall be cast-iron or cast-bronze, with threaded conduit hubs. UL rated for wet locations.

    a. Aluminum boxes shall NOT be in contact with concrete or masonry. Die-cast aluminum or cast aluminum water-tight electrical outlet boxes with threaded hubs may be provided as an alternate to cast-iron or cast-bronze outlet boxes, only where one or more of the following conditions occur:

        1) Outdoor locations above finish grade.
        2) Indoor wet locations surface or flush in walls or ceilings.

8. Provide solid gang boxes for three or more devices, typical for line and low voltage switches, receptacles, low voltage/signal outlets, etc. for mounting devices behind a common device plate.
9. Outlet boxes installed penetrating into fire rated walls, fire rated floors, fire rated ceilings and all fire rated construction. The outlet boxes shall be UL listed, classified, and labeled, for fire rated and temperature rated penetration of the respective fire rated surface and fire rated construction. The outlet box fire rating and temperature rating shall equal or exceed the fire/temperature rating of the surface/construction being penetrated. Provide UL listed and labeled supplemental fire and temperature protection to maintain ratings:

    a. Wall and ceiling penetrations, tumescent fire wrap (external or internal of outlet box).

10. Refer to Architectural and Structural Contract Documents and details for additional Box and Install Requirements.

B. Surface Outlet Boxes

1. Surface mounted outlet boxes, cast iron Type FS or FD, with threaded hubs as required. Box interior dimensions and interior volume capacity not less than

required for “Press Steel Boxes”, and “Sheet Steel Boxes”. Provide plugs in all unused openings. Provide weatherproof gaskets for all exterior boxes.

2.02 PULLBOXES

A. General

1. Sizes as indicated on the Drawings and in no case of less size or material thickness than required by the Governing Code and AHJ.
2. Exercise care in locating pullboxes to avoid installation in drain water flow areas and to clear existing condition interferences.
3. UL listed and labeled for electrical circuits.

B. General Purpose Sheet Metal Pullbox

1. General purpose sheet steel pullboxes: Install only in dry protected locations with removable screw covers. Manufacturer's standard rust proofing and baked enamel finishes.
2. Weatherproof sheet steel pullboxes: Fabricate of Code gauge steel. All surfaces interior and exterior hot-dip galvanized steel. Gasketed weather-tight cover of same material. Manufacturer's standard baked exterior enamel finish.

C. Concrete Pullboxes and Hand-holes

1. H-20 traffic rated box and cover, pre-cast concrete, steel reinforced pull boxes and hand-holes. Provide complete with pulling irons, hot-dip galvanized metal traffic cover with hot-dip galvanized metal cover frame, pull-box concrete base with sump. Four cable full height wall racks with porcelain blocks.
2. Boxes shall be “Intercept” type with multiple sections and extension cable-intercepts at both ends of box. Refer to Drawings for box size.
3. Covers shall be flush bolt down. Covers weighing more than 40-pounds shall be split cover type “Torsion-Sping” assist, hinged open-close.
4. Box covers shall comply with Federal ADA, UL, State and Local AHJ for slip resistance. Provide bead weld on cover to pull box to indicate services within pull box (i.e., "480/ 277-VOLT, 3-PHASE, 4-WIRE ELECTRICAL" OR “SIGNAL/TEL/P.A./CLOCK/FIRE ALARM" etc.).
5. Shall be set on a machine-compacted pea gravel base 12-inches thick and extend 6-inches beyond box base on all sides. Provide a ¾-inch by 10-feet copper clad ground rod through the box bottom with 9-inch projection into box, for grounding all metal parts with #10awg copper bond wire.
6. After cables have been pulled, connected, tested and inspected, seal all box joints and seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal.
7. As manufactured by Jensen Precast, or Oldcastle Precast.

2.03 RECEPTACLES

A. General

1. All receptacle wiring devices in flush type outlet boxes shall be installed with a bonding jumper to connect the box to the receptacle ground terminal. Grounding through the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under "Grounding". Bonding jumper shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws 6-32 or larger (except isolated ground receptacles). For receptacles in surface mounted outlet boxes direct metal-to-metal contact between receptacle

mounting strap (if it is connected to the grounding contacts) and outlet box may be used. Receptacle mounting ears for screw attachment to outlet box. Receptacle shall be UL listed and labeled; conform to NEMA-WD1 and WD6.

2. All receptacles shall be same Manufacturer.
3. Receptacle color as selected by Owner's Representative. Receptacles connected to emergency power circuits shall be red.
4. Tamper Resistant Receptacle

    a. Devices shall additionally be listed and labeled as tamper resistant, provide tamper resistant receptacles in buildings containing dormitories, guestrooms, condominiums, housing/residences, apartments, dwellings, hotels/motels, secondary schools K through 12th grade, child-care/day-care/kindergarten, hospital pediatric-care units and other locations required by AHJ.
    b. The electrical receptacles shall be rated "Tamper-Resistant-Receptacle" (TR), UL-TR (RTRT). Spring loaded shutters shall automatically open-close (unblock-block) the receptacle slots, when the plug-in (cap) insertion and removal occurs.
    c. Typical for 15-amp and 20-amp receptacles. Modify Manufacturer's catalog number description to include tamper resistant receptacle function.

5. Wiring devices shall be listed and labeled for connection of both "Solid" and "Stranded" copper circuit conductors.
6. Duplex convenience receptacles and 120-volt single phase branch circuits.

    a. Duplex (convenience) receptacle, wiring device with two single receptacles with the same electrical rating, integrated into a single assembly by the Manufacturer.
    b. 20-amp branch circuits with a single duplex convenience receptacle connection on each circuit, receptacles shall be rated for 20-amp.
    c. 15-amp and 20-amp branch circuits with two or more duplex convenience receptacle connections each circuit, receptacle shall be rated 15-amp or 20-amp.

7. Devices shall additionally be listed and labeled as UL-All Weather-Resistant, provide weather resistant receptacles for the following install locations. Modify Manufacturer's catalog number descriptions, shall include all-weather-resistant UL listing and labeling:

    a. Devices indicated on Drawings as Weather-Proof (W.P.).
    b. Devices installed in outdoor locations.
    c. Devices installed in classified as damp or wet locations both indoor and outdoor.
    d. All GFCI (ground-fault) receptacles all locations.

8. Receptacles with ampere and voltage ratings different than described for duplex convenience receptacles. The different rated receptacles shall have the same characteristics and performance as the respective duplex convenience receptacles, except for differing ampere and voltage characteristics.
9. Receptacles shall be GFCI type for the following locations:

    a. located within 84-inches of a sink or hosebib shall be GFCI receptacles.
    b. Devices installed in outdoor locations.
    c. Devices installed in classified as damp or wet locations both indoor and outdoor.

d. Devices indicated on Drawings as GFCI or Weather-Proof (W.P.).

B. Duplex convenience receptacles.

1. Shall be grounding type, 120 volt and shall have two current carrying contacts and one grounding contact which are internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired. Receptacles shall be tamper-resistant–TR, UL-TR.
2. GFCI receptacles shall be all Weather-Resistant and wet location rated. Rated 120-volt 60Hz AC, 20 amp, unless indicated otherwise on Drawings.
3. Heavy Duty Industrial Grade

	Manufacturer	NEMA 5-15R	NEMA 5-20R	NEMA 5-20R-GFCI
a.	Legrand/P&S	#5262	#5362	#2095HG
b.	Leviton	#5262	#5362	#W7899
c.	Hubbell	#CR5252	#5362	#GFR8300
d.	Cooper-Arrow/Hart	#AH5262	#AH5362	#WRVGF20

C. Weatherproof (W.P.) Receptacle

1. Outdoor receptacles shall be duplex convenience GFCI type rated 20-amp 120 Volt 60Hz AC weatherproof, GFCI, unless indicated otherwise on Drawings. Test-reset buttons and visual pilot.
2. GFCI receptacles shall be wet location and Weather-Resistant rated weatherproof, gasketed, key locking tamper resistant, wet location.
3. Outdoor, flush mount outlet with hinged, key-locking, weather-proof cover as manufactured by: Pass and Seymour/Legrand #4600 Series; or C.W. Cole #310 Series.
4. On exposed conduit runs, provide weatherproof ground fault circuit interrupter type GFCI receptacles installed in "FS" condulet watertight cast metal body, with weather-proof spring door type covers, gasket watertight. Door shall be key locking-type or padlock-type.

D. Other switches, receptacles, devices, and outlets.

1. Special devices, outlets and outlet locations shall be as indicated on the Drawings. Modify device and outlet characteristics to accommodate the actual install location conditions for each outlet.

2.04 PLATES

A. Metal Cover Plates for Devices

1. Provide cover plates for every line voltage and low voltage switch, receptacle, telephone, computer, television, signal and other device outlets.

   a. All line voltage circuit plates shall be metal, 0.040-inch stainless steel Type 302 alloy, composed of 18% chromium and 8% nickel.
   b. Plates for low voltage signal systems may be metal or non-metal. Non-metal plates shall be high-abuse, hard-service and high-impact resistant.

2. Plates shall be as manufactured by P&S; or Hubbell; or Leviton; or General Electric.

2.05 VANDAL-PROOF FASTENINGS

Provide approved vandal-proof type screws, bolts, nuts where exposed to sight throughout the project. Screws for such items as switch plates, receptacle plates, fixtures, communications equipment, fire alarm, blank covers, wall and ceiling plates to be spanner head stainless steel, tamperproof type. Provide Owner with six screwdrivers for this type.

2.06 STRUCTURAL AND MISCELLANEOUS STEEL

Structural and miscellaneous steel used in connection with electrical work and located out-of-doors or in damp locations, shall be hot dip galvanized unless otherwise specified. Included are underground pull box covers and similar electrical items. Galvanizing averages 2.0 ounce per square foot and conforms to ASTM A123.

2.07 FLASHING ASSEMBLIES

A. General

1. Flashing shall be compatible with the material being penetrated and with the pipe passing through the flashing. Coordinate with and comply with Manufacturer's recommendations, for both the flashing and the material being penetrated.
2. Provide lead metal flashing assemblies at all roof penetrations, unless recommended otherwise by Manufacturer.
3. Seal the joint between the flashing and pipe passing through the flashing with water-proofing compound.
4. Lead flashing for roof penetrations, as manufactured by: Santa Rosa Lead Products; or Semco; or Flashco.

B. Storm Collars

1. In addition to penetration flashing, provide a storm-collar counterflashing for each roof penetration flashing. Shall attach to the structure of the penetration and form a water-tight “Umbrella” counter flashing over the roof penetration flashing.
2. As manufactured by: STD-Storm collars; or ASI-Storm collars.

2.08 DISCONNECTS (SAFETY SWITCHES)

A. General

1. Disconnect switches shall all be rated:

   a. 600-volt 60Hz AC for all safety switches.
   b. NEMA Type HD, quick-make, quick-break, H.P.-rated.
   c. Fused Class "R", in NEMA Type I enclosure, lockable.
   d. Number of poles and amperage as indicated on the Drawings.

2. Provide internal neutral bus, ground-lug and conductor landing lugs, size to match conductors shown on Drawings. Switch access door shall be interlocked with switch to prevent access inside switch when switch is “ON” closed position.
3. Where enclosure is indicated W.P. (Weather-Proof) switches shall be rain tight NEMA Type HD and NEMA 3R enclosure, lockable.
4. Maximum voltage, current and horsepower rating clearly marked on the switch enclosure and switches having dual element fuses shall have rating indicated on the nameplate.
5. Switch and fuses ampere rating shall also comply with Manufacturer recommendation for the connected load.

2.09 CONCRETE WORK (ADDITIONAL REQUIREMENTS)

A. Portland Cement

1. ASTM C33- (latest revision), Type II, Low Alkali Cement. Composed of Portland cement, coarse aggregate, fine aggregate, and water.

    a. Concrete for use as electrical equipment footings, lighting pole bases and equipment slabs on grade, concrete shall attain minimum 28-day compressive strength of 4000psi, using not less than 5.75 sacks of cement per cubic yard of wet concrete.
    b. Concrete for underground duct/conduit encasement, the minimum 28-day compressive strength shall be 2000 psi. Provide a minimum of 10-pounds of red oxide concrete coloring per yard of concrete.
    c. Mix shall obtain a 6-inches slump, measured with standard slump cone per ASTM C143/C143M (latest revision).

2. Coarse Aggregate: Uniformly graded between maximum size not over 1½-inch and not less than ¾-inch and minimum Size #4, crushed rock or washed gravel. For concrete encased conduit only, maximum aggregate size shall be ½-inch.
3. Fine Aggregate: Clean, natural washed sand of hard and durable particles varying from fine to particles passing ⅜-inch screen, of which at least 12% shall pass fifty mesh screens.

B. Water: Clean and free from deleterious quantities of acids, alkalis, salts, or organic materials.

C. Reinforcement

1. Bars: Intermediate Grade Steel conforming to ASTM A615/A615M grade 60, with pattern deformations.
2. Welded Wire Fabric: ASTM A185/A185M.
3. Bending: Conform to Requirements of ACI 318.

D. Form Material: For exposed work, use PS 1-66 "B-B Concrete Form" plywood forms, or equal. Elsewhere, forms may be plywood, metal, or 1-inch by 6-inches boards. Forms for round lighting pole bases shall be sono-tube.

PART 3 - EXECUTION

3.01 GROUNDING (ADDITIONAL REQUIREMENTS)

A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State of California and Local Authorities Having Jurisdiction.

B. Each Pull Box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

C. The Maximum Resistance to Ground shall not exceed 5 ohms.

3.02 OUTLET AND JUNCTION BOXES

A. General:

1. Accurately place boxes and securely fastens to structural members. Where outlets are shown at same location but at different mounting heights, install outlets in one vertical line. Where outlets are shown at same location and mounting height, mount outlets as close together in a horizontal row as possible. Where the outlet boxes for switches and receptacles are shown at the same location and mounting height, mount in common out-let box with barriers between devices. Provide single piece multi-gang cover plate for close mounted outlet boxes. Where switches are shown on wall adjacent to hinge side of doors, box shall be installed to clear door when door is fully opened.
2. Boxes above accessible ceilings shall be attached to structural members. Where boxes are suspended, they shall be supported independently of conduit system by means of hanger rods and/or preformed steel channels. Boxes shall be supported independently of all piping, ductwork, equipment, ceiling hanger wires and suspended ceiling grid system.
3. Surface mounted outlets shall be attached to concrete or masonry walls by means of expansion shields.
4. Outlet Box Horizontal and Vertical Separation: Outlet boxes and device outlet rings installed flush in walls shall be horizontally and vertically separated by not less than 24-inches (edge of box to edge of box) from device outlet boxes and rings in common wall surfaces located on the opposite (back) side of the same wall.

    a. Where the separation cannot be maintained, provide a solid backing behind and completely enclosing each outlet box.
    b. The backing shall extend the width of the wall cavity (i.e., between "studs" or masonry cells) behind the box and 12-inches above and below the outlet box centerline, completely enclosing the outlet box.
    c. The backing shall consist of the following:

        1) ⅝-inch thick gypsum board anchored in place for "stud" wall construction.
        2) Solid "mortar" to completely fill the outlet box "cell" behind the box in masonry construction.

5. Provide metal outlet box for each device. Install devices in metal outlet boxes. Typical for all wiring devices including, switches, receptacles, line voltage devices, and low voltage/signal system devices.

B. Fire Wrap:

1. In fire rated walls and ceilings provide fire rated "Box-Wrap" around the outside of each outlet box placed in fire rated wall or ceiling. Install the fire wrap on exterior of box in-side the wall or ceiling, to maintain the fire rating of wall or ceiling with the installed out-let boxes.

3.03 RECEPTACLES-DEVICES

A. General

1. Provide outlet boxes for all devices, switches, receptacles, both line-voltage and low-voltage.
2. Devices installed in wireways shall be installed flush in wireway assembly.
3. Install and screw attach devices into outlet boxes and wireways.

4. Provide ground circuit connections to all devices.
5. Provide branch circuit connections to all devices.
6. Provide testing and commissioning for proper operation and phase/ground connectors.

    a. Test each GFCI devices after installation and circuit connection is complete.
    b. Test all devices for correct polarity and proper electrical energization.

7. Install and adjust all cover-plates to be flush and level, with correct device identification.
8. Were one or more devices occurring at the proximity with other similar devices, all the devices shall be “Ganged” under one common cover-plate as follows:

    a. Duplex convenience receptacles with other proximity (within 18-inches) duplex convenience receptacles.
    b. Lighting control switches not exceeding 20-amp switch rating with other proximity (within 18-inches) similar switches.

B. Line-voltage Plug-In Type Receptacle Installation Orientation:

1. The “Ground-Pin” shall face “Up” at the receptacle top location (double duplex) 4-plex, individual and vertically mounted individual duplex receptacles.
2. The “Neutral-Blade” shall face “Up” at the receptacle top location on horizontally mounted duplex receptacles.

3.04 CONCRETE WORK

A. Form:

1. Space forms properly with spreaders and securely tie together. Do not use twisted wire form ties. Keep forms wet to prevent joints from opening up before concrete is placed. Replace improper construction as directed. Do not use wood inside forms.
2. Build in and set all anchors, dowels, bolts, sleeves, iron frames, expansion joints and other materials required for the electrical work. Place all items carefully, true, straight, plumb, and even.
3. Carefully remove all exposed forms. Cut nails and tie wires below face of concrete and fill all holes. Rubbish will not be allowed to remain in, under, or around concrete.

B. Mixing: Use batch machine mixer of approved type. After ingredients are in mixer, mix for at least 1½-minutes.

C. Transit Mixing: In lieu of mixing at site, transit mixing may be used if rate of delivery, haul time, mixing time, and hopper capacity is such that concrete delivered will be placed in forms within 90-minutes from time of introduction of cement and water to mixer.

D. Placing of Concrete

1. Before placing concrete, remove wood, rubbish, vegetable matter and loose material from inside forms. Thoroughly wet down wood forms to close joints.
2. Clean reinforcement; remove paint, loose rust, scale and foreign material. Bars with bends not called for will be rejected. Hold securely in place to prevent displacement. Lap bar splices 24-diameters, min; lap fabric one mesh min. Tie intersections, corners, splices with 16-gallon annealed wire, or as otherwise called for.

3. Place concrete immediately after mixing. Do not use concrete that has begun to set; no tempering will be allowed. If chuting is used, avoid segregation. In placing new concrete against existing concrete, use bonding agent per Manufacturer's directions.
4. Give careful and thorough attention to curing of concrete. Keep concrete and forms wet for a minimum of 10-days, after placing concrete.

E. Concrete Finish

1. Finish of Exposed Concrete: Horizontal surfaces, steel troweled monolithic finish; vertical surfaces, smooth and free of fins, holes, projection, etc.

END OF SECTION 26 05 01
080322/1125080

SECTION 26 05 30

CONDUIT AND WIRE

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit Product Data Sheets for all wire, supports, conduit, fittings and splicing materials.

B. Submit Material List for all conduit and conduit fittings.

PART 2 - PRODUCTS

2.01 CONDUIT

A. General

1. The interior surfaces of conduits and fittings shall be continuous and smooth, with a constant interior diameter. Conduits and conduit fittings shall provide conductor raceways of fully enclosed circular cross section. The interior surfaces of conduits and fittings shall be without ridges, burrs irregularities or obstructions. Conduits and fittings of the same type shall be of the same uniform weight and thickness.
2. Type of conduit, type of conduit fittings and conduit supports shall be suitable for the conditions of use and the conditions of location of installation, based on the Manufacturer's recommendations and based on applicable Codes.
3. All fittings for metal conduit shall be suitable for use as a grounding means, pursuant to the applicable Code Requirements. All metal conduit and metal conduit fittings shall provide 3 second duration ground fault current carrying ratings, when installed and connected to the respective conduit, as follows:

a. RMC and EMT conduit fittings.

1) 0.5-inch through 1.5-inch conduit/fitting size - 10,000-amp RMS.
2) 2.0-inches and larger conduit/fitting size - 20,000-amp RMS.

b. FMC and LTFMC Conduit Fittings

1) 0.5-inch through 1.25-inch conduit/fitting size - 1,000-amp RMS (without external bonding jumper).
2) 1.5-inch through 4.0-inch fitting size - 10,000-amp RMS with bonding jumper.

4. Protective corrosion resistant finish for metal conduit fabricated from steel and metal conduit fittings fabricated from steel, shall be as follows:

    a. Clean all metal surfaces (including metal threads) with acid bath "Pickle" prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
    b. Hot-dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.
    c. Threads shall be hot-dip zinc coated after machine fabrication.
    d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
    e. The inner metal surfaces of conduit fittings shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the conduit/fitting.

5. Threads for metal conduit and metal conduit fittings shall be taper-pipe-thread, National Pipe Standards (NPS) and shall comply with ANSI-B1.20.1.
6. Metal conduit termination connector fittings shall be provided with a Manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks and abrasion during conductor installation and electrical load "Cycling" after installation is complete. The bushing shall comply with UL 94V-0 flammability.
7. Provide conduit bonding/grounding jumper from metal enclosures with "Concentric ring" knockouts, to positively ground/bond each respective conduit(s) to the metal enclosure.
8. Metal conduit fittings connecting to PVC coated metal conduit shall be PVC coated to match the conduit.
9. The conduit and fittings shall be watertight and airtight without cracks and pinholes.

B. Rigid Metal Conduit (RMC)

1. Rigid metal, round tubing, machine threaded at both ends.

    a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor, pursuant to applicable Codes.

2. RMC raceway types shall be as follows:

    a. Rigid Galvanized Steel conduit (RGS), minimum yield strength shall be 35,000 PSI. Shall comply with NEMA Standard 5-19 (latest revision); ANSI C80.1 and ANSI-C80.4 (latest revision); UL 514-B and UL 6 (latest revisions); National Pipe Standard Specification (latest revision).
    b. Intermediate Steel Conduit (IMC). Shall comply with NEMA Standard 5-19 (latest revision) ANSI-C80.6 (latest revision); UL 2142 (latest revision).

3. RMC fittings:

    a. Fittings shall be compatible with RGS and IMC.
    b. Fittings shall be rated "Liquid Tight".
    c. Fittings imbedded in concrete shall be rated "Liquid Tight" and "Concrete Tight".
    d. Connectors and couplings for terminating, connecting and coupling to RMC conduit shall be threaded metal.
    e. Fittings shall comply with ANSI C80.4 and ANSI C33-84 (latest revision); NEMA FB1 (latest revision); UL 514 (latest revision).

f. Conduit seal fittings:

1) Conduit seals shall prevent the passage of gasses, liquids and vapors past the location of the seal installation in the conduit.
2) Conduit seals shall be suitable for installation in both vertical and horizontal conduit locations.
3) Conduit seals shall be visible and accessible for inspection after installation is complete.
4) Conduit seals shall be rated for the following locations:

a) Wet locations
b) Classified hazardous location materials NEC Class 1 Division 1.
c) Temperature ranges from 0 minus 20 degrees centigrade through 90 degrees centigrade.

5) Conduit seals, sealing compound and sealing compound dam shall be the products of the same Manufacturer.

4. RMC fittings as manufactured by:

a. For threaded enclosure, termination connection.

1) Thomas & Betts - 106 Series bonding locknut, 5302 Series sealing ring with stainless steel retainer.

b. For non-threaded enclosure, termination connector.

1) Thomas & Betts - 370 Series watertight threaded sealing hub, 106 Series threaded bonding lock nut, Sta-Con Series enclosure bonding jumper and 3870 Series threaded ground bushing.
2) Emerson-OZ/Gedney-CHMT/CHT watertight threaded hub with bonding locknut and GH50G Series enclosure bonding jumper.

c. For RMC-to-RMC conduit-to-conduit coupling

1) Thomas & Betts/Erickson - 674 (threaded) Series
2) Emerson-OZ/Gedney Type TPC (threaded) Series
3) Threaded RMC conduit couplings, product of the same Manufacturer as the RMC conduit.

d. For RMC Conduit Seals

1) Emerson-OZ/Gedney-EYA and EYAM (threaded) Series
2) Appleton-EYF and EYM (threaded) Series

C. Electrical Metallic Tubing (EMT)

1. Rigid metal round tubing, “Thin Wall” steel construction, with non-threaded ends.

a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor pursuant to applicable Codes.
b. The conduit shall be watertight and airtight without cracks and pinholes.

2. EMT shall be allowed for conduit size ranges from 0.5-inch through 4.0-inches.
3. Comply with ANSI C80.3, C80.4, and ANSI C33.98 (latest revisions); UL 594 and UL 797 (latest revisions); CEC Section 12500 (latest revision).

4. EMT fittings:

   a. Connectors and couplings for terminating, connecting and coupling to EMT conduit shall be non-threaded steel fabrication.
   b. EMT termination connector fittings shall be as follows:

      1) Set screw type “Concrete Tight” when installed in dry interior locations.
      2) Compression types “Raintight” and “Concrete Tight” when installed in wet or damp locations, outdoors and in concrete or masonry construction.

   c. Fittings shall comply with ANSI C33.84 (latest revision); UL 514 (latest revision); NEMA FB-1.

5. EMT fittings as manufactured by:

   a. For threaded and non-threaded enclosure, termination connector

      1) Thomas & Betts-TC721A (set screw type) Series (with locknuts).
      2) Emerson-OZ/Gedney-TC500I (set screw type) Series (with locknuts).
      3) Thomas & Betts-5123 (compression type) Series (with two locknuts).
      4) Emerson-OZ/Gedney-TC600I (compression type) Series (with locknut).
      5) Thomas & Betts-4240 (compression type) Series (90-degree angle with locknut).
      6) Emerson-OZ/Gedney-TWL (compression type) Series (90-degree angle with locknut).

   b. For EMT-to-EMT conduit-to-conduit coupling:

      1) Thomas & Betts-TK121A (set screw type) Series (with locknut).
      2) Emerson-OZ/Gedney-5000 (set screw type) Series (with lock-nut).
      3) Thomas & Betts-5120 (compression type) Series.
      4) Emerson-OZ/Gedney-TC600 (compression type) Series.

   c. For EMT to RMC conduit to conduit combination coupling:

      1) Thomas & Betts-HT221 (set screw type) Series.
      2) Emerson-OZ/Gedney-ESR (set screw type) Series.
      3) Thomas & Betts-530 (compression type) Series.
      4) Emerson-OZ/Gedney-ETR (compression type) Series.

D. Flexible Metal Conduit (FMC)

1. Round flexible conduit, fabricated from a single continuous steel strip. The steel shall be factory formed into continuous interlocking convolutions to form a complete lock bet-ween steel strips and provide raceway flexibility.
2. Metal to metal grounding contact shall be maintained throughout the length of the FMC conduit.
3. FMC shall be allowed for conduit size ranges from 0.5 inch through 4.0-inches.
4. FMC shall comply with ANSI-C.33.84 and ANSI C33.92; NEMA FB-1; CEC 12-1100.

5. FMC Fittings

   a. FMC fittings shall be malleable iron construction or steel construction.
   b. Fitting shall automatically cause the FMC raceway throat opening to be centered with respect to the fitting throat opening.
   c. Straight and angled connector termination fittings shall be threaded on one end and shall include a threaded locknut, suitable for connection to threaded and un-threaded enclosures.
   d. The attachment of the fittings to FMC shall be angled saddle type, to engage and interlock with the FMC spiral groove, and shall be unaffected by vibration. Direct bearing screw type fittings shall not be used.
   e. Direct FMC conduit-to-FMC conduit coupling of FMC shall not be permitted.
   f. Shall comply with ANSI C33.9, and ANSI C33.92 (latest revision); NEMA FB1 (latest revision); UL 514.

6. FMC fittings as manufactured by:

   a. Straight Termination Connectors — Thomas & Betts- 3110 Series (with locknut)
      45- & 90-Degree Angle Connectors — Thomas & Betts-3130 (with locknut)

   b. FMC to EMT conduit combination coupling:

      Thomas & Betts 503TB Series.

E. Liquid Tight Flexible Metal Conduit (LTFMC)

1. The metal conduit core of LTFMC shall comply with the same Requirements as FMC conduit, with the addition of a thermoplastic exterior flexible jacket over the metal core.
2. The exterior jacket shall be positively locked to the metal core to prevent jacket “Sleeving”.
3. The LTFMC shall be rated for installation and operating service temperatures of between minus 20 degrees centigrade through plus 90 degrees centigrade.
4. The LTFMC jacket shall be suitable for continuous exposure to sunlight, rainwater, water vapor, mineral oils and liquid solvents, without penetrating into the conduit and without deteriorating the jacket.
5. LTFMC sizes from 0.5-inch through 1.25-inches shall include an additional internal ground conductor, fabricated by the Manufacturer, as an integral part of the conduit core.
6. Direct LTFMC conduit-to-LTFMC conduit coupling of LTFMC shall not be permitted.
7. LTFMC shall be allowed for conduit size ranges from 0.5-inch through 4.0-inches.
8. In addition to the Requirements for FMC conduit, LTFMC shall also comply with ANSI C-33.84 (latest revision); NEMA-FB1 (latest revision); CEC 12-1400 (latest revision).
9. LTFMC fittings

   a. Fittings shall include an external mechanical ground/bond wire connector.
   b. The attachment of the fitting to LTFMC shall be threaded compression type onto the conduit core with locknut and liquid tight jacket compression seal. The fitting shall automatically prevent “Sleeving” of the jacket.

c. Straight and angled termination connector fittings shall be threaded on one end and shall include locknut suitable for connection to threaded and unthreaded enclosures.

10. LTFMC fittings as manufactured by:

a. Termination connector fittings:

Straight	45- & 90-Degree Angle Connectors
Thomas & Betts-5331 GR Series.	Thomas & Betts-5341GR & 5351 GR Series
Appleton-STB & STN-L Series; for use with preformed “knockouts”.	Appleton-STB-L & STN-L Series for use with preformed “knockouts”
Emerson- OZ/Gedney-4QSeries.	Emerson-OZ/Gedney-4Q Series

b. LTFMC to RMC conduit to conduit combination coupling fittings:

1) Thomas & Betts-5271 GR Series.
2) Emerson-OZ/Gedney-4Q Series

F. Rigid Non-Metallic Conduit (RNMC)

1. General

a. Conduit and fittings shall be 90-degree centigrade conductor rated. Fabricated from homogeneous material, free from visible cracks, holes or foreign inclusions, with integral “End-Bell”. The conduit and conduit fittings shall be watertight and airtight.
b. Conduit, conduit fittings and conduit fitting assembly “Solvent Cement” shall all be the product of the same Manufacturer. Conduit fittings shall be solvent cement welded watertight.
c. Conduit and fittings shall be identified with legible markings showing ratings, size and Manufacturers name.
d. RNMC and fitting shall be corrosion resistant, watertight.
e. Conduit shall be suitable for conductor operating temperatures from minus 20 degrees centigrade to 90 degrees centigrade.
f. RNMC shall comply with NEMA TC-2 (PVC 40 conduit, latest revision) NEMA TC-6 (EB conduit latest revision) and NEMA TC-3 (fittings, latest revision); UL 514 and UL 651 (latest revision).

2. Polyvinyl Chloride (PVC)-RNMC

a. PVC-Schedule 40 heavy wall construction.

3. RNMC fittings connecting to metallic raceways shall be provided with a ground/ bond jumper connection.

G. Expansion Joint, Deflection Joint and Seismic Joint Conduit Fittings

1. Expansion Conduit Fitting - Fitting shall provide for a minimum of 2-inches straight line movement between two connecting conduits in each direction (total 4-inches conduit expansion and contraction) parallel to the respective conduit lengths. Fitting shall be watertight.
2. Deflection Conduit Fitting - Fitting shall provide for a minimum of 30 degrees angular deflection movement (“Shear” deflection) between two connecting conduits, in any direction perpendicular to the length of the respective conduits. Fitting shall be watertight.

3. Combination Expansion/Deflection Conduit Fitting, Fitting shall provide the combined “Expansion” and “Deflection” movement capacity between two connecting conduits as described for separate “Expansion” and “Deflection” conduit fittings. Fitting shall be approved for installation concealed in both masonry/concrete construction and exposed non-masonry/concrete construction. Fitting shall be watertight.
4. Fittings shall comply with UL.
5. Fittings as manufactured by:

    a. Conduit expansion fittings exposed, or concealed locations as manufactured by:

        1) Emerson-OZ/Gedney – AXB-8 Series for RMC conduit.
        2) Emerson-OZ/Gedney - TX Series for EMT conduit.
        3) Appleton – AXB or XJ8 Series for RMC conduit and EMT conduits. Provide RMC to EMT combination conduit coupling fittings for each end of the expansion fitting.

    b. Combination expansion/deflection conduit fittings exposed, or concealed conduit locations as manufactured by:

        1) Emerson-OZ/Gedney-AXDX Series for RMC conduit.
        2) Emerson-OZ/Gedney-AXDX Series for EMT conduit.
        3) Appleton-DX Series for RMC conduit.
        4) Provide RMC to EMT combination conduit coupling fittings for each end of the expansion/deflection fitting.

    c. Conduit expansion/deflection fittings for FMC and LTFMC conduit.

        1) Provide a minimum of 12-inches of “Slack” LTFMC in each FMC or LTFMC conduit at building and structure seismic or expansion joint conduit crossings.
        2) Note: Each FMC “Slack” expansion/deflection location, shall be considered as not less than a 90-degree conduit bend location, for compliance with the maximum quantity of conduit bends allowed in a raceway.

6. Conduit fitting bonding jumper:

    a. The grounding/bonding path of metal conduit shall be maintained by the fitting.
    b. Provide a bonding jumper at each expansion, deflection and combination expansion deflection conduit fitting.
    c. The jumper shall be a bare flexible copper “Braid”. The copper braid electrical current carrying capacity shall be equal to the metal conduit.
    d. Provide a factory terminated ground clamp on each end of the braid with adjusting steel conduit grounding clamps and connect to each respective conduit end.
    e. The jumper braid length shall be 8-inches longer than the respective conduit fitting.
    f. Bonding jumper for FMC and EMT fittings as manufactured by:

        1) Emerson-OZ/Gedney – BJ and BJE Series
        2) Appleton – BJ/XJ Series

H. Conduit Bodies Conduit Fitting

1. Conduit bodies shall provide conductor access with a removable conduit body cover and wiring area enclosed in metal housing. The conduit body shall facilitate pulling conductors.
2. In-line form “C” conduit bodies shall be prohibited.
3. The interior space “Length” of 90 degree “Elbow” conduit bodies shall not be less than six times the diameter size of the largest conduit connecting to the conduit body.
4. Conduit body covers shall be removable, gasketed; watertight “Domed” metal covers “Mogul-Type” with threaded screw attachment to the conduit body.
5. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire “Pulling”.
6. Conduit body fittings shall comply with UL 514.
7. Conduit bodies as manufactured by:

a. For RMC Conduit

1) Hubbell/Killark – LB/Mogul (90-degree elbow) Series – threaded body.
2) Emerson-OZ/Gedney - LB 6X/Mogul (90-degree elbow) Series - threaded body.
3) Appleton – NEC6X-LB/Mogul (90-degree elbow) Series - threaded body.

b. For EMT Conduit

1) Same as for RMC conduit. Provide EMT to RMC conduit combination coupling fitting for each outlet body connection.

2.03 CONDUIT SUPPORTS

A. General

1. Conduit Supports, hangers and fasteners for metal conduit shall be steel, hot dip zinc galvanized.
2. Threaded hardware shall be continuous, free running threads.
3. Conduit support systems, including support channels, pipe clamps, braces, anchors, hard-ware, fasteners, shall be sized to support the full capacity circuit conductors’ weight, plus the installed conduit weight, plus the conduit fitting weight and support hardware weight, plus a 300% additional weight capacity safety factor.
4. Provide lock washer at each “bolted”/threaded connection.
5. Conduit supports; fasteners, channels, braces, hardware, anchors, pipe clamps and hangers as manufactured by Unistrut or Kindorf.
6. Supports shall be free of “BURRS” and sharp edges.
7. Metal supports cut in the field shall be zinc galvanized after cutting to prevent rust.

B. Conduit Hangers

1. Threaded steel hanger rods.

a. Hanger rods smaller than 0.375-inches in diameter shall not be used for support of individual conduits.
b. Hanger rods smaller than 0.5-inches in diameter shall not be used for support of multiple conduits.

2. Conduit hanger wires shall be not less than 12-gauge steel.
3. Conduit hangers shall attach to structure fasteners with steel “Clevis” or “Swing” hangers and shall provide a minimum of 45 degrees of angular movement in any direction at the point of the conduit hanger attachment to the structure fasteners.
4. Conduits individually suspended by conduit hangers shall fasten to the respective hangers with “Clevis” type pipe hangers. The pipe hangers shall be steel, adjustable to fit conduit size and shall completely enclose the conduit circumference.

C. Conduit Support Channels

1. “C” Channels shall be factory preformed with a minimum 12-gauge thickness metal. The channel shall be factory “Punched” with regularly spaced slotted holes for fastener attachments along the length of the channel.
2. The “C” Channel shall not deflect more than 0.1-inch between channel supports at maximum installed design load, including required safety factor.
3. Channels shall comply with ANSI-1008 (latest revision) and ASTM-A569 latest revision).
4. Channels shall provide “Turned Lips” at longitudinal edges to hold (lock-in) fasteners.
5. Conduit support channels suspended from conduit hangers shall attach to conduit hangers with treaded connections. Provide a minimum of two hangers (trapeze style) connected to each channel.
6. Non-suspended conduit support channels shall connect to structure fasteners with threaded connectors.

D. Fasteners, Seismic Earthquake Rated

1. Channel fasteners:

   a. Channel fasteners shall “Prelocate” and lock into the channel “Turned Lips” and channel “Walls”.
   b. A separate metal strap shall “Tie” each conduit to each channel with conduit channel fasteners.

2. Structure fasteners:

   a. Structure fasteners for wall and floor mounted conduit attachments shall attach to existing masonry and concrete structures with structure fasteners using drilled, mechanical, expansion shield anchors.
   b. Structure fasteners for wall and floor mounted conduit attachments shall attach to new masonry and concrete structures with structure fasteners using steel threaded inserts precast into the structures.
   c. Structure fasteners shall center the support load above or below the beam flanges and reduce torsion-rotation forces exerted on the structural beam. Attach to steel structural members with “Swing-Beam Clamps”, with set-locking screw structure fasteners.

      1) Beam clamps shall include integral safety rod, strap or “J”-hook to secure the attachment clamp to the beam flanges on both sides of the beam, with integral hanger rod attachment.
      2) Or double-ended beam clamp to secure the attachment clamp to the beam flanges on both sides of the beam, with integral hanger rod attachment.

d. Structure fasteners for wall and floor mounted conduit attachments shall attach to wood structural members with flush “Through-Bolted” wood beam/wood framing stud structure fasteners.
e. Structure fasteners for wall mounted conduit attachments shall attach to steel framing studs and steel structural elements with spot welded steel structure fasteners or drilled and bolted structure fasteners.

E. Brace Connectors

1. Provide lateral brace connectors to resist horizontal, lateral and vertical movement of suspended conduits during seismic earthquakes.
2. The braces shall connect from each conduit support, attach as close to the conduit as possible, and attach to fixed rigid, non-suspended building “Main” structural elements with fixed anchoring.
3. Brace attachment connectors and fasteners shall be rigid preformed steel channels or flexible #10-gauge steel hanger wire.
4. Connect and attach the brace connectors to fixed structural elements in the same manner as conduit support hangers. The connection of braces to structural elements shall be independent of the conduit support hanger structure fasteners.

2.04 ELECTRICAL POWER WIRE AND CABLE

A. General

1. All wire and cable shall be single-conductor, annealed copper, insulated 600-volt, #12AWG minimum unless specifically noted otherwise on the Drawings. At the direction of the Owner, aluminum conductors shall not be permitted.
2. Conductors #10AWG and smaller shall be solid. Conductors #8AWG and larger shall be stranded.
3. Insulation of conductor connected to circuit protection devices required to be "100%" rated, shall be 90-degree centigrade rated insulation.
4. Insulation of conductors installed outdoors, on grade or underground, insulation shall be rated for wet locations.
5. Insulation of conductors installed outdoors, installed exposed to the sun, installed in exposed conduits, insulation shall be rated for high-temperature 90 degrees centigrade.
6. Conductor exposed to oil, insulation and jacket shall be oil resistant, complying with “Oil Resistant-1” and “Oil Resistant-2” UL 83.

B. Conductor Insulation

1. 600 Volt AC and/or DC insulated conductors installed entirely inside conduits, or enclosed inside wireways, or enclosed inside raceways, insulation shall be rated as follows.

a. Indoor above Grade locations either concealed or exposed.

1) Dual rated THHN and THWN
2) Individually rated THHN-2
3) Individually rated THWN-2
4) XHHW-2

b. Outdoor above Grade either concealed or exposed.

1) XHHW-2
2) THWN-2
3) THW-2

c. Outdoor below Grade or outdoor on Grade.

1) XHHW-2
2) THWN-2
3) THW-2

d. All other enclosed raceway locations not described above.

1) XHHW-2
2) THWN-2
3) THW-2

C. Insulation Color Coding and Identification

1. The following color code for branch circuits:

a. Neutral . . . White (Tape feeder neutrals with white tape near connections)
b. Normal Power

120/208 Volt	480/277 Volt
Ground Green	Ground Green
Phase A Black	Phase A Brown
Phase B Red	Phase B Orange
Phase C Blue	Phase C Yellow

2. When individual neutral conductors are shown for each branch circuit, the color code for the neutral conductors shall be as follows:

a. 120/208 volt; Phase A - White with Black stripe; Phase B - White with Red stripe; Phase C - White with Blue stripe.
b. 277/480 volt; Phase A - White with Brown stripe; Phase B - White with Orange stripe; Phase C - White with Yellow stripe.

3. Feeders identified as to phase or leg in each, switchboard, switchgear, panelboard and junction location with printed identifying tape.
4. Fire alarm conductors: Use 600-volt, type THHN-2/THWN-2 conductors and Color-Coded per Equipment Manufacturer's recommendations and approved and listed for use on fire alarm systems by the California State Fire Marshal.

D. Panel and Equipment Feeders

1. Wire size shown on the Drawings is for copper conductors. At the direction of the Owner, aluminum conductors shall not be permitted.

2.05 CHEMICAL GROUND ROD

A. General

1. Self-contained ground rod(s) using chemically enhanced grounding shall be provided where specifically indicated on the Drawings. As manufactured by Lyncole XIT Grounding Systems, 22412 South Normandie Avenue, Torrance, California; Telephone (800)962-2610; or Superior Grounding Systems, Irwindale, California; Telephone (800)747-7925; or ERICO – Eritech Chemical Ground Electrode.
2. The ground rod shall operate from changes in atmospheric pressure pumping air through the ground rod, hygroscopically extracting moisture from the air to

activate the ground electrolytic chemicals and improve the ground rod performance.

3. Ground rod system shall be UL-467 listed.
4. Ground rod system shall be 100% self-activating, sealed and maintenance free. The addition of chemical or water solutions shall not be required.

B. Ground Rod

1. Ground rod shall consist of a 2-inches nominal diameter hollow, copper tube. The tube shall be permanently capped on the top and bottom. Air breather holes shall be provided in the top of tube. Drainage holes shall be provided in the bottom and sides of the tube for electrolyte drainage into the surrounding soil.
2. The ground rod shall be chemically filled at the factory with environmentally non-hazardous water-soluble metallic salts to enhance electrical grounding performance.
3. Ground rod shall be a minimum of 10-feet long for straight (vertical) installation; or “L” shape minimum 20-feet long for horizontal installation.
4. Ground wire clamping “U-Bolt” with pressure plate on the top end of the tube sized for 1#2 thru 500 MCM AWG ground electrode conductor connection and stranded 4/0AWG copper pigtail exothermically welded to the side of rod for ground electrode conductor connection.

C. Ground Box

1. Precast concrete box with slots for conduit entrances. Approximately 10-inch diameter by 12-inches high. Cast iron grate flush cover with “Breather” slots XIT Box #XB-12.

D. Backfill Material

1. Natural volcanic, non-corrosive Bentonite Clay backfill material.
2. Shall absorb water at a minimum of thirteen times its dry volume or approximately 14-gallons for 50 pounds of clay.
3. PH value 8-10 with maximum resistivity of 2.5 OHMS-M at 300% moisture content by weight.

PART 3 - EXECUTION

3.01 TRENCHING, FOOTINGS, SLEEVES

Provide Trenching, Concrete Encasement of conduits, back-filling, and compaction for the under-ground electrical work, in accordance with applicable Sections of this Specification.

3.02 GROUNDING

A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State and Local Authorities Having Jurisdiction.

B. Where Nonmetallic Conduit is used in the distribution system, the Contractor shall install the proper sized copper ground wire in the conduit with the feeder for use as an equipment ground. The electrical metallic raceway system shall be grounded to this ground wire.

C. The Maximum Ground/Bond Resistance to the grounding electrode shall not exceed 1ohm from any location in the electrical system. The maximum ground resistance of the grounding electrode to earth shall not exceed 5ohms.

D. Ground/Bond Conductors

1. Provide an additional, dedicated, green insulation equipment ground/bond wire inside each conduit type and raceway as follows. Size the ground/bond conductors to comply with CEC Requirements. The metal conduit or raceway shall not be permitted to serve (function) as the only (exclusive) electrical ground return path:

    a. All types of nonmetallic conduit and all types of non-metallic raceways including but not limited to: RNMC - Rigid Nonmetallic Conduit.
    b. FMC - Flexible Metal Conduit.
    c. LTFMC - Liquid Tight Flexible Metal Conduit.
    d. Metal and non-metal raceways.
    e. RMC - Rigid Metal Conduit.
    f. EMT - Electrical Metal Tubing.

2. The equipment ground/bond wire shall be continuous from the electrical circuit source point of origin to the electrical circuit end termination utilization point as follows:

    a. Every conduit and raceway path containing any length of the above identified conduits or raceway.
    b. Every conduit path and raceway path connected to any length of the above-identified conduits and raceways.

3. The equipment ground/bond wire shall be sized as follows, but in no case smaller than indicated on the Drawings. Install equipment ground/bond wire in each conduit/race-way, with the respective phase conductors:

    a.

Feeder, Sub-feeders and Branch Circuit Protection	Minimum Equipment Ground Wire Size
15 amp	#12
20 amp	#12
0 to 60 amp	#10
70 to 100 amp	#8
101 to 200 amp	#6
201 to 400 amp	#2
401 to 600 amp	#1

4. Splices in ground/bond wires shall be permitted only at the following locations:

    a. Ground buses with listed and approved ground lugs.
    b. Where exothermic welded ground/bond wire splices are provided.

5. Provide ground/bond wire jumpers for conduit fittings with ground lugs, expansion and deflection conduit fittings at conduit fittings connecting between metallic and non-metallic raceways and to bond metal enclosures to conduit fittings with ground lugs.

E. Where conductors are run in parallel in multiple raceways, the grounding conductor shall be run in parallel. Each parallel equipment-grounding conductor shall be sized on the basis of the ampere rating of the overcurrent device protecting the circuit conductors in the raceway. When conductors are adjusted in size to compensate for voltage drop, grounding conductors, where required, shall be adjusted proportionately in size.

F. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.

G. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

3.03 CONDUIT

A. General

1. The sizes of the conduits for the various circuits shall be as indicated on the Drawings, but not less than the conduit size required by Code for the size and quantity of conductors to be installed in the conduit.
2. Conduits shall be installed concealed from view. Install conduits concealed in walls, concealed below floors and concealed above ceilings, except as specifically noted otherwise.

    a. Conduits shall not be installed in concrete floors.

3. The following systems shall be considered as circuits 100 volts and less, all other circuits shall be considered to be over 100 volts (power circuits) unless specifically noted otherwise: Fire alarm, energy management control, telephone, public address, data, computer, television, intercom, intrusion alarm and nurse call.
4. Conduits shall be provided complete with conduit bends, conduit fittings, outlet boxes, pullboxes, junction boxes, conduit anchors/supports, grounding/bonding for a complete, and operating conductor/wire raceway system.
5. Metal and nonmetal conduits shall be provided mechanically continuous between termination connection points. Metal conduit shall be provided electrically continuous between termination connection points.
6. Individual conduit paths and home runs shown on the Drawings shall be maintained as separate individual conduits for each homerun and path.
7. Conduits, conduit fittings and installation work occurring in classified hazardous materials locations shall comply with applicable Code Class 1 Division 1 Requirements, unless specifically noted otherwise.
8. Transitions between conduits constructed of different materials and occurring in above grade locations shall be allowed only at outlet boxes, junction boxes, pull boxes, and equipment enclosures unless specifically indicated otherwise. Provide outlet boxes and junction boxes.
9. Metal conduit terminating to nonmetal enclosures; terminating into metal enclosures with “concentric.ring” knockouts; terminating into metal enclosures with knockout reducing washers, including but not limited to equipment housings, outlet boxes, junction boxes, pull boxes, cable trenches, manholes, shall be provided with a ground/ bonding lug integrated with the conduit termination conductor fitting construction, by the Fitting Manufacturer. The lug shall provide for connection of a grounding/bonding conductor (insulated or uninsulated). The grounding lug shall be located on the fitting, inside the termination enclosure.
10. The type of conduit, type of conduit fittings, and type of conduit supports, and method of conduit installation shall be suitable for the conditions of use and conditions of location of installation based on the Manufacturer’s recommendations; based on the applicable Codes and based on the Requirements of the Contract Documents.

B. RMC Installation Locations. RGS, IMC conduits and RGS, IMC fittings shall be installed in the following locations:

1. Embedded in floors, walls, ceilings, roofs, foundations, and footings constructed with concrete.
2. Embedded in walls and foundations constructed with brick and masonry.
3. Interior of buildings, within 9-feet of finish floor lines for exposed conduit locations.
4. Exterior of building for exposed conduit locations.
5. Damp or wet locations exposed or concealed locations.
6. Exposed on roofs.
7. RMC conduit and RMC fittings may be installed in any location where EMT and FMC conduit is permitted to be installed.

C. EMT Installation Locations. EMT conduit and EMT fittings may be installed in the following locations, for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”; only dry locations:

1. Concealed in hollow non masonry/non-concrete, metal stud frame and wood stud frame walls and floors.
2. Concealed above ceilings.
3. Exposed inside interior enclosed crawl spaces.
4. Exposed interior locations placed 9-feet or higher above finished floors (except as described in paragraph below at lower heights).
5. Exposed on walls and ceilings (any height) in the following dedicated function areas, interior enclosed room locations:

    a. Indoor enclosed electrical equipment rooms and closets.
    b. Indoor enclosed data and telecommunication terminal rooms and closets.
    c. Indoor enclosed HVAC equipment rooms and closets.

6. Any location where FMC is described to be installed, except as the final connection to rotating or vibrating equipment.

D. FMC Installation Locations. FMC conduit and FMC fittings may be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”; only dry, interior locations:

1. Concealed in hollow non-masonry metal stud frame and wood stud frame fully enclosed walls.
2. Concealed above fully enclosed ceiling spaces.
3. FMC conduit shall be installed in continuous lengths between termination points. FMC shall not be “spliced” or coupled directly to FMC or any other conduit type under any circumstance.
4. The maximum continuous length of FMC that shall be installed between termination end points is 15-feet. Circuits requiring continuous conduit lengths exceeding 15 feet between termination end points shall be installed using either RMC or EMT conduits. FMC lengths shorter than 16-inches are prohibited.
5. The minimum size FMC conduit shall be as shown on the Drawings but not be less than the following:

    a. FMC lengths of 6-feet or less, minimum FMC conduit size shall be 0.50-inch.
    b. FMC lengths exceeding 6-feet, minimum FMC conduit size shall be 1.0-inch.

E. LTFMC Installation Locations. LTFMC conduit and LTFMC fittings shall be installed in the following locations for circuit conductors operating below 600 volts to ground; locations containing only “non-hazardous materials”:

1. Final electrical connection to vibrating or rotating equipment; control and monitoring devices mounted on vibrating and rotating equipment including the following. Minimum conduit length shall not be less than 24-inches:

    a. Motor, engines, boilers, solenoids, and valves.
    b. Fixed mounted “Shop” (manufacturing) production equipment.
    c. Fixed mounted food preparation equipment and “Kitchen” equipment.

2. All locations where exposed flexible conduit connections are required, both indoor and outdoor.
3. Final connection to indoors electrical transformers. Minimum conduit length shall not be less than 24-inches; maximum conduit length shall not exceed 72-inches.
4. Do not install LTFMC located in environmental air plenums.

F. RNMC Installation Locations. RNMC conduit and RNMC fittings shall be installed in the following locations containing only “non-hazardous material”:

1. Underground, concealed below earth grade, unless specifically noted or specified otherwise.
2. RNMC type “EB” conduit(s) shall be concrete encased along the entire length of the conduits for all installation locations.
3. Non-metal type raceways and RNMC type conduit shall not be installed inside buildings.

G. Conduit Installation

1. Conduit Supports

    a. Securely and rigidly support all raceways/conduits from the building structure. Raceways/conduits shall be supported independent of all piping, air ducts, equipment ceiling hanger wires, and suspended ceiling grid systems. Secure conduit to structural element by means of UL listed and approved hangers, fasteners, “C” channels and pipe clamps.
    b. Provide conduit supports spaced along the length of the conduit as follows:

        1) RMC and EMT conduit, maximum not to exceed 96-inches on center; within 24-inches of each conduit bend and conduit termination location.
        2) FMC and LTFMC conduit, maximum not to exceed 24-inches on center; within 6-inches of each conduit bend and conduit termination location.

    c. Suspended conduit methods:

        1) Individual, suspended raceways/conduits separated by more than 12-inches from any other conduit and suspended from ceilings and roofs shall be supported as follows:

            a) Conduits smaller than 1.5-inch by means of hanger rods or hanger wires.
            b) Conduits 1.5-inch and larger by means of hanger rods.
            c) The conduit shall attach to the hangers with pipe clamps.

2) Suspended raceways/conduits positioned within 24-inches of any other conduit shall be grouped and supported by hanger rods using trapeze type conduit support channels ("C" channels). Conduits shall individually attach to common channels side-by-side, with pipe clamps.

d. Non-suspended conduit methods:

1) Individual raceway/conduits placed against wall/ceiling/floors, placed inside hollow wall/ceiling construction or structure framing (i.e., “dry- wall” or plaster hollow wall construction), shall be secured by means of individual pipe clamps and fasteners attached to the framing studs or other structural members and the conduit/raceway.
2) Provide common “C" channel supports for all multiple raceway/conduits placed against vertical or horizontal surfaces and positioned within 24-inches of other raceways/conduits. Attach channels to the framing studs or other structural members. Attach the conduits/raceway individually to common channels, side-by-side, with pipe clamps.
3) The use of toggle bolts is prohibited.

e. Conduit rising from floor for motor connection shall be independently supported if extending over 18-inches above floor. Support shall not be to a motor or ductwork, which may transmit vibrations.
f. Provide conduit anchoring, conduit support and conduit bracing systems conforming to Earthquake Seismic Zone 4 Requirements. The conduit support/anchoring system capacity shall include the weight of the conduits, conduit fittings, conduit supports, and conductors/wires/cables installed in the conduits plus a 300% safety factor. Submit Shop Drawing details showing each typical conduit anchor, conduit support and conduit brace location.

2. Conduit separation:

a. Conduit installed underground or below building slab without full concrete encasement: Shall be separated from adjacent conduits of identical systems (i.e., signal to signal, data to data, power to power, control to control etc.) by a minimum of 3-inches. Conduits of non-identical systems (i.e., signal to power; data to power; power to control; signal to control, etc.) shall be separated by a minimum of 12-inches.
b. Conduit installed underground with full concrete encasement; shall be separated from adjacent conduits of similar systems (100 volt and less) by a minimum of 2-inches; conduits for non-power systems (100 volts and less to ground) shall be separated by a minimum of 6-inches from power circuits (over 100 volts to ground); conduits for power circuits shall be separated from adjacent conduits of similar power systems (over 100 volts to ground) by a minimum of 3-inches.
c. Separation of conduits entering termination points or crossing other conduits may be reduced as required within 60-inches of the termination or crossing points.
d. Conduits shall be separated from hot water piping, exhaust flues/ chimneys, steam piping, boilers, furnaces, ovens by a minimum of 12-inches.

3. Conduit stubs:

   a. Conduits stubbed underground outside of building line for future use shall be terminated a minimum of 5-feet clear (whichever distance is greater) of building or adjacent concrete walks and AC paving. The stubout conduit shall be capped. Provide concrete monuments, 6-inches by 6-inches by 15-inches deep, buried flush with grade over the capped ends. The face of monument shall be furnished with 3-inches square brass plates securely mounted and engraved with the number and size of conduits and type of service (i.e., "POWER", "TEL.", etc.).
   b. Conduits stubbed into ceiling spaces from outlets for telephone, video, computer/ data or television shall be provided with an insulated throat bushing, on the end of each conduit stubout.
   c. Conduit stubouts from outlet boxes and equipment located in hollow stud walls, into ceiling spaces, shall be EMT or RMC conduit. The stubouts shall terminate into the ceiling and floor spaces with a conduit termination connector fitting.
   d. Empty conduit stubs into building spaces and equipment shall be individually identified with an “ID-tag” located at each end of the conduit. The ID-tag shall state the origination point and termination point of the respective conduit (i.e., “from PNL-A/to Room #121”; “from outlet #24/to outlet #17 in Room #120”; etc.).
   e. Provide a conduit termination fitting with insulated throat bushing and mechanical ground lugs at each conduit “stub-up” location.

4. Conduit concrete encasement:

   a. Conduits which are run underground exterior to building slab shall be continuously concrete encased except, 15- and 20-amp power branch circuit conduits under-ground do not require concrete encasement.
   b. Concrete for encasement of underground conduits shall be 2000-PSI 28-days cure strength with a mix of cement, sand, water and maximum of ¾-inch gravel. Concrete encasement of conduits shall be continuous without voids. The encasement shall extend 3-inches past the edges of all conduits on all sides of the circuit. Provide 10 pounds of red oxide cement coloring uniformly mixed with each cubic yard of concrete for conduit encasement.
   c. Conduits located below or adjacent to structural foundations shall be separated from the foundation by a minimum of 12-inches. Conduits located below structural foundations shall be fully and continuously concrete backfilled and encased between the bottom of the foundation to the bottom of the conduits. The concrete shall be 4000-PSI 28-day cure strength instead of 2000-PSI concrete.
   d. Conduits of any size and type (including 15 amp and 20-amp power branch circuits) located under roads, paved areas and “transit-system” right of way shall be concrete encased.

5. Underground conduits:

   a. Three or more underground conduits larger than 1-inch in size and occupying the same trench shall be separated and supported on factory fabricated, non-metallic, duct/conduit support spacers. The spacers shall be modular, keyed interlocking type, "built-up" to accommodate quantity, size orientation and spacing of installed conduits. The spacers shall maintain a constant distance between adjacent conduit supports and hold conduits in place during trench backfill operations. Minimum

support spacer installation interval along with length of the conduits shall be as follows:

1) Concrete encased conduits, not less than 8-feet on center.
2) Non-concrete encased conduits, not less than 5-feet on center.

b. Provide trenching, excavation, shoring and Back-filling required for the proper installation of underground conduits. Tops of backfill shall match finish grade.

c. Bottoms of trenches shall be cut parallel to "finish grade" elevation. Make trenches 12-inches wider than the greatest diameter of the conduit.

d. Back-filling Trenches for Conduits without Concrete Encasement Requirements

1) Conduits which are not required by the Contract Documents to be concrete encased and are located exterior to building slab, shall be set on a 3-inch bed of damp clean sand. Conduit trenches shall be back-filled to within 12-inches of finished grade with damp sand after installation of conduit is completed. Remainder of backfill shall be native soil.
2) Conduits located under a building which are not required by the Contract Documents to be concrete encased, shall be completely backfilled and compacted with clean damp sand to the same level as the building foundation pad.
3) Provide a continuous yellow 12-inches wide flat plastic tracer tape, located 12-inches above the conduits in the trench. The tracer tape shall be imprinted with "Warning-Electric Circuits" a minimum of 24-inches on center.

e. Back-filling trenches for conduits under paved areas:

1) In addition to the Requirements of conduit concrete encasement, conduits under walkways, roads, parking lots, driveways, and buildings shall be cast in place concrete "slurry mix" backfill. The slurry mix shall cover each side and top of conduits and conduit concrete encasement. The slurry mix shall be continuous to the underside of the finish subgrade surface.

f. Back-filling trenches for conduits with concrete encasement Requirements by the Contract Documents:

1) Trenches with all conduits concrete encased shall be backfilled with clean damp sand when located under building pads.
2) Trenches with all conduits concrete encased and not located under a building pad and not located under paved areas shall be backfilled with clean damp sand or native soil.

g. Backfill material:

1) Sand and native soil backfill of trenches shall be machine vibrated in 6-inch lifts to provide not less than 90% compaction of backfill.
2) Soil backfill shall have no stones, organic matter of aggregate greater than 3-inches.
3) Concrete and slurry mix (2000-PSI) shall be machine vibrated during installation to remove "air-voids".

4) The slurry mix shall consist of concrete, clean rock, clean sand and clean water mixture. Maximum shrinking of slurry mix shall not exceed 5% wet to dry.

h. Do not backfill until Owner's Representative has approved Installation and As-Built Drawings are up to date. Promptly install conduits after excavation has been done, to keep the excavations open as short a time as possible. Excess soil from trenching shall be removed from the site.

i. Install underground conduit, except under buildings, not less than 24-inches below finished grade in non-traffic areas and 30-inches below finished grade in traffic areas, including roads and parking areas. Not less than 48-inches below finished grade under public/private transit system right of way and railroad right of way. Dimensions shall be measured to the top of the conduit.

j. Conduit crossing existing underground utilities shall cross below the bottom depth of the existing utilities. If the top portion of the existing utility depth below finish grade exceeds 72-inches and the specified separation and depths are maintained when crossing over the top of the existing underground utility, the conduit may cross above the existing underground utility.

k. Provide long radius horizontal bends (minimum radius of 36-times the conduit diameter) in underground conduits where the conduit is in excess of 100-feet long.

l. Conduits installed below grade and on grade below buildings, shall not be smaller than 0.75-inch. Conduits for circuits exceeding 600 volts shall not be smaller than 5.0-inches.

m. Underground conduits entering a building shall be sloped. The conduit direction of slope shall be away from the building and shall prevent water in the conduit from "gravity draining" towards the building. The conduit slope "high point" shall originate from the building, out to the first exterior pullbox, manhole etc. exterior conduit termination "low point". The minimum slope angle shall be a constant 8-inches (or greater) of fall for each 100-feet of conduit length.

n. Dewatering:

1) Provide pumping to remove, maintain and dispose of all water entering the excavation during the time the excavation is being prepared, for the conduit laying, during the laying of the conduit, and until the backfill at the conduit zone has been completed. These provisions shall apply on a continuous basis. Water shall be disposed of in a manner to prevent damage to adjacent property. Trench water shall not be drained through the construction. Groundwater shall not be allowed to rise around the pipe until joining compound has firmly set.

2) The Owner's Representative shall be notified 48 hours prior to commencement of dewatering.

6. Raceway/Conduits, which are installed at this time and left empty for future use, shall have 0.25-inch diameter polyvinyl rope left in place for future use. The pull rope shall be 500-pounds minimum tensile strength. Provide a minimum of 5-feet of slack at each end of pull ropes.

7. Unless otherwise restricted by Structural Drawings and Specifications, the maximum size conduit permitted in concrete slab on-grade, walls, ceilings and roofs constructed of masonry or concrete shall not be greater than 20% of the concrete/masonry thickness. Conduits installed in these locations shall not cross.

    a. Conduits shall not be installed in cast-in-place concrete floors.

8. Provide openings in building structures for conduit penetrations:

    a. New construction shall be provided with conduit sleeves, to provide conduit penetrations.
    b. Existing construction shall be drilled (core drill masonry and concrete) and provide conduit sleeves installed after drilling, to provide conduit penetrations.
    c. Where the structure penetrations for underground conduits penetrating through foundations will not comply with the (restriction/penetration) shown in the Contract Documents, install the conduits below and clear of the foundation lowest point.

9. Conduit bends risers and offsets:

    a. The minimum bend radius of “factory or field” fabricated conduit bends shall not be less than the following. The bend radius shall be measured at the surface, inside radius of the conduit wall:

        1) FMC and LTFMC conduit - conduit minimum bend radius 12-times the conduit diameter.
        2) RMC and EMT conduit minimum bend radius - conduit for power circuits over 100-volts and less than 600-volts, 8-times conduit diameter. Conduit for power circuits over 600-volt, 12-times conduit diameter. Conduit for low voltage, signal and fiber optic circuits, 10-times conduit diameter.
        3) RNMC conduit - conduit minimum bend radius 36-times the conduit diameter. Under building reduce minimum bend radius to 10-times the conduit diameter. Conduit bends and offsets in RNMC with less than 36-times conduit diameter bend/offset radius shall be RNMC PVC schedule 80 or PVC coated RGS.

    b. Bends and offsets in conduits shall be kept to an absolute minimum. The total summation of all bends and offsets permitted in a conduit segment, occurring between two conduit termination/connection end points, shall not exceed the following, including conduit fittings:

        1) RMC and EMT conduit - 360 angular degrees
        2) FMC and LTFMC conduit - 180 angular degrees
        3) RNMC conduit - 270 angular degrees

    c. Each field fabricated conduit offset, bend and elbow which are not the standard product of the Raceway/Conduit Manufacturer shall be mandrel tested. The test shall be conducted after the conduit installation is complete and prior to pulling-in any wire, in the same manner as for underground conduits.
    d. Factory manufactured angle connector conduit fittings shall be installed in exposed conduit locations only. Installation in locations normally concealed from view shall not be permitted. Not more than one factory

manufactured angle connector shall be permitted in any length of conduit between conduit termination end points.

e. RNMC conduit risers from below grade shall be PVC coated RGS. Conduit risers, bends or offsets entering into a building shall be PVC coated RGS.

f. If three or more conduit-bends of the same conduit size and same conduit material type, installed, as part of the Contract Work, fail to comply with the required minimum conduit bend radius or conduit angular degree limits. The following corrective actions shall occur:

1) The Contractor shall remove all the non-complying conduit bends and the respective wire in the conduit from the Project Site. Provide new conduit and wire, complying with the Contract Documents.
2) Where the conduit bends similar to the non-complying conduit bends are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the conduit bends to allow visual observation.
3) The Contractor shall remove the non-complying conduit bends and dispose of the Project Site. The Contractor shall provide new conduit bends and conductors complying with the Contract Documents.
4) All the costs to correct the deficient material and work along with costs to repair the direct, indirect, incidental damages and Contract delays shall be the sole responsibility of the Contractor and shall be included in the bid price.

10. Expansion joint, deflection joint and seismic joint fittings.

a. Provide a conduit expansion fitting for each conduit length and conduit type as follows (Note - The installation of specified combination expansion/deflection fittings at seismic joints shall satisfy this spacing Requirement also):

	Conduit Type	Conduit	Fitting Length Spacing
1)	RMC and EMT	Exposed exterior locations	200-feet
2)	RMC and EMT	Interior weather protected locations	400-feet

b. Provide a conduit combination expansion/deflection fitting for each conduit, crossing the following elements:

1) At each building or non-building structure seismic joint.
2) At each building on non-building structure expansion joint.
3) At each conduit penetration of a “sound-rated” wall, floor or ceiling.

11. Provide two locknuts and an insulated throat bushing at each metal conduit terminating at enclosures, including but not limited to outlet boxes, junction boxes, terminal cabinets, switchgear, transformers, switchboards, distribution panels and panelboards.

12. Provide metallic or plastic closure caps on all conduit ends during construction, until installation of conductors in the respective conduit.

13. Conduit run exposed, shall be run at right angles or parallel to the walls or structures. All changes in directions, either horizontally or vertically, shall be made with conduit outlet bodies as manufactured by Crouse Hinds, OZ or equal. Conduits run on exposed beams or trelliswork shall be painted to match surrounding surfaces.

14. Rigid steel conduit or electrical metallic tubing shall not be strapped or fastened to equipment subject to vibration or mounted on shock absorbing bases.
15. RMC conduit threads:

    a. Machine cut threads on RMC conduit required for field fabrication shall comply with NPS and ANSI-B1.20.1.
    b. The length of bare metal exposed during thread fabrication shall be completely covered by conduit couplings and fittings. Additionally, the thread length shall insure that conduit joints will reach “torque” tightness and become secure before conduit ends “butt” together and before conduit ends “butt” into the “shoulders” of other conduit fittings.
    c. Running threads or right/left-handed threads shall not be used to connect RMC.

16. RNMC conduit:

    a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.

17. Tighten each conduit fittings and fitting appurtenance, to the “torque” (allowable tolerance ±5%) value recommended by the Fitting Manufacturer and applicable Code. If three or more conduit fittings are found to not be in compliance with the Manufacturer’s “torque” (tightness) recommendations, the following corrective actions shall occur:

    a. The Contractor shall tighten “re-torque” the defective fittings and all similar conduit fittings installed as part of the Contract Documents in the presence of the Owner’s Representative.
    b. If the respective conduit fittings similar to the deficient “torque tightness” fittings are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the fitting, to allow retightening each similar conduit fitting to the Manufacturers recommended “torque” values.
    c. All the cost to repair the direct, indirect, incidental damages and Contract delays resulting from complying with these Requirements shall be the sole responsibility of the Contractor and shall be included in the bid price.

H. Conduit Bodies

1. Conduit bodies shall be installed in exposed conduit locations only or above accessible ceilings.
2. Conduit bodies shall be accessible for removing body cover and pulling wire through the conduit body.
3. Conduit bodies shall not be installed inside enclosed walls.

I. Preparation of Reuse of Existing Conduits

1. Prepare existing conduits shown to be reused as part of Contract Work as follows: Complete the required work prior to installing any conductors or cables in respective existing conduits.

    a. “Rod” out existing raceways to be used under this contact, with approved test and flexible mandrels to remove all obstructions to clear debris from inside conduits.
    b. Use test mandrels at least 12-inches long, 0.25-inch less than diameter of duct at center, tapering to 0.5-inches less than duct size at ends.

2. If test mandrels cannot be pulled through raceways, Contractor shall perform the following to clear the existing raceways:

    a. Force rigid or semi-rigid rods through the raceways to clear the obstructions from one to both ends of the raceway.
    b. Force a power-driven rotating router device through the conduit from one or both ends of raceways. Device shall incorporate small diameter cutting blades. Repeat the “router” process in incremental stages to a cutting blade diameter approximately ⅛-inch smaller than the raceway inside diameter.

3. After clearing the raceway of obstructions, pull a test mandrel or brush through the raceway to clear the remaining debris from the raceway.

3.04 WIRE AND CABLE

A. Branch circuit and fixture joints for #10AWG and smaller wire shall be made with UL-approved connectors listed for 600 volts, approved for use with copper and/or aluminum wire. Connector to consist of a cone-shaped, expandable coil spring insert, insulated with a nylon shell and two wings placed opposite each other to serve as a built-in wrench or shall be molded one-piece as manufactured by 3M-"Scotchlok".

B. Branch circuit joints of #8AWG and larger shall be made with screw pressure connectors made of high strength structural aluminum alloy and UL-approved for use with both copper and/or aluminum wire as manufactured by Thomas & Betts. Joints shall be insulated with plastic splicing tape, tapered half-lapped and at least the thickness equivalent to 1.5-times the conductor insulation. Tapes shall be fresh and of quality equal to Scotch.

C. Use UL listed pulling compound for installation of conductors in conduits.

D. Correspond each circuit to the branch number indicated on the panel schedule shown on the Drawings except where departures are approved by the Owner’s Representative.

E. All wiring, including low voltage, shall be installed in conduit.

F. All splices in exterior pull boxes shall be cast resins encapsulated.

    1. Power conductor splices - 3M Scotchcast Series 82/85 /90; Plymouth or equal.
    2. Control and signal circuits 3M Scotchcast Series 8981 thru 8986, Plymouth or equal.

G. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3-inches on centers. Tag all spare conductors.

3.05 TESTING

A. Testing Conduit and Conduit Bends. The Contractor shall demonstrate the usability of all underground raceways, and field fabricated conduit bends installed as part of this Contract.

    1. A round tapered segmented semi-rigid mandrel with a diameter approximately ¼-inch smaller than the diameter of the raceway, shall be pulled through each new raceway.
    2. The mandrel shall be pulled through after the raceway installation is completed. Conduits which stubout only, may have the mandrel pulled after the concrete encasement is completed, but prior to completing the backfill.

3. Owner's Representative shall witness the raceway testing for usability. A Representative of the respective Utility Company shall witness the raceway testing where applicable.
4. Contractor shall repair/replace any conduit and conduit bend provided under this Contract which will not readily pass the mandrel during this test.

END OF SECTION 26 05 30
080322/1125080

BLANK PAGE

SECTION 26 24 15

PANELBOARDS AND TERMINAL CABINETS

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and Drawings for related work required to be included as work under this Section.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Provide Manufacturers catalog data for panelboards, cabinets and circuit breakers.

B. Provide Shop Drawing showing panelboard circuit arrangements, size, voltage, ampacity, overcurrent protective devices, etc.

C. Provide nameplate engraving schedule.

D. Short Circuit and Arc-Flash

1. Perform and submit engineered settings for each fuse and adjustable circuit breaker device, showing the correct time and current settings to provide the coordination within the limits of the specified equipment, per the latest applicable Standards of IEEE and ANSI. Provide Electric Arc-Flash calculations as part of the Coordination Study recommendations. The information shall be submitted in both tabular form and on time current log-log graph paper, with an engineering narrative, six copies.
2. The goal is to minimize an unexpected but necessary electrical system outage and Personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract equipment, including but not limited to:

a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
b. IEEE-1584, Guide to Performing Arc-Flash Hazard Study.
c. CEC/NEC

PART 2 - PRODUCTS

2.01 PANELBOARDS

A. Panelboards shall be flush or surface mounting as indicated with circuit breakers as shown on panel schedule, hinged lockable doors, index cardholders and proper bussing.

B. Where indicated on the Drawings, panelboards shall be furnished with subfeed breakers and/or lugs, split bussing, contactors, time switches, relays, etc., as required.

C. All panelboards shall be keyed alike.

D. All panelboards shall be finished with one coat of zinc chromate and coat of primer sealer after a thorough cleaning where exposed to public view (e.g., corridors, covered passages, offices, etc.) and gray in switchboard, janitor's heater and storage rooms. Prime coated panelboard shall be painted to match surroundings after installation. Panelboards shall be fabricated of sheet steel of the following minimum gauges: Door and trim #12; enclosure - Code gauge steel.

E. Furnish all panelboards and terminal cabinets with the Manufacturers flush locks and keys except where indicated otherwise herein. Fasten the trim to panelboards and terminal cabinets by means of concealed, bolted or screwed fasteners accessible only when the door is open.

F. Panelboards 208/120 volt, three phase, 4 wire, S/N or 120/240-volt, single phase, 3 wire, S/N. Panelboard types as manufactured by:

1. Cutler Hammer ..... Type Pow-R-Line 1
2. General Electric ..... Type "A" Series
3. Square D..... Type NQOD
4. Siemens..... Type “S” Series

G. Panelboard for bussing sizes thru 400-amp shall be 20-inches wide surface mounted type. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with trim plate cover extending 1-inches on all sides of enclosure. Depth shall be 5¾-inches nominal. Height of panel as required for devices.

H. Provide 6-inches additional gutter space in all panels where double lugs are required or where cable size exceeds bus size. Minimum bottom gutter space shall be 6-inches high. 12-inches additional gutter space may be required for aluminum feeders where used.

I. Panelboards with buss sizes greater than 400-amp for 480/277 volt, three phase, 4 wire, S/N or 480 volt, three-phase, 3 wire shall be 24-inches (maximum) wide by 6½-inches (maximum) deep units and 30-inches to 40-inches (maximum) wide by 8-inches to 12-inches (maximum deep units. The wider units shall be used only at locations where the narrow unit is not available with the number of 225-amp frame branch circuits shown on the panel schedules, or where the main breaker size exceeds the narrow panel maximum. Distribution panels shall be as manufactured:

	Narrow	Wide
1.	Cutler Hammer…… Pow-R-Line 3 or	Type CDP
2.	General Electric……...Type CCB or……..	QMR
3.	Square D……Type HCN or…….	HCM

4. Distribution panelboards for 208/120 volt three-phase and 120/240-volt single phase shall be similar to the 480/277-volt panelboards.

J. Panelboard shall have a circuit index cardholder removable type, with clear plastic cover. Index card shall have numbers imprinted to match circuit breaker numbers.

2.02 SHORT CIRCUIT RATING

A. Branch circuit panelboard circuit breakers and bussing shall be rated for short circuit interrupt and withstand symmetrical amperes as shown on the Drawings.

2.03 CIRCUIT BREAKERS

A. Circuit breakers as manufactured by the following companies only are acceptable:

1. Cutler Hammer
2. General Electric Co.
3. Square D Co.
4. Siemens

B. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the Drawings. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs, which can readily be changed from front of panel, will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.

C. Where 2-pole or 3-pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.

D. All circuit breakers shall be pad-lockable in the "off" position. Locking facilities shall be riveted or mechanically attached to the circuit breaker (submit sample for approval). Other means of attachment shall not be accepted without prior written approval of Architect.

E. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall be furnished with lockout clips, mounted in the “on” position. The breakers shall be able to trip automatically with lockout clips in place.

F. Panelboard circuit breakers shall be bolt on type.

2.04 BUSSING

A. Bussing shall be rectangular cross section copper, or silver or tin-plated aluminum. Bussing shall be full length of the enclosure.

B. Each panelboard shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

C. Provide space and all hardware and mounting attachments for future devices as indicated on the Drawings.

2.05 TERMINAL CABINETS

A. Terminal cabinets shall be fabricated of Code gauge sheet steel for flush mounting (except where noted as surface) of size indicated on the Drawings, and complete with hinged lockable doors and the number of 2-way screw terminals required for termination of all conductors. Terminal cabinet locks to operate from same key used for panelboards. The trim to terminal cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door to terminal cabinets. Terminal cabinets shall have 5/8-inches plywood backing. Cabinets shall be finished with one coat of zinc chromate and one coat of primer sealer after a thorough cleaning where exposed to public view (e.g., corridors, covered passages, offices, etc.) and gray in switchboard, janitors, heater and storage rooms. Prime coated cabinets shall be painted to match surroundings after installation.

B. Terminals for signal systems cabinets to Cannon Type “SS”.

C. Provide engraved nameplate on each cabinet indicating its designation and system (i.e., “Life Safety System - Panel 2LS”).

PART 3 - EXECUTION

3.01 MOUNTING

A. Surface mounted panelboards and terminal cabinets shall be secured to walls by means of preformed steel channels securely fastened to at least two studs or structural members.

B. Panelboards shall be installed to ensure the top circuit protective device (including top compartment control devices) are not more than 6-feet-6-inches above finish floor in front of the panel and the bottom device is a minimum of 12-inches above the floor. Manufacturer shall specifically indicate on Shop Drawing submittals each panel where these conditions cannot be met.

3.02 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. Provide a red and white bakelite nameplate with ½-inches high letters in each 277/480 volt panel fastened to face of dead-front plate, to read: “DANGER 480 (or as applicable) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY”.

B. Panelboard Manufacturer shall stencil the panel number identification on the inside of panel door to correspond with the panel designation on the Drawings.

C. Identification plates and numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind shall not be used.

END OF SECTION 26 24 15
080322/1125080

SECTION 26 60 10

ELECTRONIC NETWORK SYSTEMS INFRASTRUCTURE

PART 1 – GENERAL

BRIEF STATEMENT OF WORK

Tustin USD is looking to have Three Portables re-cabled with CAT6 network cabling and have the old cabling removed. For aspects of the project, cable type, installation notes, etc. were included in the detailed statement of work and materials.

1.01 SCOPE

A. Include all labor, equipment, and materials necessary for providing a complete data networking system as described herein and/or as indicated on the Drawings.

B. Quality Assurance

1. Manufacturers' qualifications: All components shall be manufactured by an approved Manufacturer. Acceptable Manufacturers are Berk-Tek/Levinton, Middle Atlantic, Chatsworth Products (see the "Quick Order/Accepted Parts" reference sheets and product part numbers https://tustin.sharepoint.com/:w:/s/InfrastructureTeam/Eb5n4ewOxYJIouLdD_WwgnoBAsvvLxHlb0nIfaKTA4IN7A?e=rhxEAs) Systems or components as manufactured by any other Manufacturer's which are not specifically listed in 1.01., are not approved for use on this project. Specified system warranties are to be established between the component Manufacturers (t use product solution part numbers in order to get a warranty from the manufacture. Product reference sheets and product part numbers at the end of this document) and the Owner, warranties between the Cable Manufacturer or Installing Contractor and the Owner are not considered equal. See Manufacture Warranty Statement at the end of this Document (specifically the copper and fiber cabling solution from Bertek Leviton).
2. Installing Contractor qualifications: Firms and their Personnel must be regularly engaged in the installation of data networking cabling and equipment for systems of similar type and scope. The Contractor must have a full-service office able to respond to emergency callouts during the warranty period. The warranted system solutions for each Manufacturer shall be proposed Category-6 certified warranties per Section 1.03. The Contractor must also provide complete installation of all wiring and devices or equipment. Subcontracts with electrical Contractors or other warranted or non-warranted Contractors for supervised installation of any part of this system, is not approved. All conduit and standard back boxes will be furnished and installed by the Electrical Contractor. Specialty boxes will be furnished by the Equipment Supplier and installed by the Electrical Contractor.
3. Equipment qualifications: It is the intent of these Specifications that each Bidder provides all hardware, components and installation services that are necessary to ensure a fully operational Category-6 wiring system proposed in the EIA/TIA Category-6 and the ISO Class E drafts.
4. Warranty: Warranty shall be a full "Performance Warranty" installed by a "Certified Contractor" as specified by the Manufacturer (i.e., Levinton - Bertek). A "Component Warranty" will not be considered equal. All components, labor, and 'Link Performance Criteria" shall be warranted by one of the approved Manufacturers as indicated in Section 1.01. and shall be incompliance with the most current Category-6 standards. Warranty shall be to the customer for a minimum period of 5-years after Customer acceptance and signoff of the completed system. The Contractor must provide documentation from one of the

approved Manufacturers as indicated in Section 1.01. indicating their qualifications for installation of this system in compliance with the Manufacturer's Warranty Requirements as a warranted Contractor. See Manufacture Warranty Statement at the end of this Document.

C. In order to ensure project cohesion, a single point of contact is required to provide a "TURNKEY" solution. The work covered under this section ofthe Specification consists of furnishing all labor; cabling (which shall include patch cords in the IDF or MDF frompatch panel to District provided network electronics. Patch cords shall be Cords (copper), Levinton fiber Patch cords, qty to be decided based on number of terminations length to be decided by Tustin Unified School District IT Dept at (714) 730-7301; equipment; supplies; materials, and training. The Contractor will perform all operations necessary for the "TURNKEY" and fully completed installation in accordance with the Specifications herein. As such, the successful Contractor must be factory trained on all aspects of system hardware. The successful Contractor shall be a California licensed C7 or C10 premise Wiring Contractor as defined in this Specification.

D. Based on the Construction Site Plans Service Providers are to propose complete bills of quantities, including all materials, components, devices, and equipment required for this work. The bills of quantities shall be tabulated respective of each and every system as specified, and shall contain the following information for each Section listed:

1. Description and Quantity of Each Item
2. Manufacturer's Name and Model Number
3. Manufacturer's Specification Sheet
4. Include with submittals all warranty information and a description of support and maintenance services to be provided. Also include all licenses and maintenance agreements required for continued operation of the equipment.

PART 2 – PRODUCTS

PRODUCT, INSTALLATION, TESTING AND DISPOSAL

Below is TUSD's "Product, Installation, Testing, and Disposal" Requirements for these projects. Any further detail on top of these will be added to the "Job Specific" detailed sections.

2.01 PRODUCTS

A. All termination equipment, outlets, fiber optic cable, UTP cable, and required hardware shall be as manufactured by the approved Manufacturers as listed in Section 1.

B. Equipment racks have been detailed on the Drawings and additional Component Information Requirements have been described in the IDF products sections. The following is a list of approved Manufacturers for each type of rack system.

1. Alternate equipment Manufacturers other than those indicated will not be reviewed or approved for use on this project.
2. (Open Frame) shall be manufactured by Chatsworth CPI Reference Drawing details and Specifications for Complete Requirements.
3. (Enclosed Wall/Floor Mount) shall be manufactured by Middle Atlantic DWR-26 Series. Reference Drawing details and Specifications for Complete Requirements.

2.02 INTERMEDIATE DISTRIBUTION FRAME (IDF)

A. The Intermediate Distribution Frame shall be a secondary wiring and equipment location for the data networking system. The Contractor shall include the following items at this location.

1. If using wall mounted Cabinet, Provide flame resistant plywood mounting backboard will need to be installed. Painted with fire resistant paint, white or color to match. Contractor shall provide minimum one side finish grade plywood. Backboard shall be mounted with finish side out, regardless of location of fire rating stamp.
2. Fiber optic termination equipment (rack or wall mounted per Drawings), including all associated installation hardware for fiber feed cables. The equipment must have sufficient number of ports to connect all fibers in every cable terminated at this location. Fully populate panel with duplex LC bulkheads.
3. Category-6 Modular Patch Panel (rack mounted) with RJ45 style connectors, for terminating all twisted pair cable from each data outlet served from this location. All patch panels shall be 24, or 48 port maximum. Provide equipment mounting rack or enclosure as detailed in the Drawings. Provide ladder rack bracing at top of rack back to wall and seismic bolting to floor and wall as shown on detail Drawings. Rack shall be furnished with the following accessories:

    a. One grounding kit, connect grounding conductor to nearest ground buss bar. CPI Part #41016-001 or equal.
    b. (Only applies to open frame/four post rack) Provide full length vertical wire managers, Part number located on the “Quick Order/ Accepted Parts” reference sheets and product part numbers at the end of this document) on each side of each rack section, and between racks (if multiple racks are used) for full height open racks.
    c. Applies to Open Frame and Wall mount Cabinets. Horizontal wire managers. Due to how rigid Cat 6A we DO NOT request or require Horizontal cable manager. If you are to provide them, you will need to take them back and credit back the District/Project.
    d. For wall-mounted cabinets. Provide one rack mounted surge arrest style power strips, Part number located on the “Quick Order/ Accepted Parts” reference sheets and product part numbers at the end of this document)
    e. For open frame/four post rack Provide or one vertically mounted surge suppressed. Part number located on the “Quick Order/ Accepted Parts” reference sheets and product part numbers at the end of this document)

2.03 CAMPUS INDOOR/OUTDOOR FIBER OPTIC FEED CABLE

A. Provide one continuous fiber optic cable routed from the Main Distribution Frame fiber patch panel to each Intermediate Distribution Frame fiber patch panel, and/or other locations as shown on the Drawings.

B. Fiber optic cable shall be rated for indoor/outdoor applications. Construction shall consist of; all dielectric, stranded loose tube with central strength member, no more than six strands per tube, flame retardant PVC or PE jacket, rated OFNR, water blocking gel in tubes or dry water-blocking compound, and blank fillers as required. Central tube type fiber will not be considered equal.

C. Fiber optic feeds shown as composite type may be run as separately jacketed cables. Cables shown as separate runs on the Drawings may not be combined together.

D. Cable shall contain one or all types of fibers listed below:

1. For Fiber Optic runs should use Single mode OS2 Indoor/Outdoor loose tube or tight buffered fiber with a water barrier to prevent water from entering jacket of cable capable of 10 gigabit transfer rates (six or twelve strand based on request from Tustin USD. If number of strands are not specified, then Contractor will need to call Tustin IT Dept at 714-730-7301).
2. Refer to Drawings for cable types required. Refer to acceptable cables section for additional information and approved Manufacturers.

E. Each fiber optic cable shall contain the quantity of strands of optical fibers as detailed on the Drawings. A pull rope shall be placed with all fiber cable at the time of installation. All outdoor rated fiber runs shall be provided with a minimum ¼-inch pull rope for future access.

F. All fibers in a multi-fiber cable shall be fully operational within the required performance characteristics. If any individual fiber does not meet the minimum standards, the entire cable must be replaced, end to end, including connectors, without any additional expense to the customer.

1. Acceptable cables shall be:

a. Berk-Tek Premium Single Mode Enterprise Fiber OS2 (indoor/outdoor)

2.04 ABOVE GLASS TYPES ARE AN EXAMPLE OF PRODUCT NAMES PER MANUFACTURER. CONFIRM REQUIREMENTS FOR INDOOR/OUTDOOR FIBER CABLE WITH

Riser Drawings and Site Plans. Part numbers for composite style cable will vary greatly. Confirm part numbers with Manufacturer.

2.05 DATA STATION CABLE

A. Category 6A cables shall be copper wire, individually insulated and color coded.

B. The cables shall be UL or ETL rated and UL verified in compliance with proposed Category-6.

1. Acceptable Patch cables shall be:

a. Leviton ATLAS-X1 CAT6 SLIMLINE PATCH CORDS

2. Acceptable cable shall be:

a. Berk-Tek – Ber-Tek LANmark-2000 (Plenum Rated)

3. Data cable locations shall be identified with a blue color jacket.
4. Where data cables are indicated to run underground, Contractor shall use a Ber-Tek Category6 LANmark-1000 OSP

2.06 DATA OUTLETS

A. Unshielded twisted pair data outlets shall be an RJ45 Enhanced performance type eight-position/eight-conductors modular jacks and shall comply with proposed Category-6 Performance Requirements, single port, dual port or four port as noted on Drawings. All outlets shall be wired in an EIA/TIA 568B configuration.

B. For single port data outlet locations, the faceplates shall have space for two connections with one port fully operational for connection to all the specified protocols. The second port shall be covered by a blank plate.

C. For dual port data outlet locations, the faceplates shall have space for two connections with both ports fully operational for connection to all the specified protocols.

For triple port data outlet, the faceplates shall have space for four connections with three ports fully operational for connection to all the specified protocols. The fourth port shall be covered by a blank plate.

D. For quad port data outlet, the faceplates shall have space for four connections with all four ports fully operational for connection to all the specified protocols.

E. All data outlet faceplates shall have a unique sequential identification number applied to faceplate. Handwritten labels are not permitted. All faceplates shall include colored icons and color-coded port inserts.

F. Reference the Drawings for special Outlet Configurations or Plate Requirements.

G. Outlets in false ceiling will need to be within 3 feet of the projector location.

2.07 CLASSROOM COMPUTER LABS

All Classroom Labs will have a wall mounted IDF with fiber back to the MDF and enough patch panels ports to accommodate everything in its room.

PART 3 – INSTALLATION

3.01 INSTALLATION

A. Upon completion of 10% of the cabling installation, the Contractor shall notify the Tustin Unified School District Network Engineer for an inspection of the methods and types of materials used on the project. The Contractor shall give a minimum of 72 hours notification to the engineer for the inspection. The Contractor will be given a written review of the findings, so if adjustments are required, they can be done before the project proceeds.

B. Pull strings will be provided with all cable runs including but not limited to; conduit stub ups, conduit sleeves, cable trays, open wiring routes, innerduct, and point-to-point conduits. Pull strings shall be free from cable bundles in open wiring routes. Pull strings shall not be substituted for pull ropes.

C. Velcro cable management straps are required on all Category-6 and 6a cable bundles, the last 20 feet or upon entry into equipment closet, a maximum of 12-inches apart. Cable bundles shall also be routed through cable management or “D” rings in the equipment closet.

D. Data Contractor shall supply protective bushings or slide on rings at the ends of all exposed conduits used for the data system cabling. This is to include all conduits installed for any future data cabling Requirements. Slide on bushings may not be used for sleeves through fire rated walls or for site/riser conduits. All sleeves and site/riser conduit ends must have a connector and plastic bushing. Contractor shall submit planned protection bushing prior to installation of cabling for approval.

E. Velcro cable management straps are required on the rear of the equipment racks and on the patch cords within the vertical cable managers. Straps shall be a maximum of 12-

inches apart. Velcro straps are also required at all service loops above the accessible ceiling where outlet locations are placed.

F. Every single mode fiber in every fiber optic cable must be terminated at both ends on a fiber patch panel in the IDF closet or on a faceplate in the classroom location. Termination shall be accomplished using Duplex LC type connectors with a long strain relief boot, except for fiber ran to station locations where a short boot shall be used.

G. All LC connectors shall be of the same manufacture to ensure compatibility. Polarity of fiber strands must be observed at all times.

H. Labeling

1. Each cable run shall be permanently labeled at each end with a unique sequential number which corresponds to a similar number provided for each data outlet and punch down point. A printed label shall be placed at each of the following locations.

    a. On the cable at the rear of the patch panel or termination block.
    b. Requires the use of a self-laminating wrap around label. Brady Label self-laminating 1.2-inch by 1.5-inch wrap around label Part #29689 or equal.
    c. On the face of the patch panel, provide a ¾-inch by ¾-inch label with a letter or number identifying the patch panel designation.
    d. On the face of the faceplate in the label holder window.

2. Handwritten labels are not permitted. Where cable ID includes room number identification the Contractor shall obtain written verification of actual room numbers prior to beginning labeling (numbers on plans do not always match actual room numbers). Cable pulling cross reference lists will not be accepted with final documentation.
3. Each patch panel port shall be identified with a unique sequential labeling scheme. Port identification labeling pattern shall be consistent throughout the project.
4. All faceplates shall be identified with permanent printed labels. Labels must not be subject to removal by incidental contact. Contractor shall be responsible for replacing defective labeling for a period of 1-year from date of final sign-off of project.
5. All fiber optic and UTP feed cables shall be identified with a permanent, water resistant, printed labels. Labeling information shall include closet identifications, quantity of conductors (UTP) or strands (fiber) and house pair designations (UTP).
6. Labeling will follow recommended EIA/TIA standards or as requested by the customer. Contractor will confirm labeling pattern prior to final identification or testing. All test results will be identified by the final labeling scheme.
7. All fiber optic cables and/or innerduct shall be tagged with fiber optic warning tags in every manhole or pullbox. Fiber warning tags shall also be placed at each end of the cable in the termination closets in clear view. A minimum of three tags are required at each end. Fiber warning tags shall be placed on fiber optic cable and/or innerduct routed through open ceiling environments at increments no less than 15 feet apart.

I. Where open wiring cables are run through the ceiling space (only permitted where specifically noted on the Drawings), the wire shall be bundled together and supported above the ceiling.

J. All cables must be fastened to the building structure via “j-hooks” or an approved Category 6 suspension system, and not directly in contact with ceiling system. For “j-hooks” maximum fill capacity is as follows: 1-5/16-inch hooks – 35 cables; 2-inch hooks

1. 60 cables; 4-inch hooks – 120 cables. For quantities beyond 120 cables use a sling support system such as “Erico Cable Cat” or equal. Maximum fill capacity 200 cables. D-rings, “Caddy #WMX cable hangar”, “Caddy Bridle Rings”, drive rings or any other type of wire ring support is not allowed.

K. Where cables pass through a fire-resistant portion of the structure. Conduit sleeves shall be provided to maintain the rating of the wall penetrated. Sealing of all penetrations with an approved fire barrier is required. Conduits and sleeves must remain accessible for future use. Permanent sealants may not be used to seal sleeves and conduits.

L. Fiber optic cables connecting to equipment racks shall be installed with not less than 20 feet of slack cable between the rack and the terminal backboard. See Drawings for Fiber Optic Service Loop Requirements.

M. Provide 6 inches of cable slack at computer data system outlets inside conduit box.

N. In an accessible ceiling area, provide a 10-foot service loop above the data/voice outlet locations. Service loop must be tied up off of ceiling titles or ceiling surface. Neatly coil cable without exceeding minimum bend radius limitations. Do not provide length in excess of 15 feet. May cause improper test results.

O. The minimum bending radius for all cables and the maximum pulling tension shall not exceed Manufacturer's recommendations.

P. Cables installed in manholes and pullboxes on terminal backboards shall be installed on wall mounted cable support racks.

Q. Provide a full 360-degree loop of cable around manhole and pullbox interiors.

R. Cable pulling shall use a split mesh grip over the cable jacket. Connection directly to optical fibers and copper wire conductors shall not occur.

S. When pulled through conduits, cable pulling lubricants shall be continuously applied to all cables and be specifically approved by the Manufacturer.

T. Where cables are pulled through or pulled from a center of run, pull without splices or terminations, lead out the cables at all manholes, pullboxes, and conduits, taking care to feed them in again by hand for the next run.

U. For each cable pull where a cable direction change is required, flexible feed-in tubes, pullout devices, multi-segmented sheaves, etc., shall be used to ensure proper cable pulling tensions and side wall pressures. Cables shall not be pulled directly around a short right-angle bend. Any device or surface the cable comes in contact with when under pull-in tension shall have a minimum radius 50% greater than the final specified minimum installed cable bending radius. The maximum possible size radius sheaves and feed-in tubes, usable in the available working space, shall be provided in all situations, to ensure the minimum possible cable sidewall pulling pressure. Do not use devices with multi-segment "roller" type sheaves.

V. Cable lengths over 250 feet shall be machine pulled, not hand pulled. Cables shall be pulled in a continuous, smooth operation without jerking or stop-start motion after initiation of pull. Maximum cable pulling speed shall be less than 50 feet per minute. Minimum pulling speed shall be greater than 15 feet per minute.

W. When pulling cable through conduit, cables shall be pulled straight into or out of the raceway without bends at the raceway entrance or exit. Pull in cable from the end having the sharpest bend (i.e., bend shall be closest to the reel.) Keep pulling tension to minimum by liberal use of lubricant, hand turning of reel, and slack feeding of cable into duct entrance. Employ not less than one man at reel and one at manhole or pullbox during this operation. Cables shall be pulled directly from cable reels.

All cables shall be new and extend continuous from each MDF or IDF backboard or rack to all voice/data outlets or other equipment locations.

X. Where cables are not installed in a conduit or other raceway system, they shall not be routed parallel with other line voltage equipment or wiring (120 volt and above) within 36-inches or within 12-inches of line voltage equipment or wiring where crossing. W here Flooded Enhanced Category-6 cables or outdoor rated fiber optic cables are routed exposed through ceilings for more than 50-feet-0-inches, install in innerduct or EMT conduit system.

PART 4 – TESTING

4.01 GENERAL

A. All Category-6 cables shall be point to point (link) tested after installation/termination and verified to operate at minimum 1000Mbps. Performance of installed cables shall satisfy all current addendums to the EIA/TIA 568A standard for Category-6 wiring. In addition, testing shall satisfy all proposed amendments to the existing ISO/IEC Requirements. The wiring shall support all specified communication protocols. Testing shall support the Category-6A Requirements by the EIA/TIA.

B. Upon completion of testing cable links, the Contractor shall supply a copy of the original database files downloaded from the tester in original format on disk. Contractor shall provide with database files an original copy of the Tester's Manufacturer software program (included in original cost) for record management and archiving, in a Windows format (e.g., MicroTest's software program - ScanLink ver. 4.1 10 PC for Windows, WaveTek's software program-LTRM ver. 1.07, etc). The Manufacturer's software program will be used by the Engineer to review all test results, and then turned over to the customer to keep as their record copy with the final approved test results.

C. Contractor will repair or replace cable runs or connecting hardware that do not meet specified criteria.

D. Single mode fiber optic cable shall be tested bi-directionally at 1310nm and 1550nm. All fiber strands shall be tested with a power meter and light source as well as an OTDR (Optical Time Domain Reflectometer). OTDR fiber tests for runs under 100 meters are not required. All fiber test results shall contain final source and destination information that matches IDF or MDF labeling shown on Drawings. Fiber test results shall be submitted on USB Drive or electronically emailed in Microsoft Excel format.

E. Test procedures shall comply with EIA/TIA 526-14 Method B. Test results shall meet the minimum following criteria:

1. Fiber optic test results shall not exceed 2dB attenuation loss in addition to inherent loss published by Manufacturer tested at minimum 2000 Mhz for 850nm and 500 Mhz for 1300nm for the fiber optic cable.

2. Test all voice/data cables minimum Category-6 UTP cable to test results for "Link Testing" Requirements at 250 Mhz per current EIA/TIA draft Requirements. Any

cables which do not meet these Minimum Requirements shall be replaced or repaired at no cost to the customer.

F. End to end attenuation termination points measure the power loss between end points from both directions.

G. End to end attenuation testing shall be performed with a temporary test jumper cable at each end of the installed fiber cable. The test jumper shall be the same size as the installed cable. The measured attenuation of the test jumpers, test connectors, and test interconnection sleeve between the two test jumpers shall be less than 1dB as calibrated at the time of the test at indicated wave lengths and frequencies.

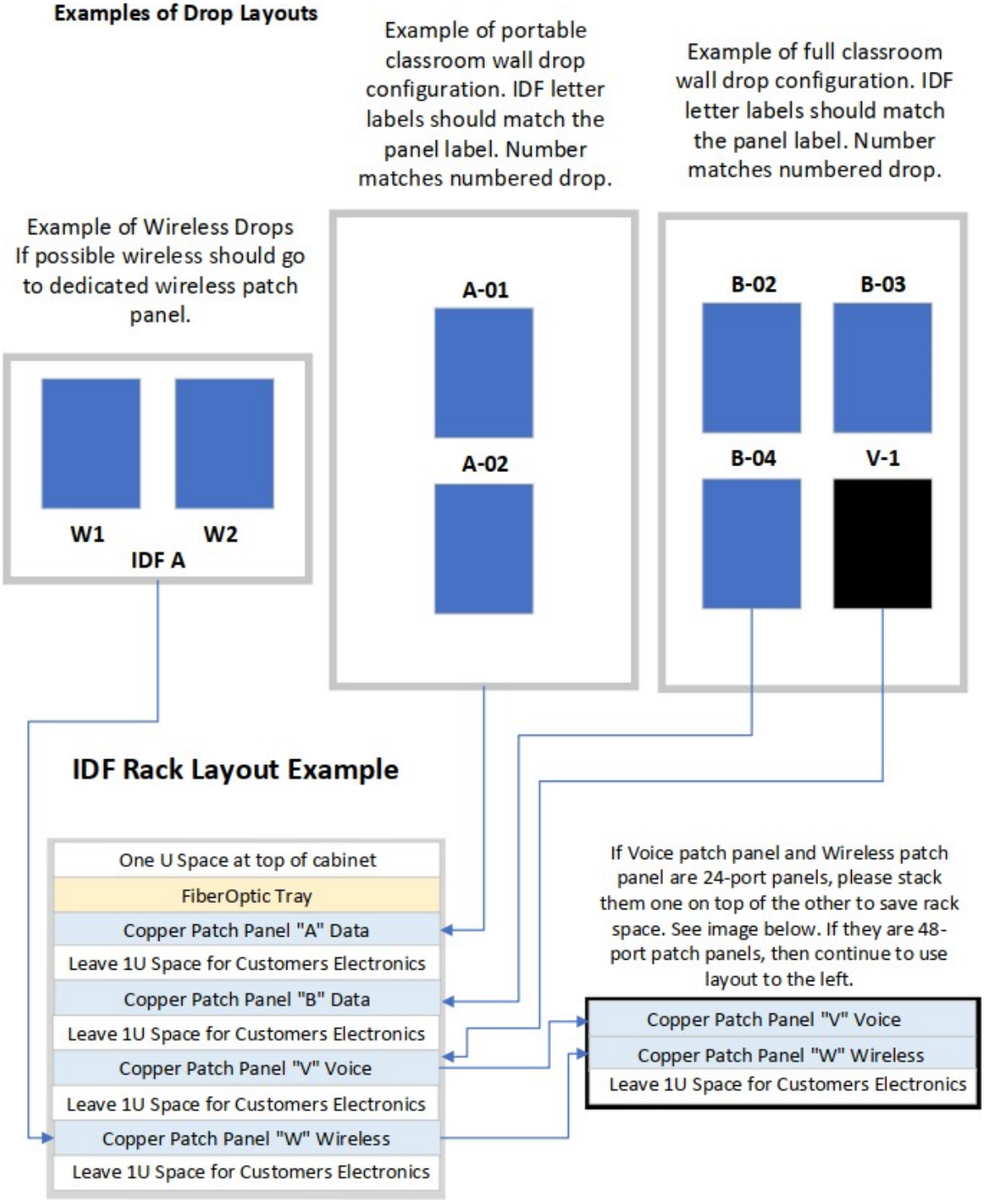
PART 5 – TRASH/WASTE DISPOSAL

A. All waste/trash created from the project will need to be taken off site and disposed of. NO TRASH IS TO BE THROW IN TUSTIN USD FACILITY DUMPSTERS!

B. For larger projects the contracted party can have a dumpster dropped off at the work site property to dump project trash/waste. Please coordinate with the Network Manager for dumpster drop of location and access.

END OF SECTION 26 60 10
080322/1125080

Examples of Drop Layouts



27 00 00

COMMUNICATION

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 27 41 19

PORTABLE ASSISTIVE LISTENING SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances tools, equipment, facilities transportation, and services necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Sections for work related to those other Sections and required to be included as work under Division 26.
2. General Provisions and Requirements for electrical work.

1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

Submit block wiring diagrams and catalogs data showing component interconnection and descriptive literature for all component parts and cabinets.

1.03 EQUIPMENT QUALIFICATION

All equipment shall conform to Federal, State and Local applicable Codes, Ordinances and AHJ, and shall be listed and labeled by Underwriters Laboratories.

PART 2 - PRODUCTS

2.01 GENERAL

A. The Assistive Listening System shall include the following items

1. Instructor (program source) wireless transmitter units.
2. Student (audience) portable wireless receiver units.
3. Plug-in microphones and earphones, for each unit.
4. Multiple program source inputs for, Instructor’s microphone, respective room audio / video A/V system input/output and instructor’s computer audio input/output.
5. System accessories.

B. Function

1. The Assistive Listening System shall provide amplified available audio programs for hearing impaired students/audience, originating from classroom/stage/room instructors and audio/video instructional program source materials, and equipment in respective building spaces, rooms, classrooms, and outdoor areas.
2. The audible program shall be transmitted wireless from the program source to the student/audience, with reception coverage throughout not less than approximately 80% of the respective floor space/area space.
3. Shall provide automatic stereo or mono audio full system operation, depending on program source input.
4. The system in each space shall comply with Federal ADA, State and Local AHJ Requirements for the hearing impaired.

C. Assistive-Listening Systems

1. Assistive-Listening Systems shall be provided in accordance with CBC Section 11B-219 and shall comply with CBC Section 11B-706.
2. The minimum number of receivers to be provided shall be equal to 4% of the total number of seats, but in no case less than two. 25% minimum of receivers provided, but no fewer than two shall be hearing-aid compatible in accordance with CBC Section 11B-706.3.
3. If the system provided is limited to specific areas or seats, then such areas or seats shall be within a 50-foot viewing distance of and have a complete view of the stage or playing area. CBC Section 11B-219.4.
4. Provide a minimum of two portable assistive listing systems, each with a transmitter and a minimum of two receivers for use in classrooms without audio amplification. The portable assistive listening systems shall be stored in the school site administration office until requested.
5. Provide an assistive listening system for assembly areas such as multi-purpose rooms, cafeterias, lecture halls of other assembly areas. If room has no fixed seating, calculate the number of seats using 7 SF per occupant. Provide 4% of assistive listen receivers for the total number of seats in each assembly areas, but in no case less than two. The assistive listening receivers should be stored in or near the assembly area.

2.02 MATERIAL (INFRARED WIRELESS)

A. General

1. All equipment shall be the product of the same Manufacturer.
2. The receivers and transmitters shall be US Government FCC and Industry Canada-approved.
3. Provide power on-off control on each unit, to extend battery duration.
4. As manufactured by Williams Sound; or PhonicEar; or Listen Technologies; or Centrum Sound.

B. Master (Program Source) Transmitter (Infrared Emitter) Units

1. The infrared emitter/transmitter shall be compact, portable units, self-contained ABS/plastic housing/enclosure.
2. The emitter panel shall be a dual-channel system operating on both 2.3 and 2.8MHz invisible infrared light waves frequencies. The channels shall be designated “CHANNEL A” for the left and “CHANNEL B” for the right.
3. The emitter shall provide left and right AUDIO IN jacks to accept an input signal from a sound system, left and right “SYNC IN/SYNC OUT” jacks for master/slave daisy-chaining with other emitters if desired, and left and right “MIC-IN” jacks to accept an audio signal from a microphone or Audio/Video preamplifier.
4. The emitter shall provide separate LED input level detectors for each channel which illuminate when the audio signal peaks. Stereo and mono audio processing.
5. The emitter shall be mounted by the following methods:

    a. Portable mounted to a table-top-or floor-stand, using accessory support-stand adapter.

6. Each emitter shall provide an array of not less than 130 infrared LEDs covered by an infrared transparent acrylic lens. The infrared signal from each emitter shall cover not less than 3,000 square feet (32,000 cubic feet) enclosed space. Note: For room sizes smaller than 3,000-square feet, the infrared transmitter/emitter

infrared output shall be reduced to accommodate the actual smaller room square feet size and height.

7. 120-volt 60Hz AC input to nominal 24-volt DC output (plug-in "power-brick") power supply external transformer shall be UL approved, with cable "plug-in" connection to emitter/transmitter. Provide remote system master on-off control.
8. Slave emitter/transmitter for rooms exceeding 30,000-cubic feet. Provide one additional infrared emitter/transmitter repeater slave unit, for each additional 30,000-cubic feet room volume, or fraction thereof. The slave repeater shall receive and retransmit the program signals from the master unit. Provide one 100-feet long "master-to-slave" auxiliary portable extension wire cable for each slave unit.
9. Provide a quantity of nine emitter/transmitter "master" units, plus additional "slave" units for adjusted room sizes.

C. Student/Audience Receiver Units

1. Battery Power

   a. Power for each unit operation shall be supplied by internal, changeable rechargeable NiCad batteries and alternately by alkaline disposable batteries. Rechargeable batteries shall be recharged without removal from the unit. Each unit shall have a charging indicator light. The batteries shall be recharged from either a portable charger/organizer and with wall transformer/two-unit chargers. The units shall operate for up to 40-hours with alkaline batteries, and up to 15-hours with NiCad (NiMH) batteries.
   b. Provide power on-off control on each unit, to extend battery duration.
   c. A protection circuit shall prevent battery "back-drain" if the power to the charger is turned off while the unit is being recharged.

2. The receiver shall be a dual-channel unit for wearing around the neck with an adjustable strap. Stereo and mono audio reception and processing.
3. Compatible with the transmitter (emitter) and operate on 2.3 and 2.8MHz frequencies invisible infrared light waves. Self-contained and switchable from "CHANNEL A" to "CHANNEL B" through a switch located on the back of the unit.
4. The receiver shall provide an infrared light-gathering lens on the front of the unit to focus the light signal from the emitter onto the infrared detector element. The receiver shall detect and decode the infrared emitter/transmitter light source within a 160-degree acceptance angle.
5. Audio squelch circuit which turns the output circuit off when the infrared signal is reduced or not received, with on/off and volume control.
6. Output jack, which accepts any of the listening accessories. Headsets shall provide magnetic induction pick-up for hearing impaired, hearing aid interface operation.
7. Shall be compact easily portable units, self-contained ABS/plastic housing/ enclosure with red infrared receiver lens. Shall clip to pocket or belt.
8. Provide quantity of four infrared receivers for each master transmitter.

D. Infrared System Accessories

1. Battery recharger portable charger/organizer pack.

   Locking, portable case with cover, shall accept a group of not less than twelve plug-in portable transmitters and receivers' units in each pack for simultaneous multi-unit battery recharging. Provide a quantity of one organizer for each

quantity group of twelve (or fraction thereof) receivers provided as part of the contract.

2. Stereo audio headset style automatic noise canceling microphones, integral on-off-volume control and with behind the neck support style. Each with 25-feet long extension cables and outlet plug-jacks to match transmitter outlet jacks. Provide two cables for each emitter/transmitter.
3. Equipment wall mount support brackets.
4. Auxiliary audio program source 15-feet long cables with plug-in at both ends to match transmitter jacks. Provide two for each transmitter.
5. Headset style earphones with cable and plug to match receiver jacks. Headsets shall provide magnetic induction pick-up for hearing impaired, hearing aid interface operation. Provide one headset for each receiver.
6. Rechargeable Ni-Cad (NiMH) batteries, one complete set for each unit.
7. Locking auxiliary equipment storage cases for cables, microphones, and headsets. Quantity and capacity as required to store all accessories.
8. Portable floor stand, for infrared emitter/transmitter units mounting and support, with variable height adjustment and tip-resistant weighted base. Provide one floor stand for each infrared emitter/transmitter.
9. Locking, portable case for infrared emitter/transmitter. One for each emitter/ transmitter unit.
10. Provide microphone extension cable with plug to match microphone and infrared emitter/transmitter microphone input jack, 25-feet length. One for each micro-phone.

PART 3 - EXECUTION

3.01 GENERAL

A. Each System General

1. Assemble, set up, and test each transmitter, receiver, and accessories units.
2. Install and fully charge all batteries prior to and after testing/set up is complete.

B. Wireless Infrared Units

1. Provide aiming and intensity adjustments of emitter/transmitter units to insure complete room coverage.

END OF SECTION 27 41 19
092722/1125080

SECTION 27 50 00

DISTRIBUTED COMMUNICATIONS SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specifications Sections and Drawings for related work required to be included as work under Division 26.
2. General Provisions and Requirements for electrical work.

B. Principal items of work shall include, but not be limited to the following:

1. Furnishing, installing, and connecting to an existing public address/paging, GPS wireless clock, and intrusion detection systems including interior and exterior speakers, analog clocks, motion sensors, and door contacts as indicated on Drawings.
2. Furnishing and installing all connectors, power supplies, and equipment as may be required, as specified herein.
3. Performing necessary revisions to or furnishing and installing and connecting all wiring and terminal strips, in cabinets and on backboards, necessary to provide for Functions and Requirements specified herein. All conductors or cables shall be installed in conduits or raceways, unless indicated otherwise. Contractor must include all terminations from the field and from the existing equipment headend equipment and all cross-connect wires in his warranty. Contractor is to determine if existing field terminations are warrantable and either replace them or include them in the warranty.
4. Engineering design, testing, materials, components, and supervision necessary to provide a complete operable installation.

1.02 SUBMITTALS

A. Submit product data sheets and descriptive literature for all component parts.

B. Submit block writing diagrams of the public address/paging system.

1.03 QUALITY ASSURANCE

A. Contractor shall warrant and guarantee that all work executed, and materials furnished are free from defects of material and workmanship for a period of 2 years from acceptance date of Contract Completion, not including specific items of work which require a guarantee or warranty of a greater period of item as set forth in the Specifications. Immediately upon receipt of written notice from the District, Contractor shall repair or replace at **no** expense to the District any defective material or work which may be discovered before the final acceptance of work or within guarantee period, any material or work damaged thereby, and all adjacent material or work which may be displaced in repair or replacement required hereunder. Examination of failure to examine work by the District shall not relieve Contractor from these obligations.

B. If the Contractor fails to repair or replace material or work as indicated above within 24 hours of receiving a written notice, the District, with its own Personnel or by Contract,

may proceed with repair or replacement and assess the cost thereof against Contractor when necessary for keeping school open or safety operating if the Contractor does not respond accordingly.

C. Ordinances and Regulations:

1. All work of this Section shall conform to California Building Code and California Electrical Code.

D. Permits and Inspections: Obtain and pay for Permits and Inspections required and deliver certificates of inspection to the District Inspector.

E. All work shall be done by a qualified Contractor holding all **the** licenses required by the legally constituted authorities having jurisdiction over the work. Contractor shall have completed at least three projects of equal scope to systems described herein and shall have been engaged in business of supplying and installing specified type of systems for at least 5 years. Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair serve to the equipment.

F. Installation shall be carried out under direction of a qualified Engineer at the Contractor's expense.

1.04 QUALIFICATION OF BIDDERS

To qualify as an acceptable Bidder, whether the bid is submitted to the District, his Agent, a General Contractors, or a Sub-Contractor shall be qualified Sound Contractor and shall hold a valid C61 License issue by the Contractors State License Board of California. The System Bidder or Contractor shall hereinafter be referred to as the Contractor. The Contractor shall hold all other licenses required by the legally constituted Authorities Having Jurisdiction over the work. The Contactor shall be the Factory-Authorized Distributor for the brand of equipment offered and shall have been engaged on the business of supplying and installing the specified type of system for at least 5-years. The Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The Contractor shall be financially able to provide a performance bond covering the work and the guarantee described. The Contractor shall provide that bond if requested.

1.05 EQUIPMENT QUALIFICATIONS

A. All equipment shall be exclusively as produced by the Manufacturers' names herein and on the Drawings in order to match existing equipment on the site and operational and maintenance systems within the District. No substitutions or equals will be approved.

B. All of the Electronic Systems Equipment shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the Manufacturer of all major equipment, which certifies that the Installing Communication Contractor is the Authorized Distributor, and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the Manufacturer that they will have a service representative assigned to this area for the life of the equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

Comply with pertinent provisions of Section 26 05 00.

2.02 EXISTING CAMPUS CENTRAL EQUIPMENT

A. Visit site and become thoroughly familiar with existing public address/paging, GPS wireless clock, and intrusion detection systems equipment prior to submitting a bid. Include within this Contract all costs to modify and/or add to the existing central equipment as required to fully serve the new construction.

B. Provide auxiliary components and/or accessories where required to interface new and existing equipment.

2.03 PUBLIC ADDRESS/PAGING SYSTEM

A. The existing Dukane public address/paging system on campus shall be expanded as required to serve the new construction. Provide final connections to equipment rack and for re-programming of the system to account for the new construction.

1. Speakers

a. Interior speakers shall be 8-inch diameter paper cone type with T25 25V line matching transformer. Frequency range to be 30 to 15,000Hz. Interior wall and/or recessed ceiling mounted speakers shall be mounted in Soundolier #198-8/161-1 backbox/baffle assembly with a factory installed and wired volume control mounted in the baffle as herein before specified.
b. Exterior speaker assembly shall consist of an Atlas #APF-15 Series loudspeaker with T-11 transformer in a Soundolier #L20-211/VP161-APF flush mounted back box and cover or equal. Housing shall include a baffle and shall be painted to match surrounding surface.

2. Cabling

a. Cable run in conduits below grade shall be Teflon-coated or otherwise approved by the Manufacturer for the purpose. Repull any existing site runs and add conductors necessary to add new cabling and return existing rooms to operation.
b. Cable serving exterior speakers shall be a twisted pair of #14 AWG solid copper conductors with overall and jacket. Each speaker shall have separate conductors' homerun back to termination location as indicated on Plans.
c. Cable serving interior speakers shall be a twisted pair of #16 AWG conductors with overall shield and jacket. Each speaker shall have separate conductors' homerun back to termination location as indicated on Plans.
d. All cabling shall be of the type approved or the areas where it is used.

2.04 WIRELESS CLOCK SYSTEM

A. The existing Primex Wireless XR GPS Wireless Clock system and transmitters on campus will provide signal to the new wireless clock being provided in the new Portable Building.

1. Traditional analog clocks (battery): Analog clocks shall be wall mounted. Clocks shall have polycarbonate frame and polycarbonate lens. Clock face shall have a custom school logo and color as per District requirements. Hour and minute hands shall be black.

a. 16-inches (317.5mm) diameter analog clock: Primex Wireless Model 14163 to match existing clocks currently used on campus.
b. Custom school logo and color.
c. Analog clocks shall be battery-operated.
d. Wire guards for clocks located in Gymnasium.
e. Analog clocks shall be capable of automatically adjusting for Daylight Saving Time. An on-off switch located on the transmitter shall disable this function if desired.
f. Time shall be automatically updated from the transmitter six times per day.
g. Analog clocks shall remember the time during changing of batteries.
h. Analog clock receivers shall be as follows:

1) Receiver sensitivity: >-110 dBm
2) Receiver power: dual lithium battery pack, supplied by Manufacturer.
3) Antenna type: Internal
4) Antenna gain: -7dBd

2. Dual D Lithium Battery Pack Primex Wireless Model 14885 contains two sealed parallel lithium primary batteries for each clock.
3. If the transmitter stops transmitting valid time signals due to power failure, the clocks will continue to function as accurate quartz clocks until a valid time signal is decoded. If signal transmission is not restored after 96 hours, the second hand will “five steps” as a visual indicator that the signal has been lost. Should the clocks lose power and signal, the clocks will not function.

2.05 INTRUSION DETECTION SYSTEM

A. Provide additions to existing campus Radionics/Bosch D9412G Series intrusion detection system control panel and re-program as required to account for the new devices.

B. Provide all necessary hardware, wiring and connections for a complete and fully operable system.

C. Motion sensors shall be Detection Systems Inc. DS774 Series for wall mounted types and DS938 for ceiling mounted types. Sensors shall be dual performance, dual event devices to minimize false alarms or equal passive infrared devices detecting thermal motion signals. Sensor coverage patterns shall be as required for optimum coverage at each individual location. Sensor shall be adjustable Gimbal mounted with plate and outlet box

D. Magnetic switch shall be fully concealed in the door frame, Admeco, Sentrol or equal.

E. Each intrusion detection system terminal cabinet shall contain a 12-volt DC power supply with a minimum 7-amp hour battery backup for motion sensors and POPEX (Zonex) modules. All popits and detectors shall be clearly marked on the exterior with its own address. All motion detectors shall have their own unique address. All popits for each building shall be centrally located in or near the terminal cabinet and secured to ¾-inch thick marine “A-C” grade ply-wood backboards. A side of plywood shall be exposed and painted. Attach plywood to wall structural framing with mechanical fasteners a minimum of 6-inches on center vertically on walls at each framing vertical member, and along the length of the wall, but not less than 16-inches on center horizontally along the length of the wall. Backboard shall be of sufficient size to accommodate all popits and provide an additional 20% for future expansion.

F. Cabling shall be Westpenn 369 or equal as required for system operation. All cabling shall be shielded.

PART 3 - EXECUTION

3.01 MATERIALS

Comply with pertinent provisions of Section 26 05 00.

3.02 WIRING DESIGNATION AND TERMINAL CABINET MAKE UP

A. All #22AWG and #24AWG connections throughout the system shall be made by spring tension clip "punch block" Siemens Type 66 terminals or equal. Wires of #16 gauge and larger shall be terminated on barrier screw terminals. All conductors in terminal cabinets shall be carefully formed and harnessed in a workmanlike manner.

B. All wiring for complete communications system shall be new wire. Multi-pair cables may be used between buildings. Any wires pulled through in ground junction boxes shall be continuous with no splices. The wiring shall be intact with no cuts in the protective outer jacket. All splices to be made in above ground junction boxes, using terminal strips in all cases.

C. Provide all cabling from building terminal cabinets to each outlet shown on the Plans.

D. Provide labeling for each conductor with identification as its use and function as per District Requirements.

3.03 PORTIONS OF CABLES

A. The portions of cables installed without raceways or cable tray supports shall be installed with “j-hook” cable supports.

B. The “j-hooks” shall provide multi-tiered “treed” “J” shaped hoods, with wide flat cable support base (0.5-inch wide minimum) and smooth rounded corners, specifically designed for Category-5 and fiber optic cable support. As manufactured by Erico Inc.

C. The individual “j-hook” attachment to the building structure shall be “beam clamp”, “hanger rod”, clevis hanger styles.

D. Install “j-hooks” not more than 36 inches on center along the entire cable length, at each cable change in direction, to insure less than 6 inches of cable sag between adjacent hooks. Secure cables to “j-hooks” with cable tie wraps. “J-hook” supported cables, bundle cables together with tie wraps.

E. “Bridle rings” shall not be used to support cables.

F. Cables shall not lay directly on ceilings, ceiling hangers, lighting fixtures, air ducts, piping, or equipment.

3.04 MOTION SENSORS

Locate motion sensors to provide optimum coverage of the space and to avoid conflicts with the architectural aesthetics of the building. Submittal Drawings shall show the exact locations of all system sensors.

3.05 DOOR CONTACTS

Coordinate concealed door switch installations with Finish Hardware Manufacturer.

3.06 INSTALLATION

A. The wiring of the system shall be executed in accordance with the Drawings and the Equipment Manufacturer's Wiring Diagrams. Should any variations in these Requirements occur, the Contractor shall notify the architect before making any changes. It shall be the responsibility of the Factory-Authorized Distributor of the specified equipment to install the equipment and guarantee the system to operate as per Plans and Specifications.

B. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

C. The labor employed by the Contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the Owner and Architect to engage in the installation and service of this system. The systems shall be installed in accordance with NFPA 70 and other applicable Codes.

D. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

E. Control Circuit Wiring:

1. Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by System Manufacturer to provide control functions indicated or specified.
2. The Contractor shall provide necessary transient protection on the AC power feed, all station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.

F. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

G. Grounding:

1. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
3. The Contractor shall provide all necessary transient protection on the AC power feed and on all station-lines leaving or entering the building.
4. The Contractor shall note in his System Drawings, the type and location of these protection devices as well as all wiring information.
5. The Contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.

3.07 CLEANING AND PROTECTION

The Contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., the Contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The Contractor shall thoroughly

clean all buildings of any dirt, debris, rubbish, marks, etc., caused by the performance of this work.

3.08 EXISTING CONDUITS

A. Include within this Contract sufficient labor costs to locate, trace, and verify existing conduits related to the new construction. Examine each site including terminal cabinets, panels and ceiling spaces in order to identify existing conduits and Plan layout of new conduits.

B. Notify the Architect immediately if existing conduits are discovered to be broken or in any other way not usable as specified.

C. All new wiring shall be installed in conduit, unless noted otherwise.

END OF SECTION 27 50 00
080422/1125080

BLANK PAGE

28 00 00

ELECTRONIC SAFETY & SECURITY

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 28 47 00

VOICE EVACUATION AND ALARM

PART 1 - GENERAL

1.01 SCOPE

A. Provide complete installation of Gamewell-FCI E3 Series Fire Alarm Voice Evacuation and Fire Alarm System with System Sensor two wire synchronized notification and LifeGuard Networks IP based building automation and control system. The Fire Alarm Control Panel (FACP) or panels shall be microprocessor-based, network capable and complete with an integral Digital Alarm Communications Transmitter (DACT) that is UL listed for Remote Station, Proprietary and Central Station fire alarm systems. The FACP shall be compliant with UL 864, 9th Edition. The fire alarm system shall be connected/ integrated to the existing District LifeGuard Networks centralized integration and automation system

1. The Fire Alarm System shall be provided and installed by a Gamewell-FCI Elite Dealer and LifeGuard Networks Authorized Distributor. Systems provided and/or installed by anyone other than an Authorized Distributor shall be considered in non-compliance with this Specification and subject to replacement at the expense of the Prime Contractor.
2. The Gamewell-FCI Elite Dealer and LifeGuard Networks Authorized Distributor shall furnish all labor, materials, appliances, cabling, tools, equipment, facilities transportation, and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of all equipment, wiring, programming, configuration, testing, training required by this Section, complete as indicated on the applicable Contract Drawings and/or specified herein.

B. This Specification provides the Requirements for the installation, programming, configuration, testing and maintenance of a complete analog addressable fire alarm system. This system shall be capable of providing and include at a minimum, but not be limited to:

1. Fire Alarm Control Panel

a. Network Interface capability via copper and/or fiber optic network
b. Voice Evacuation
c. Fire Fighter Telephone
d. Integral Digital Alarm Communications Transmitter (DACT)
e. Annunciators / Keypads
f. Power Supplies / Batteries
g. Analog Addressable Initiation Devices
h. Analog Addressable Control Modules
i. Notification Appliances
j. Associated Peripheral Devices
k. Other relevant components and accessories required to provide a complete and operable analog addressable networked life safety system.
l. Any material and/or equipment necessary for the proper operation of the system, which is not specified or described herein, shall be deemed part of this Specification.

2. The Fire Alarm System shall be connected to a UL Listed Central Station Monitoring Company.

    a. Contractor shall coordinate with the Owner or his Representative to obtain two telephone lines for Code required offsite monitoring.

1.02 QUALIFICATIONS

A. Equipment

1. This Specification is based on the equipment of Manufacturer(s) who have been approved by the Owner and the Manufacturer(s) herein named shall be considered as meeting the Requirements of this Specification.
2. The Equipment Manufacturer shall be a United States Manufacturer, who has been regularly engaged in the manufacture of fire alarm systems for at least 10-years.
3. The District has an existing Lifeguard Networks Automation and Control system. The Fire Alarm Contractor shall integrate the new system with the Automation and Control system. The Fire Alarm Contractor shall be a certified Lifeguard Networks Dealer.
4. It is the Contractor's responsibility to meet the entire intent of these Specifications. Deviations from the specified items shall be at the risk of the Contractor until the date of final acceptance by the Architect, Engineer, and the Owner's Representative. All costs for removal, relocation or replacement of a substituted item shall be at the risk of the Prime Contractor.
5. All equipment shall conform to applicable Codes and Ordinances.
6. All equipment shall be California State Fire Marshal (CSFM) listed.
7. All equipment shall bear the label of a Nationally Recognized Testing Laboratory (NRTL) such as Intertek Testing Services NA, Inc. (ITSNA - formerly ETL) or Underwriters Laboratories Inc. (UL) and be listed by their re-examination service.

B. System Supplier / Installer

1. The system shall be provided and installed by a Gamewell-FCI Authorized Elite Dealer and Lifeguard Networks Authorized Distributor who is trained and certified by the Manufacturer in the proper installation, programming, configuration, testing, service and maintenance of each system
2. Subsequent to a successful bid and upon request of the Owner the System Supplier/Installer shall submit a qualification documentation package which shall include the following:

    a. Underwriters Laboratories (UL) listing indicating current status as a UL Listed Central Station Fire Service – Local Service (UUFX-L) Installation Company.
    b. Evidence of current status as the Gamewell-FCI Authorized Elite Dealer. The evidence shall be a letter from Gamewell-FCI stating the system provider's authenticity as a dealer and specifically mention this project in the body of the letter. The letter must contain contact information so that the owner can verify.
    c. Certificates indicating that a minimum of three Technicians have attended and completed all Requirements and received certification from the Manufacturer's installation and service school.
    d. Evidence of current status as the Lifeguard networks Authorized Distributor. The evidence shall be a letter from Lifeguard Networks stating the System Provider's authenticity as a Dealer and specifically

mention this project in the body of the letter. The letter must contain contact information so that the Owner can verify.

e. Evidence of current State of California Contractor's License, C-10.
f. Evidence of current State of California Alarm Company Operator License, ACO.
g. A list of twenty completed projects of equal scope, with associated Owners Representative contact names and telephone numbers.
h. A minimum of four National Institute for Certification in Engineering Technologies (NICET) certificates in "Fire Protection Engineering Technology – Fire Alarm Systems". NICET certificates shall include at a minimum one Level-3 and two Level-2

3. Per California Codes all individuals involved in the installation of the fire alarm system shall hold a valid State of California, Division of Apprenticeship Standards (DAS), Fire/Life Safety Technician Certification.

   a. Evidence of DAS certification shall be provided immediately upon request at the project site.

4. The System Supplier/Installer shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection, service, and maintenance of the system.

   a. The System Supplier/Installer shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the Manufacturer to maintain and service the equipment being supplied.

5. The System Supplier/Installer shall be prepared to offer a Service Contract for the maintenance of the system beyond the warranty period.
6. The System Supplier/Installer shall be an established fire alarm systems contractor that resides in Southern California and currently maintains a locally run office within 100 miles of the job site, with parts and service readily stocked.
7. The System Supplier/Installer shall employ a minimum of four Gamewell-FCI factory trained Technicians and maintain a 24-hour Emergency Service Department.
8. The System Supplier/Installer shall designate one person to act as the Project Manager having total responsibility for coordination, communications and project technical integrity. This Project Manager shall have a minimum of 5-years-experience as a Supervisor and Installer of the system specified herein.

1.03 RELATED SPECIFICATIONS

A. The conditions of the General Contract (General, Supplementary, and other Conditions) and the Division 1 - General Requirements Specifications are hereby made a part of this Section.

   1. Section 26 05 00 – Common Work Results for Electrical
   2. Section 26 05 01 – Basic Electrical Materials and Methods
   3. Section 26 05 30 – Conduit and Wire

1.04 RELATED DOCUMENTS

In the event of a conflict between this Specification and the Construction Drawings this Specification shall take precedence.

1.05 APPLICABLE CODES AND STANDARDS

A. Current Building Standards Administrative Code.

B. Current California Building Code (CBC).

C. Current California Electrical Code (CEC).

D. Current California Mechanical Code (CMC).

E. Current California Plumbing Code (CPC).

F. Current California Fire Code (CFC).

G. Current NFPA Standards

1. The Fire Alarm System shall comply with the applicable provisions of the following current National Fire Protection Association (NFPA) Standards:

a. NFPA 12 Carbon Dioxide Extinguishing Systems
b. NFPA 12A Halon 1301 Fire Extinguishing Systems
c. NFPA 13 Installation of Sprinkler Systems
d. NFPA 15 Water Spray Fixed Systems
e. NFPA 16 Installation of Foam-Water Sprinkler Systems
f. NFPA 17 Dry Chemical Extinguishing Systems
g. NFPA 17A Wet Chemical Extinguishing Systems
h. NFPA 70® National Electrical Code®
i. NFPA 72® National Fire Alarm and Signaling Code®
j. NFPA 90A Installation of Air Conditioning and Ventilation Systems
k. NFPA 101® Life Safety Code®
l. NFPA 750 Water Mist Fire Protection Systems
m. NFPA 2001 Clean Agent Fire Extinguishing Systems

H. ADA – Americans with Disabilities Act

I. CAC – California Administrative Code

J. UL Standards

1. The system shall comply with the applicable provisions of the following U.L. Standards and Classifications.

a. UL 268, Smoke Detectors for Fire Alarm Signaling Systems
b. UL 464, Audible Signal Appliances
c. UL 521, Heat Detectors for Fire Protective Signaling Systems
d. UL 864, Control Units for Fire Protective Signaling Systems
e. UL 1481 Power Supplies for Fire Alarm Systems
f. UL 1971, Emergency Devices for the Hearing Impaired
g. UOJZ, Control Units, System
h. SYZV Control Units, Releasing Device
i. UOXX, Control Unit Accessories, System
j. SYSW Accessories, Releasing Device Service

1.06 SUBSTITUTIONS

The Fire Alarm System shall be Gamewell-FCI (Fire Control Instruments) to integrate with existing campus network. No substitutions shall be approved.

1.07 SUBMITTALS

A. Within 35-calendar days after the date of the award of the Contract, the Contractor shall submit to the Architect for review, one electronic copy of a complete Submittal Package. The Submittal Package shall consist of the following sections, with each section separated with index tabs.

1. Title Page
2. Index of Submittal Contents
3. Certifications

a. Valid State Contractor's License
b. Manufacturer Authorization Letter
c. Technician Certifications
d. UL Certification
e. NICET Certifications
f. California DAS Fire-Life-Safety Technician Certifications

4. Project References
5. Product Data

a. Material List of Equipment
b. Manufacturer Specification Data Sheets
c. Applicable Listings and Approvals
d. Copy of Manufacturer Warranty

B. Shop Drawings shall only be required if Contractor is proposing design changes that differ from DSA approved Drawings.

PART 2 - PRODUCTS

2.01 SYSTEM REQUIREMENTS

A. Basic Performance

1. The fire detection and alarm system shall continually supervise and monitor the integrity of conductors: Initiating Device Circuits (IDC); Notification Appliance Circuits (NAC); and Signaling Line Circuits (SLC); per the Requirements of NFPA 72.

a. Loss of signal from any of these circuits will activate a trouble indication, both audible and visual, at the local FACP.

2. The system shall be microprocessor-based operating system having the following: capabilities, features, and capacities.

a. Two intelligent loops expandable to four with supplemental loop module
b. Capability of 159 analog addressable sensors and 159 addressable modules per SLC intelligent loop, as a minimum
c. Intelligent devices shall operate on "standard wire" no special twist or shield shall be required.
d. Two 24V DC 2A notification circuits capable of Style Z (Class A) or Style Y (Class B)
e. Optional relays or LED drivers for graphic annunciation
f. Remote graphic annunciator (NGA) with Microphone
g. DACT capable of sending point information to a Central Station depending on protocol required by the Central Station

h. 80-character backlit LCD display
i. Loss of signal from any of these circuits will activate a trouble indication, both audible and visual, at the local FACP

3. System shall be fully programmable and configurable on site to accommodate system expansions and facilitate changes in operation.
4. All software programs shall be stored in non-volatile programmable memory within the FACP.

   a. Loss of primary and secondary power shall not erase the instructions stored in the memory
   b. System programming shall be password protected.

5. Alarm, supervisory and trouble signals from analog addressable devices shall be encoded onto NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
6. Initiation device circuits (IDC) shall be wired NFPA Style B (Class B)
7. Notification appliance circuits shall be wired NFPA Style Y (Class B
8. A single ground or open on any system SLC, IDC or NAC shall not cause a system malfunction, loss of operating power or the ability to report an alarm.
9. Alarm signals arriving at the main FACP shall not be lost due to a power failure.
10. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of 120 VAC power in a normal supervisory mode for a period of 24-hours with 5-minutes of alarm indication at the end of this period.

    a. Systems that include voice evacuation shall provide sufficient battery capacity for 24-hours with 15-minutes of alarm in lieu of the five noted above.

11. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70% capacity in 12-hours

B. System Functional Operation

1. The actuation of any approved alarm initiating device shall automatically initiate the following functions.

   a. Alarm LED on the FACP shall flash
   b. Local audible piezo electronic signal in the FACP shall sound
   c. The alarm condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s)
   d. System shall transmit the condition to a UL Listed Central Station monitoring facility. Supervising station shall be approved per Current CFC.
   e. Printing and history storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence
   f. System output programs configured via Control-By-Event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system output (alarm notification appliances and relays) shall be activated on either local outputs or points located on other network nodes.

2. The actuation of any approved supervisory alarm initiating device shall automatically initiate the following functions.

    a. Supervisory LED on the FACP shall flash
    b. Local audible piezo electronic signal in the FACP shall sound
    c. The supervisory condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s).
    d. System shall transmit the condition to a UL Listed Central Station monitoring facility. Supervising station shall be approved per Current CFC
    e. Printing and history storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence
    f. System output programs configured via Control-By-Event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system output (alarm notification appliances and relays) shall be activated on either local outputs or points located on other network nodes

3. Whenever a trouble condition is detected and reported the FACP shall automatically initiate the following functions.

    a. Trouble LED on the FACP shall flash
    b. Local audible piezo electronic signal in the FACP shall sound
    c. The trouble condition description, including the type of point and the location within the protected premises, shall be displayed on the LCD display at the FACP and any remote annunciator(s).
    d. System shall transmit the condition to a UL Listed Central Station monitoring facility. Supervising station shall be approved per Current CFC
    e. Printing and history storage equipment shall log the information associated with the condition, including the time and date of the alarm occurrence
    f. System output programs configured via Control-By-Event (CBE) programming to be activated by the particular point in alarm shall be executed, and the associated system output (alarm notification appliances and relays) shall be activated on either local outputs or points located on other network nodes.

C. Remote Monitoring Connection

1. The fire alarm system shall be connected via Digital Alarm Communicator Transmitter (DACT) over telephone lines to a UL Listed Central Station Monitoring Company.

    a. The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter (DACT) for signaling to a UL Listed Central Station Monitoring Company. The DACT shall contain a “Dialer-Runaway” feature preventing unnecessary transmissions as the result of intermittent faults in the system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers.
    b. The fire alarm system shall transmit alarm, supervisory alarm and trouble signals with the alarms having priority over the trouble signal.

D. Internet Protocol (IP) Connectivity for Remote Access

1. The system shall be capable of remote access via LAN/WAN network

a. Remote access features and functions shall include the following:

1) Perform programming of the main processor including all system features and functions noted elsewhere in this specification.
2) The capability to perform system diagnostics and access integral system report software regarding the current system status.

b. Remote access features and functions shall include the following

1) Shall support RS-232, RS-422 and RS-485 serial connections
2) Shall configure via HTTP, DHCP, Telnet or serial
3) Shall be capable of Flash ROM upgrades
4) Network Interface – (10Base-T or 10Base-T/100Base-TX) Ethernet
5) Serial Interface – DB25F, RS-232/RS-422/Rs-485 serial port with DCE configuration.
6) Shall be capable of modem emulation and accept modem AT commands on the serial port to establish a network connection to the system

2. The Contractor shall provide all active electronics, software, and peripheral equipment for a complete and operable system
3. Systems not capable of Remote Access Requirements of this Specification will not be considered acceptable

E. Centralized Integration and Control System – LifeGuard Networks IP Based Building Automation and Control System.

1. The Contractor shall furnish and install a complete integration/expansion of the existing LifeGuard Networks IP Based Building Automation and Control System.

a. The Contractor shall provide all equipment and labor to integrate the new Fire Alarm Controls with the existing District's control server for a complete and operable system. This shall include the following:

1) Provide and install a LifeGuard Networks SY-MTIP IP Gateway
2) All necessary modifications, programming, and upgrades to the existing SY-FSERX server software.

2. System features

a. Communication protocols include RS-485, RS-232, Cellular, Analog Digital, and 2-way audio
b. Serial interface to addressable FACP and/or dry contacts for conventional fire panels.
c. Fourteen inputs and eight programmable outputs
d. Complete system monitoring and transmission of data via existing network including event based unlimited email notification, itemized system monitoring of each device, wiring and peripherals. System control and response based upon event data
e. Redundant buffer and onboard 2-gigabyte storage
f. VoIP Telephony connection of all networked devices

g. Six onboard video ports with expansion to twelve with motion control, remote PTZ and remote view
h. Standard 2-gigabyte memory with expansion capability to 500 Terabytes
i. Embedded Script language with logic control

3. The Fire Alarm System Installing Contractor shall employ the services of a certified LifeGuard Networks System Installer to install, train District Personnel and maintain all current system warranties. Contact LifeGuard Networks at (978) 212-1312 for local authorized Service Company.

2.02 FIRE ALARM CONTROL PANEL

A. FACP – Gamewell FCI E3 Series

1. California State Fire Marshal (CSFM) Listing No. 7165-1703:0125

B. Cabinet Enclosure - Model E3BB-RD & E3ID2-D

1. The system cabinet shall be either surface or semi-flush mounted with a texture finish and shall consist of a back-box, an inner door and a door. The cabinet shall be of dead-front steel construction with an inner door to conceal any internal circuitry and wiring. A minimum of a 1-inch wiring gutter space shall be provided behind the mounting plate. Wiring shall be terminated on removable terminal blocks to allow field servicing of all modules without disrupting system

C. Intelligent Loop Interface-Main Board - Model ILI-MB-E3

1. The system shall be of multiprocessor design to allow maximum flexibility of capabilities and operation.
2. Field Programmable - The system shall be capable of being programmed by means of a Field Configuration Program (FCP) allowing programming to be downloaded via portable computer from any node on the network.
3. RS-232 Serial Output - A supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept a downloaded program from a portable computer, or provide 80 column readout of all alarms, troubles, location descriptions, time, date, etc. The communication shall be Standard ASCII Code operating from 1200 to 115,200 baud rate.
4. RS-485 Serial Output - Each ILI-MB-E3 shall incorporate an RS-485 bus via a ribbon harness for connection of modules inside the same cabinet, and via a 4-wire quick connector for connection of modules up to 3000 feet from the cabinet. This RS-485 bus shall support up to sixteen ASM-16 auxiliary switch modules, six LCD-E3 main Annunciators and five LCD-SLP annunciators.
5. Peer-to-Peer Panel Configuration - All Loop Interface Modules shall incorporate its own programming, log functions, Central Processor Unit, and control by event (CBE) programming. In the event that any loop becomes disabled, each remaining loop driver shall continue to communicate with the remainder of the network and maintain normal operation. “Degrade” configurations under these conditions are not acceptable.
6. Control-by-Event (CBE) Program - The ILI-MB-E3 shall be capable of programming using Boolean logic including AND, OR, NOT, and TIMING functions to provide complete programming flexibility.
7. Alarm Verification - Smoke detector alarm verification shall be a standard option while allowing other devices (i.e.: manual stations, sprinkler flow, etc.) to create an immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
8. Alarm Signals - All alarm signals shall be automatically latched or “locked in” at the control panel until the operated device is returned to normal and the control

panel is manually reset. When used for sprinkler flow, the “SIGNAL SILENCE” switch may be bypassed, if required by the AHJ.

9. Electronically Supervised

    a. Each SLC and NAC circuit shall be capable shall be electrically supervised for opens, shorts and ground faults. The occurrence of any fault shall activate the system trouble circuitry but shall not interfere with the proper operation of any other circuit
    b. A yellow “SYSTEM TROUBLE” LED’S shall light, and the system audible sounder shall steadily sound when any trouble is detected in the system. Failure of power, open or short circuits on the SLC or NAC circuits, disarrangement in system wiring, failure of the microprocessor or any identification module, or system ground faults shall activate this trouble circuit. A trouble signal may be acknowledged by operating the “TROUBLE ACKNOWLEDGE” switch. This shall silence the sounder. If subsequent trouble conditions occur, the trouble circuitry will resound. During an alarm, all trouble signals shall be suppressed with the exception of lighting the yellow “SYSTEM TROUBLE” LED’S.

10. Drift Compensation - Analog Smoke Sensors - System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to the effects of component aging or environment (i.e.: dust). Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring the factors which generally contribute to nuisance alarms. The system trouble circuitry shall activate, display “DIRTY DETECTOR” and “VERY DIRTY DETECTOR” indications and identify the individual unit that requires maintenance.
11. Analog Smoke Sensor Test - System software shall automatically test each analog smoke sensor a minimum of three times daily. The test shall be a recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of a sensor shall activate the system trouble circuitry, display a “Test Failed” indication, and identify the individual device that failed.
12. Off-Premises Connection - The fire alarm system shall be connected via Digital Alarm Communicator Transmitter (DACT) and telephone lines to a central station or remote station. The panel shall contain a disconnect switch to allow testing of the system without notifying the Fire Department.
13. Central Station Option - The fire alarm control panel shall provide an integral Digital Alarm Communicator Transmitter (DACT) for signaling to a Central Station. The DACT shall contain a “Dialer-Runaway” feature preventing unnecessary transmissions as the result of intermittent faults in the system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. The Fire Department shall be consulted as to the authorized central station companies serving the municipality. The fire alarm system shall transmit both alarm and trouble signals with the alarm having priority over the trouble signal. The Contractor shall be responsible for all installation charges, while the customer shall be responsible for the line lease charges.
14. Network Annunciator Option - Each ILI-MB-E3 and associated display shall provide the option of being configured as a network annunciator. The options for annunciation shall default as a regional annunciator with the capability of selecting global annunciation to provide system wide protection as well as Acknowledge, Silence, and Reset capabilities.
15. Redundant History Log - Each ILI-MB-E3 shall contain a full 4100 event history log supporting local and network functions. In the event that a main processor or

network node is lost the entire log shall be accessible at any other Loop Interface board.

16. LED'S Indicator and Outputs

    a. Each ILI-MB-E3 Loop Interface shall incorporate as a minimum the following Diagnostic LED'S indicators

        1) Power (green
        2) Alarm (red)
        3) Supervisory (yellow)
        4) General Trouble (yellow
        5) Ground Fault (yellow)
        6) Transmit (green)
        7) Receive (green)

17. Auxiliary Power Outputs

    a. Each ILI-MB-E3 Loop Interface shall provide the following supply outputs as follows:

        1) 24 VDC Non-resettable, 1 amp. max., power limited.
        2) 24 VDC Resettable, 1 amp. max., power limited

18. Microprocessor - The Loop interface shall incorporate a 32-bit RISC processor. An isolated "watchdog" circuit shall monitor the microprocessor and upon failure shall activate the system trouble circuits on the display. The microprocessor shall access the system program, for all Control-By-Event (CBE) functions. The system program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.
19. Auto Programming - The system shall provide means for all SLC devices on any SLC loop to be pre-programmed into the system. Upon activation of auto programming, only the devices that are present will activate. This allows for a system to be commissioned in phases without the need of additional downloads.
20. Environmental Drift Compensation - 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 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.
21. One-Man Walk Test

    a. 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.
    b. This test feature is simply intended to provide for certain random spot testing of the system and is not intended to comply with the Requirements of testing fire alarm systems in accordance with NFPA 72,

as it is impossible to test all the functions and verify things such as annunciation with only one person

22. Signaling Line Circuits - Each ILI-MB-E3 module shall provide communication with all analog/addressable (initiation/control) devices via two signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. The circuits shall be capable of operating in an NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of 99-analog sensors and 99-addressable monitor/control devices. A unique 40-character identifier shall be available for each device. The devices shall be of the Velocity series with the capability to poll ten devices at a time with a maximum polling time of 2 seconds when both SLC's are fully loaded.
23. Notification Appliance Circuits - Two independent NAC circuits shall be provided on the ILI-MB, polarized and rated at 2-amp DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y, or Class A, Style Z.
24. Alarm Dry Contacts - Alarm dry contacts (Form C) shall be provided and shall be rated 2-amp at 30VDC (resistive) and shall transfer whenever a system alarm occurs.
25. Supervisory Dry Contacts - Supervisory dry contacts (Form C) shall be provided and shall be rated 2-amp at 30VDC (resistive) and shall transfer whenever a system Supervisory condition occurs
26. Trouble Dry Contacts - Trouble dry contacts (Form C) shall be provided and shall be rated at 2-amp at 30VDC (resistive) and shall transfer whenever a system trouble occurs.

D. Intelligent Loop Interface Expansion Board – Model No. ILI-S-E3

1. Signaling Line Circuits - Each ILI-S-E3 module shall provide communication with analog/addressable (initiation/control) devices via two additional signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. The circuits shall be capable of operating in an NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of 99-analog sensors and 99-addressable monitor/control devices. A unique 40-character identifier shall be available for each device. The devices shall be of the Velocity series with the capability to poll ten devices at a time with a maximum polling time of 2 seconds when both SLC's are fully loaded.

E. Power Supply – Model PM-9

1. The PM-9 power supply shall use the latest technologies to provide power to the INCC and shall incorporate the following features:

   a. Power saving switching technology using no step-down transformers.
   b. 9-amp continuous rated output to supply up to all power necessary under normal and emergency conditions for INCC Command Center Modules.
   c. Integral Battery Charger with capacity to charge up to 55 amp-hour batteries while under full load.

F. Intelligent Network Interface Voice Gateway – Model INI-VGX

1. The INI-VGX shall incorporate the following features:

   a. Support up to 150 watts of audio power using AM-50 series amplifiers
   b. Support up to 16 switch modules for a total of 256 switches

c. Support for 16 messages with up to a 3-minute duration

G. 50-Watt Digital Amplifiers – Model AM-50-25/70

1. The AM-50- shall incorporate the following features:

   a. 50 watts at 25Vrms or 70Vrms (as required on plans)
   b. Two speaker circuits

H. LCD Keypad – Model LCD-E3

1. The LCD display shall be an 80-character RS-485 based textual annunciator with the capability of being mounted locally or remotely. It provides audible and visual annunciation of all alarms and trouble signals. Dedicated LEDs shall be provided for:

   a. AC Power On (green)
   b. Alarm (red)
   c. Supervisory (yellow)
   d. System Trouble (yellow)
   e. Power Fault (yellow)
   f. Ground Fault (yellow)
   g. System Silenced (yellow)

2. The 80-character alphanumeric display shall provide status of all analog/ addressable sensors, monitor and control modules. The display shall be of the liquid crystal type (LCD), clearly visible in the dark and under all light conditions.
3. The panel shall contain four functional keys:

   a. Alarm Acknowledge
   b. Trouble Acknowledge
   c. Signal Silence
   d. System Reset/Lamp Test

4. The panel shall contain three configuration buttons:

   a. Menu/Back
   b. Back Space/Edit
   c. OK/Enter

5. It shall also have a 12-key telephone style keypad which shall permit selection of functions

I. Addressable Switch Module – Model ASM-16

1. Each ASM-16 has sixteen programmable push-button switches.
2. Each push-button switch has three associated status LED's (red, yellow, green), configurable to indicate any combination of functions.
3. Flexible switch configurations to allow flexible set-up of phone, speaker and auxiliary function circuits.
4. A slide-in label to identify the function of each switch and LED'S combination.
5. Specialty modules that only perform one task such as Speaker, Phone, or Auxiliary are not acceptable.

J. Network Repeater – Model RPT-E3

1. The Intelligent Network Interface shall provide interconnection and protection of remote network nodes. The Repeater shall regenerate and condition the token passing, 625 k-baud signals between units. The Repeater shall be available in wire, fiber, or wire/fiber configurations as determined by field conditions.
2. Fiber configurations shall utilize “ST” type connectors and be able to operate with up to 200-micron multi-mode fiber but optimize for 62.5/125. The interface shall have a jumper to allow selection of ground detection of wiring when used in the wire mode. The interface shall have integral LEDs to display current status of the board.

K. Network Graphic Annunciator – Model NGA

1. The Network Graphic Annunciator shall be a networkable, ¼ VGA, touch screen annunciator with the following Characteristics:

   a. Custom Graphics: The panel shall permit uploading of a custom bit-mapped graphic to the display screen. Graphic shall display when all systems are normal
   b. Intuitive Functions: In an alarm or trouble condition, the annunciator shall display only the information pertaining to the event including control switches.
   c. In a trouble condition, the display shall indicate the cause of the trouble. The only controls available to the operator shall be the Acknowledge and Reset functions.
   d. In alarm conditions the display shall indicate cause of the alarm. The only controls available to the operator shall be Acknowledge, Silence, and Reset functions.

2.03 ADDRESSABLE MODULES

A. Monitor Modules – Model AMM-2F / AMM-4F

1. CFSM: 7300-1703:102
1. Addressable monitor module with an initiating circuit wired Class B, Style B shall be furnished to provide an address for individual, normally open (N.O.) contact devices

B. Output Relay Control Module – Model AOM-2RF

1. CFSM: 7300-1703:102
2. Addressable output module shall be connected to the same signaling line circuit as the analog/addressable monitor devices and shall provide a relay output (Form "C" 2 amp at 24 VDC, resistive only)

C. Output Repay Supervised Control Module – Model AOM-2SF

1. CFSM: 7300-1703:102
2. Addressable output module shall be connected to the same signaling line circuit as the analog/addressable monitor devices and shall provide a supervised relay output (Form "C" 2 amp at 30 VDC, resistive only)

2.04 INITIATING DEVICES

A. Addressable Sensors

1. Two LEDs providing 360-degree visibility of operating status and alarm indication shall be provided on each sensor. The LEDs shall pulse periodically indicating that the sensor is receiving power and communication is taking place. This feature shall be field programmable. Upon alarm, these LEDs shall light continuously. An alarm output shall be available for remote annunciation.
2. Each sensor shall be interchangeable with all other spot type addressable sensors via twist-lock mounting base, to ensure matching the proper sensor to the potential hazards of the areas being protected. In all cases the system shall recognize when an improper sensor type has been installed in a previously programmed sensor type location.

B. Photoelectric Smoke Detector – Model ASD-PL2F

1. CSFM: 7272-1703:0121
2. Operating Temperature Rating: 32° F to 122° F (0° C to 50° C)
3. Air Velocity Rate: 0 to 4,000 ft/min (0 to 1219.2 m/min)
4. Relative Humidity Rating: 10% to 93% non-condensing
5. Voltage Range: 15 to 32 VDC
6. B210LP-6 Plug in Base (7300-1653:0109)

C. Addressable Thermal Sensor – Model ATD-HL2RF

1. CSFM: 7270-1703-0115
2. Operating Temperature 135° F rate-of-rise - -4° F to 100° F (-20° C to 38° C)
3. Operating Temperature 190° F rate-of-rise - -4° F to 135° F (-20° C to 57° C)
4. Operating Humidity Range - 10% to 93% noncondensing
5. Voltage Range: 15 to 32 VDC
6. B210LP Plug In Base (7300-1653:0109)

D. Manual Fire Alarm Pull Station – Model MS-7

1. CSFM: 7150-0028:0109
2. Operating Temperature Rating: 32° to 120° F (0° to 49° C)
3. Operating Humidity Rating: 10 to 93% (non-condensing)

2.05 NOTIFICATION DEVICES

A. Audio Visual Speaker Strobe Ceiling – Model SPSCRL

1. CSFM: 7320-1653:0505
2. Operating Temperature Rating: 32°F to 120°F (0°C to 49°C)
3. Operating Humidity Rating: 10 to 93% (non-condensing)
4. Frequency Range: 400 to 4000 Hz
5. Power: ¼, ½, 1, 2 watts
6. Candela Range: 15-115
7. See Plans for specified color

B. Outdoor Speaker – Model SPRK

1. CSFM: 7320-1653-201
2. Operating Temperature Rating: –40°F to 151°F (–40°C to 66°C)
3. Humidity Rating: 10 to 93% (non-condensing)
4. Frequency Range: 400 to 4000 Hz

5. Power: ¼, ½, 1, 2 watts
6. See plans for specified color

2.06 ACCESSORY EQUIPMENT

A. Notification Appliance Circuit (NAC) Remote Power Supply – Model HPF24S8

1. CSFM: 7315-1637:0102
2. Operating Power: 120 VAC, 2.7 amp. 60 Hz
3. Operating Temperature: 32° to 120° F (0° to 49° C)
4. Relative Humidity: 85% (non-condensing)
5. The Remote Power Supply is a device designed for use as either a remote 24-volt power supply or used to power Notification Appliances.
6. The Remote Power Supply shall offer up to 8.0 amps of regulated 24-volt power. It shall include and integral charger designed to charge sealed lead-acid storage batteries and to support up to 60-hour standby.
7. Four outputs shall be available for connection to the Notification devices. All four outputs shall be capable of accommodating both Style Y (Class B) and Style Z (Class A) Notification Appliance Circuits.
8. The Remote Power Supply shall include the ability to delay the AC fail delay per 2019 NFPA Requirements.
9. The Remote Power Supply shall provide integral synchronization and shall be capable of accommodating Audible and Visual devices, combined on each individual Notification Appliance Circuit, with the capability of silencing of Audible devices while Visual Devices remain in operation.

2.07 CABLE AND WIRE

A. All fire alarm system cable and/or wire shall be run in conduit or raceways

B. Signaling Line Circuit (SLC) and Annunciator data cable:

1. Indoor Dry Location: Model West Penn D990 or approved equal

a. CSFM: 7161-0859:0101
b. Two Conductor / 16 AWG
c. FPL Rated
d. Red PVC Jacket

2. Outdoor Wet Location: Model Burton 18JE2-0 or approved equal

a. CSFM: 7161-0895:0101
b. Two conductor / 16 AWG
c. FPL Rated
d. Black Underground, Direct Burial, Sunlight Resistant, Black Jacket

C. Notification Appliance Circuit (NAC) and 24-volt VDC Auxiliary Power

1. Speaker Circuit: Model West Penn D991 or approved equal

a. CSFM: 7161-0859:0101
b. Two conductor / 16 AWG with Overall Shield
c. FPL Rated
d. Red PVC Jacket

2. Strobe and other circuits: Model #12 THHN / THWN

a. CSFM: Not Applicable

b. Colors to be provided per Plans

PART 3 – EXECUTION

3.01 COMMAND AND CONTROL

A. Focal Point Command and Control System

1. Provide Campus Focal Point Command and Control System. Contractor shall provide all required modules for complete integration.
2. System shall be U.L. listed
3. System shall include the U.L. workstation.
4. Provide one touch screen monitor with the system
5. System shall be installed and programmed at an off-site location
6. Configure system and software for offsite application
7. Provide integration with existing Focal Point system
8. New system shall incorporate all existing Graphic Mapping from original system
9. Provide control functionality of all existing Gamewell-FCI systems
10. Setup to include all network configuration at the local and off-site locations
11. Provide backup capabilities for system screens, user, and history databases
12. Provide labeling as directed by Owner. Coordinate custom labels and locations with owner, i.e., HAZMAT, handicapped accessible areas, and gas/electric shut-offs

B. Centralized Automation and Control System

1. IP Gateway – Lifeguard Networks Model SY-MTIP / SY-ITIP
2. Communication protocols include RS-485, RS-232, Cellular, Analog Digital, and 2-way audio.
3. Serial interface to addressable FACP and/or dry contacts for conventional fire panels.
4. Fourteen inputs and eight programmable outputs
5. Complete system monitoring and transmission of data via existing network including event based unlimited email notification, itemized system monitoring of each device, wiring and peripherals. System control and response based upon event data.
6. Redundant buffer and onboard 2-gigabyte storage
7. VoIP Telephony connection of all networked devices
8. Six onboard video ports with expansion to twelve with motion control, remote PTZ and remote view
9. Standard 2-gigabyte memory with expansion capability to 500 Terabytes
10. Embedded Script language with logic control
11. The Fire Alarm System Installing Contractor shall employ the services of a certified LifeGuard Networks System Installer to install, train District Personnel and maintain all current system warranties. Contact LifeGuard Networks at (978) 212-1312 for local authorized Service Company.

PART 4 - EXECUTION

4.01 GENERAL

A. Division of Work

1. All equipment shall be installed in strict accordance with the Manufacturer's installation documentation. Any deviation shall require the Contractor to correct

the installation without impact to the construction schedule and at no additional cost to the Owner.

2. While all work included under this Specification is the complete responsibility of the Contractor, the division of actual work listed following shall occur.

    a. All conduits with pull cords, all electrical pull boxes, grounding rods, all outlet boxes, terminal cabinets, backboards, etc., which form part of the rough-in work shall be provided and installed completely by the Electrical Contractor. Coordinate as required for proper installation.
    b. The balance of the system, including installation of initiating devices, notification appliances, cabling and equipment, making all connections, etc., shall be performed by the System Supplier/Installer (reference Part 1, Section 1.02 of this Specification).
    c. All 120 VAC power conductors and conduits associated with power circuits to all low voltage system equipment locations shall be provided and installed by the Electrical Contractor.
    d. An insulated stranded copper ground wire shall be provided from each equipment cabinet to the building grounding system, in compliance with CEC Article 250, by the Electrical Contractor.
    e. Labeling of pullboxes, and terminal cabinets shall be provided and installed by the Electrical Contractor.

        1) All fire alarm junction boxes shall be painted red.

B. Installation

1. All work shall be completed in strict accordance with all applicable Codes and Ordinances, by a Gamewell-FCI Elite Dealer.
2. Per California Codes all individuals involved in the installation of the Fire Alarm System shall hold a valid State of California, Division of Apprenticeship Standards (DAS), Fire/Life Safety Technician Certification.

    a. Evidence of DAS certification shall be provided immediately upon request at the project site.
    b. Failure to provide evidence of DAS certification shall mandate immediate removal of said individual from the project site.

C. Cable and Wire

1. All cable/wire for the fire alarm system shall be new, unless otherwise noted on Plans.
2. Raceways containing conductors serving the fire alarm system shall not contain any other conductors. No AC current carrying conductors shall be allowed in the same raceway with DC fire alarm system conductors.
3. All fire alarm system cable/wire shall be labeled at all points of termination. All labeling shall be based on the room numbers as provided by the Owner or his Representative
4. Cable Shielding (for voice evacuation):

    a. Cable shielding shall be connected to common ground at the main communications system terminal board and shall be free from ground at any other point within the system. Cable shields shall be terminated in same manner as conductors.

5. Underground cables

    a. Any cable/wire pulled through manholes or pullboxes located below grade shall be continuous with no splices. The cable/wire shall be intact with no cuts in the protective outer jacket.
    b. Shall be approved for use in underground applications

D. System Start-Up

1. All start-up programming and system commissioning shall be performed by a Gamewell-FCI trained and certified Technician.

E. System Verification

1. Subsequent to system start-up the system installer shall perform a 100% pre-test to verify that the following features are functioning properly.

    a. All initiation devices
    b. All notification appliances
    c. All Control Modules
    d. All Monitor Modules
    e. Communication to monitoring and command systems

F. Acceptance Testing

1. The System Installer shall, in the presence of the Owner's Representative and the Inspector of Record (IOR), perform 100% testing as noted in System Verification above.

PART 5 - CLOSEOUT

5.01 GENERAL

A. In-Service Training

1. The Contractor shall instruct Personnel designated by the Owner in the proper use, basic care and maintenance of the system. Contractor shall provide up to 8-hours of in-service training with this system.

B. Factory Training and Certification

1. The Manufacturer shall provide factory certified training to two Fire Alarm Technicians employed by the School District. These Technicians shall be trained and certified as Manufacturers certified Technicians capable of performing any work on the system after the installation of the system.
2. All cost for training including travel, lodging, meals and per diem shall be included in the Fire Alarm Contractor's bid for this project.

C. Contract Closeout Documentation

1. Contractor shall provide the following:

    a. One reproducible hard copy of Project Record Drawings
    b. One copy of Manufacturer's maintenance and operation manuals.
    c. One copy of Contractor's system warranty
    d. One copy of Manufacturer's warranty
    e. One copy of the NFPA 72 Record of Completion

f. One copy of NFPA Certificate to the Owner, Local Fire Official, Architects and DSA.

D. Warranty

1. The Contractor shall warrant the equipment to be new and free from defects in material and workmanship, and will, within one year from the date of installation, repair or replace any equipment found to be defective.

   a. This warranty shall not apply to any equipment that has been subject to misuse, abuse, negligence or unauthorized modification.

2. Equipment provided shall be complete with 7-year Manufacturer's product warranty on Fire Alarm Control Panel.

   a. This warranty shall not apply to any equipment that has been subject to misuse, abuse, negligence or unauthorized modification.
   b. Manufacturer's warranty shall be provided with system submittal.

E. Field Services

1. The Gamewell-FCI Authorized Elite Dealer shall, at the Owner's request, make available a Service Contract offering continuing factory authorized service of this system upon expiration of the initial warranty period.
2. Contractor shall offer Code required Fire Alarm System Testing and Inspection Contract.
3. The System Manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

END OF SECTION 28 47 00
080322/1125080

32 00 00

EXTERIOR IMPROVEMENTS

TUSTIN UNIFIED SCHOOL DISTRICT

SECTION 32 12 16

ASPHALT PAVING AND AGGREGATE BASE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Asphaltic concrete paving as indicated on the Drawings and specified herein.

B. Principal items of Work:

1. Preparation of subgrade
2. Soil sterilization
3. Aggregate base course
4. Asphaltic surfacing materials
5. Mixing asphaltic concrete material
6. Placing asphaltic concrete pavement
7. Flood test

C. Related Sections:

1. Utility Storm Water Treatment, Section 33 44 19.

2. Earth subgrade preparation for asphaltic paving: Section 31 20 00 – Earth Moving.

3. Storm Utility Water Drains, Section 33 44 00.

4. Painting and Coating, Section 09 90 00.

1.02 PERFORMANCE REQUIREMENTS

A. Establishment of Grades:

1. The Contractor shall be responsible for finished elevation grade stakes and other surveying necessary for the layout of the Work.

2. Conduct operations in such a manner that the survey stakes shall be protected as long as their need exists. Be responsible for replacement of stakes.

3. Areas having drainage gradients of 2% or more shall have elevation stakes, set with instrument, at grid intervals of 25 feet. Intermediate stakes may be set by using a tightly-drawn string line over the tops of adjacent stakes. Grade stakes must be set at all grade breaks, grade changes, etc.

4. Areas having drainage gradients of less than 2 percent shall have elevation stakes, set with instrument, at 10 foot intervals. Grade stakes must be set at all grade breaks, grade changes, etc.

1.03 SUBMITTALS:

A. Provide the following:

1. Material Compliance Data Specifications.
2. Material Safety Data Specifications.
3. Copy of Installer's license.
4. Sterilization application data and purchase receipt.
5. Sample of aggregate for testing, if requested by engineer.
6. Data Sheets for seal coat and paint.

1.04 QUALITY CONTROL SUBMITTALS

A. Testing and Control of Materials:

1. Material shall meet the requirements specified herein. Laboratory tests of all of the materials will be required. If such tests meet the specified requirements, the laboratory test fees shall be paid by the Owner. If cost of subsequent tests fail to meet specified requirements, the costs of such tests shall be paid by the Contractor, and the Contractor shall immediately rectify the deficiency. Refer to Section 01 45 23 – Testing and Inspecting Services.

2. The Owner's inspector shall test the temperature of each batch of asphaltic concrete prior to placement. If asphaltic concrete temperature is not within tolerances as set forth in this Section of the Specifications the affected batch shall be rejected. Any and all costs due to the rejected asphaltic concrete shall be the responsibility of the paving contractor.

1.05 PROJECT SITE CONDITIONS

A. Protect existing installations: Such installations, which are shown on the plan or whose location could be reasonably inferred and which become damaged or broken by the operations, shall be repaired or replaced at no cost to Owner.

PART 2 - MATERIALS

2.01 MATERIALS

A. Soil Sterilization: The soils sterilant shall be in accordance with current EPA acceptable standard and the California Department of Pesticide Regulations for soils sterilant. Sterilant shall be selected as appropriate for the environment in which is it to be placed. Contractor shall be licensed with the State of California to apply sterilant.

1. Sterilant shall be commercial grade for commercial application. Contractor may obtain a list of acceptable sterilants from the District prior to bidding project.

B. Base and Aggregate Base:

1. Base and Aggregate base shall conform to the State of California, Department of Transportation (CALTRANS) Standard Specifications, Current Edition. All base, whether called out as aggregate base or base shall be in conformance with CALTRANS Section 26 for Class 2 Aggregate Base, 3/4-inch maximum. The maximum percentage of recycled material allowable shall not exceed 50% of the total volume of aggregate used.

2. Base and Aggregate Base shall be provided by a licensed commercial materials supplier. Certifications shall be submitted with each submittal. Use of on-site asphalt materials in aggregate base or base is strictly prohibited. The use of Crushed Miscellaneous Base is strictly prohibited.

3. Base depth shall be in accordance with plans and specifications. If no depth is specified, the minimum depth shall be 4".

C. Asphalt Concrete: Shall be produced by a commercial asphalt paving plant. Mineral aggregate and asphalt concrete production shall be in compliance with the State of California, Department of Transportation (CALTRANS) Standard Specifications, Current Edition.

1. Paving asphalt shall be per CALTRANS Section 39 Hot Mix Asphalt.

2. All on site paving shall be PG-64, ½" maximum Medium Grade asphalt per CALTRANS, Section 92, unless otherwise specified by the geotechnical engineer.

D. Asphalt Sealer: Sealer shall be LAS-320 by Enviroseal Corporation, 800-775-9474, or equal. Sealer cannot be installed for a minimum of 30 to 45 days after asphalt has been completed. Contractor shall account for this in his schedule. If asphalt must be striped prior to sealer, contractor shall account for sealer application and a subsequent restripe of any striping obscured by sealer.

E. All stripes and markings shall be painted with two (2) coats of pavement parking paint, v.o.c. compliant, lead free, base acrylic copolymer TSP, TT-P-115F, Type I and TT-P-85E for parking lots (yellow and white); and regular dry waterborne traffic paint (red, yellow and blue), TT-P-1952B for curbs, fire lanes, accessible striping, etc. Paint curb red at fire lanes - refer to the Fire Access Site Plan. Asphaltic concrete seal coat shall be in place a minimum of 10 days before applying paint.

1. Apply parking stall lines as indicated on the Drawings. Parking stall lines shall be 3 inches wide and white in color. Edges shall be clean and sharp.

2. Accessible Parking Stalls: Parking Spaces for persons with disabilities to be marked according to CBC Sections 11B-208, and 11B-502.

3. Loading and unloading access aisle shall be marked by a border painted blue. Within the blue border, hatched lines a maximum of 36" on center shall be painted white to contrast with the parking surface. CBC Figures 11B-502.2, 11B-502.3, 11B-502.3.3, and 11B-503.3, Blue color shall conform to Color No. 15092 per Federal Standard 595B. Paint to be slip resistant and provide a minimum 0.6 static coefficient of friction. Refer to drawings for width of painted lines and markings on pavement (3" minimum).

F. Application of Tack Coat

1. Apply tack coat at a rate of 0.05 to 0.15 gallon per square foot to cleaned contact surfaces of previously placed asphaltic concrete, abutting or projecting into asphaltic concrete paving and face of concrete curbs and walks. Protect exposed concrete.

G. Detectable Warning Area Tile: Terra Paving, ADA-3 Truncated Domes, 12 inch by 12 inch, or Armor-Tile, truncated vitrified polymer dome tiles, as distributed by White-Cap Construction Supply, CBC, 2019, Title 24, Part 2, Section 11B-705.1.2.5

1. Detectable Warnings, CBC, 2019, Title 24, Part 2, Section 11B-705.1.2.5:

a. Square grid, in-line pattern:

b. Diameter of nominal 0.9 inch (22.9mm) at base tapering to 0.45 inch (11.4) at top.

c. Nominal height of 0.2 (5.08 mm) inch.

d. Nominal center to center spacing of 2.35 (59.7 mm).

e. Color “yellow” conforming to Federal Color No. 33538 per Standard No. 595B. CBC Sections 11B-705.1.2.5 and 11B-810.5.2.

2. Provide a written five (5) year product warranty provided by the manufacturer of detectable warnings and directional surface products as equivalent to the evaluation and product approval program. Such warranty shall indicate compliance with architectural standards as published in the current edition of the California Building Standards Code, and also include durability criteria which indicates that the shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for at least five (5) years after initial installation. Warranty will certify that the produce will not degrade significantly, meaning that the product maintains at least 90 percent of its approved design characteristics, as determined by the enforcing agency.

H. Concrete Wheel Stops

1. Provide concrete wheel stops by San Diego Precast, or equal. Concrete shall be 4000 psi in 28 days. Provide two be galvanized dowels as anchorage, and glue wheel stop to asphalt surface. Dowels shall be hot dipped galvanized, 16-inch long, #4 reinforcing. Recess head of dowel beneath the top of the wheel stop. Wheel Stop shall be a minimum length of 6-feet.

PART 3 - EXECUTION

3.01 FINAL PREPARATION OF SUBGRADE

A. Immediately prior to placing base or aggregate base, the subgrade shall be scarified to a depth of at least 12 inches, moistened, and the entire area thoroughly compacted by rolling to obtain a smooth, hard, even surface of 95 percent compaction at bus drop off and fire lane and 90 percent compaction elsewhere to receive the base or aggregate base. The subgrade shall be finished to the required grades with due allowance being made for the thickness of base course and finished surfacing to be placed thereon.

B. Subgrade for the pavement structures shall not vary more than $\pm$ 0.04 feet from the specified grade and cross section.

C. Areas inaccessible to power rolling or areas that cannot be compacted properly with power rollers shall be compacted with vibrating compactors or other suitable mechanical means which shall produce a firm foundation for the paving structure.

3.02 SOIL STERILIZATION

A. The Contractor shall take whatever precautions are necessary to prevent contamination of adjacent soil areas with sterilant and for the protection of personnel. Sterilant shall not be applied within two feet of planting areas.

B. Certification shall be furnished to the Architect, showing the purchase receipt and rate of application of the material. Payment for soil sterilization will include full compensation for application and all materials and incidental work required.

3.03 AGGREGATE BASE OR BASE

A. The base material shall be placed upon the finished subgrade after the subgrade has been properly prepared as herein specified. The base shall be placed in accordance with CALTRANS, Section 26.

3.04 DEFINITIONS

A. For the purpose of compacting procedures the following definitions are used:

1. Initial or Breakdown Rolling: The first coverage of a roller on asphalt concrete after the material has been placed to line and grade.

2. Intermediate Rolling: The rolling performed immediately after the initial rolling. When completed, the pavement should meet job density requirements.

3. Compaction Rolling: Including initial and intermediate rolling.

4. Finish Rolling: The final rolling necessary to obtain the desired surface texture and eliminate roller marks. No further densification is anticipated in this operation.

5. Coverage: The number of movements of a roller required to cover the entire width being paved at least once.

6. Steel-Wheel Roller: A 2-wheel steel tandem roller weighing 8 to 10 tons.

7. Pneumatic-tired Roller: A rubber-tired roller equipped with tires a minimum 7.50 x 15 in size, capable of being ballasted up to 12 tons.

8. Vibratory Roller: A vibratory roller capable of imparting a dynamic force of at least 21,000 pounds.

9. Maximum Laboratory Density: Density achieved on a sample of a material taken from a specific location at the job site under working conditions. This density can be obtained using the California Kneading Compactor per Test Method No. Cal. 304.

B. Prior to paving, furnish manufacturer's certificates or literature demonstrating that rollers meet requirements specified above. Prior to paving, state which procedure will be used and do not change that procedure without the Engineer's approval.

3.05 PRIMARY LIFT SPREADING AND COMPACTION

A. Asphalt concrete in excess of 2 inches in thickness, shall be placed in two (2) lifts, a primary lift, and a surface course. Surface Course shall be a minimum of 1 inch thick.

B. Asphalt concrete shall be delivered to the project site at a temperature of not less than 260 degrees F. nor more than 320 degrees F.

C. The depositing, distributing , and spreading of asphalt concrete shall be accomplished in a single, continuous operation by means of a self-propelled paving machine, motor grader, spreader box, rock spreader, or similar equipment.

D. Prior to spreading, a tack coat shall be applied to the vertical face of all curbs, gutters, and structures which will butt against the new pavement. A tack coat is required between courses if surface has been contaminated by dirt or oxidized by extended exposure. A diluted SS-type emulsion shall be used for tack coat and shall meet the requirements set forth in CALTRANS, Section 39 and Section 94.

E. Certification: Provide certification that the asphalt aggregate mixture has at least 80 percent of compacted density values equal to or greater than 96 percent - and 100 percent equal to or greater than 95 percent - of a laboratory specimen prepared by the appropriate test method from a sample taken from a truck delivering mixture to the job site. Field density of compacted asphalt concrete shall be determined by:

1. A properly calibrated nuclear asphalt testing device in the field, or

2. ASTM D1188 when slabs or cores are taken for laboratory testing. Zinc stearate may be substituted for paraffin.

3. In case of dispute, the procedure described under Sub-Item E (2.) above shall be used. Combination of rollers shall be allowed under this procedure.

F. Steel-Wheel and Pneumatic: Apply a breakdown (initial) coverage with a steel-wheel roller loaded to 10 tons. Follow by intermediate rolling consisting of a minimum of 6 coverages of a pneumatic-tired roller, the tires being inflated a minimum of 60 psi cold and a maximum of 90 psi when hot. Finish rolling may consist of one coverage of an 8-ton tandem steel-wheel roller.

G. Steel Wheel: Apply a minimum of eight coverages with a steel-wheel roller loaded to 10 tons.

H. Vibratory: Compaction shall consist of at least six coverages with a vibratory roller. Rolling from the center to the edge shall be permitted, and all compaction rolling shall be accomplished before the mix temperature falls below 185 degrees F. Rolling shall commence at least one foot from edge of the mat after which the roller shall be gradually advanced to the edges. Within one foot of edge, the roller on its initial coverage shall advance to the edge in 4-inch increments. The roller shall be advanced to a supported edge first, if applicable. Rolling within one foot of an unsupported edge should be delayed to minimize possible distortion but completed at such time that proper densities are obtained after the completion of rolling. No roller shall be permitted to stand motionless on portion of the work before it has been properly compacted.

3.06 SURFACE COURSE SPREADING AND COMPACTION

A. Surface course shall be 1-inch thick.

B. At the time of delivery to the site of work, the temperature of mixture shall not be lower than 260 degrees F., or higher than 320 degrees F. Asphalt concrete shall not be placed when the atmospheric temperature is below 40 degrees F. or during unsuitable weather.

C. The asphalt concrete shall be evenly spread upon the subgrade or base to such a depth that after rolling, it shall be of the specified cross section and grade of the course being constructed.

D. The depositing, distributing, and spreading of the asphalt concrete shall be accomplished in a single, continuous operation by means of a self-propelled mechanical spreading and finishing machine designed especially for that purpose and equipped with a screed or strike-off assembly capable of being accurately regulated and adjusted to distribute a layer of the material to a definite predetermined thickness.

E. Spreading, once commenced, must be continued without interruption. No greater amount of the mixture shall be delivered in one day than can be properly distributed and rolled during that day.

F. Compaction is the same as outlined in Paragraph 3.05, except as noted below:

1. Steel-Wheel and Pneumatic: Apply a breakdown (initial) coverage with a steel-wheel roller loaded to 10 tons. Follow by intermediate rolling consisting of a minimum of four coverages of a pneumatic-tired roller, the tires being inflated a minimum of 60 psi cold and maximum of 90 psi when hot. Finish rolling may consist of one coverage of an 8-ton tandem steel-wheel roller.

2. Steel-Wheel: Apply a minimum of six coverages with a steel-wheel roller loaded to 10 tons.

3. Vibratory: Compaction shall consist of at least four coverages with a vibratory roller.

G. As soon as the layer of asphalt concrete has been placed, it shall be thoroughly compacted by rolling. Rolling shall be commenced along the lower edge of the area to be rolled and shall be continued until the edge is thoroughly compacted, after which the roller shall be gradually advanced to the crown point, both sides being rolled in a like manner. Rolling shall be continued until the layer has become thoroughly compacted throughout and is true to grade and cross-section.

H. Maintain rollers in good mechanical condition, and those that cannot be operated without jerking, or driven along a straight path, shall not be used. No leakage of petroleum products from roller shall be allowed to come in contact with the pavements being constructed, nor shall roller be permitted to stand motionless on portion of the work before it has been properly compacted.

Rolling surfaces shall be treated with water to prevent the adherence of the asphalt concrete, but the quantity used must not be such as to be detrimental to the surface being rolled.

3.07 FLOOD TESTING

A. Flood Test: Before seal coat is applied, a water flood test shall be done in the presence of the Inspector. The flooding shall be done by water tank truck. Depressions where the water ponds to a depth of more than 1/8-inch shall be filled, or the slope corrected to provide proper drainage. The edges of the fill shall be feathered and smoothed so that the joint between the fill and the original surface is invisible.

B. Seal Coat: After completing the flood test and the pavement has cured for 30 days, all new A.C. pavement shall receive a slurry sealer applied in accordance with the manufacturer's specifications.

1. Areas to receive sealer shall be swept clean, and, before application, lightly sprayed with water, leaving it cool and damp but free of excess water.

2. Make two or more applications using a total of at least 80 square foot/gallon, min.

3. Each coat of sealer shall dry 24 hours before the succeeding coat is applied.

4. The finished surface seal, when dry and thoroughly set, shall be smooth, tough, waterproof, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges, and other surface irregularities. Should defect appear in the finished surface, apply as many additional coats of sealer as may be required to produce the specified finished surface at no additional cost. Protect from traffic during all operations and until the sealer is thoroughly set and cured and does not pick up under foot or wheeled traffic – min. of 24 hours. When cured and set, thoroughly wash off with water to remove excess residue before applying painted markings.

5. Application shall be by spray method is possible. Brush method may be used when sealer is covering existing pavement and the pavement is in poor condition. Skid-slip resistance applications using sand are not acceptable.

6. Repair any damage caused by construction traffic.

3.08 PAVEMENT MARKINGS

A. Accessible Parking:

1. Accessible parking spaces serving a particular building or facility shall be located on the shortest accessible route to an entrance complying with CBC Section 11B-208.3.1.

2. Accessible parking spaces serving more than one accessible entrance shall be dispersed and located on the shortest accessible route to the accessible entrances.

3. 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 Section 11B-208.3.1

4. Minimum number of required accessible parking spaces shall be provided in accordance with CBC Table 11B-208.2 for each parking facility provided on a site.

5. For every six or fraction of six accessible parking spaces, at least one shall be an

accessible van parking space. CBC Section 11B-208.2.4

6. 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:

   a. 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

   b. 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.

   c. 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

   d. Access aisles (accessible parking spaces as well – similar application) shall not overlap the vehicular way. CBC Section 11B-502.3.4

   e. 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.

B. Passenger Drop-off and Loading Zones:

   1. 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:

      a. Vehicle pull-up spaces shall be 8' x 20' minimum.

      b. Access aisles shall be 5' wide minimum x full length of vehicle pull-up spaces they serve and shall be adjacent and parallel to the vehicle pull-up spaces. They shall be at the same level with each other and with slopes not steeper than 1:48 in any direction. Access aisle shall adjoin an accessible route and shall not overlap the vehicular way.

      c. 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. (Blue interior hatch lines are preferred for concrete surfaces and white interior hatch lines are preferred for asphalt surfaces. Where white hatch lines are used, hatch lines shall be interrupted at 12" high 'No Parking' text so that legibility is maintained.) CBC Section 11B-503.3.3

C. Pavement Marking Paint: Vinyl acrylic type for use on asphaltic concrete and Portland cement concrete. Pavement Marking Paint: Vinyl acrylic type for use on asphaltic concrete and Portland cement concrete. Painted lines and markings on pavement shall be 3" minimum wide and blue in color equal to Color No 15092 per Federal Standard 595B. Refer to Paragraph 2.01 D., for additional paint striping information.

D. Provide International Symbol of Accessibility for each accessible parking stall at location indicated in the Drawings. Symbol shall be 36 inches square, white on standard blue background, and ADA Accessibility Guidelines for Buildings and Facilities.

1. Parking spaces for the disabled shall be marked according to CBC Sections 11B-208, and 11B-502.

2. Refer to paragraph 2.01 D., for additional paint striping information.

E. Preparation:

1. Immediately before applying the paint, thoroughly clean the pavement surface of dust, dirt, sand, scale, water, oil, grease or other objectionable matter. Do not use solvent materials that will damage pavements as cleaning agent. Immediately before paint, give pavement surface a final cleaning by means of a power broom. Following the power brooming, use power blower containing compressed air.

2. Provide warning devices required to protect the painting operations and the finished work.

F. Application: Immediately following other preparation of the pavement surface, apply the striping at the rate of 100 to 110 square feet, per gallon of paint. Apply lines 4 inches wide unless otherwise indicated. Apply the stripe of the indicated or specified width with clean true edges and without sharp breaks. Repaint to the applicable specification portions of the stripe damaged by any type of traffic within 24 hours after the stripe has been applied.

G. Provide temporary striping where parking must be occupied prior to installation of seal coat.

3.09 CLEANUP

A. Clean up the paved areas prior to acceptance of the work. Dirt, spoil, and debris of nature shall be removed, and the entire site shall present a clean, workmanlike appearance.

B. Damage to paint work from paving or seal-coating operations shall be corrected.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes: Chain link fencing, including gates, and hardware and as indicated on the Drawings and specified herein.

B. Related Sections:

1. Section 03 30 00 – Cast-in-Place Concrete.

1.02 REFERENCE STANDARDS

Work of the section shall conform to the following 2010 California Code of Regulations:

A. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

B. ASTM A121 – Metallic-Coated Carbon Steel Barbed Wire.

C. ASTM A123 – Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.

D. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

E. ASTM A392 – Zinc-Coated Steel Chain-Link Fence Fabric.

F. ASTM A491 – Aluminum-Coated Steel Chain-Link Fence Fabric.

G. ASTM A653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

H. ASTM A1011 – Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

I. ASTM B117 – Operating Salt Spray (Fog) Apparatus.

J. ASTM C94 – Ready-Mixed Concrete.

K. ASTM F567 – Installation of Chain-Link Fence.

L. FS RR-F-191 - Fencing, Wire and Post, Metal.

1.03 SUBMITTALS

A. Submit shop drawings showing application to project, including gates. Include plan layout, grid, spacing of components, accessories, fittings, hardware, anchorages, and schedule of components.

B. Submit manufacturer's product data with printed specifications and installation instructions.

C. Submit samples.

D. Manufacturer's certifications of compliance for chain link fabric, posts and rail.

1.04 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the site in an undamaged condition. Carefully store material off the ground to provide proper protection against oxidation caused by ground moisture.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Materials shall be new and products of recognized, reputable manufacturers. Used, re-rolled or re-galvanized materials are unacceptable. Like products shall be supplied by a single source.

2.02 MATERIALS

A. Fabric: Steel fabric shall be hot-dipped galvanized before weaving with 1.2 ounces of zinc per square foot of surface conforming to ASTM A392, Class I, or aluminum coated in accordance with ASTM A491. Wire shall be 9 gauge, 2 inch diamond mesh, with selvage edges knuckled. Provide 1-3/4 inch diamond mesh at tennis courts and athletic areas. Height as indicated on drawings.

B. Tension Wire: 7 gauge galvanized spring steel with same galvanizing as fabric.

C. Framework: Shall conform to FS RR-F-191/3E Class 1, Grade A or B, or Class 3, except as herein modified.

1. Class 1, Grade A pipe shall conform to ASTM A53, except the hydrostatic test shall be waived. Galvanizing shall be in accordance with ASTM A123.

2. Grade B pipe, shall be made from steel complying with ASTM A653 Grade D or ASTM A1011. The exterior surface shall have a hot dipped zinc coating of 1.0 $\pm$ .1oz/ft^2 followed by 15 micrograms/in^2 min. chromate conversion coating and .5 $\pm$ .2 mils of clear acrylic. The interior surface shall be hot dipped zinc coated with a minimum of 1.0 $\pm$ .1 oz/ft^2, or shall be a minimum of .5 mils of zinc rich organic coating with a minimum zinc loading of 91%.

3. Class 2 Roll-Formed C-Sections shall be made from steel conforming to ASTM A1011, Grade 45 and shall be galvanized with 1.8 oz. hot dipped zinc in accordance with ASTM A123. The product of the yield strength and the section modulus of framework material shall not be less than that of pipe conforming to ASTM A53.

D. Top Rail: Steel pipe, 1.660” O.D. weighing 2.27 lb/ft; pass through intermediate post tops and form a continuous compression member from terminal to terminal of each stretch of fence. The pipe shall be in approximately 20 foot lengths and shall be joined with couplings of the outside sleeve type at least seven inches long. Top rail shall be fastened to terminal posts by heavy pressed steel connections stretched along the fence bottom and secured to terminal posts.

2.03 COMPONENTS

A. 6 Foot High Fence or Less:

1. Line Posts: 1.9" o.d. steel pipe, Class 1 Grade A or B; or 1.875" x 1.625" x 1.85 lbs/ft. Class 3.

2. Corner and Terminal Posts: 2.375" o.d. steel pipe, Class 1 Grade A or B.

3. Provide posts at 10'-0" maximum o.c. Provide top rail and bottom tension wire, as specified herein. Provide bottom rail at athletic areas.

B. 6 to 8 Foot High Fence:

1. Line Posts: 2.375" o.d. steel pipe, Class 1 Grade A or B;

2. Corner and Terminal Posts: 2.875 o.d. steel pipe, Class 1 Grade A or B.

3. Provide posts at 10'-0" maximum o.c. Provide top rail and bottom tension wire, as specified herein.

C. For Fence Heights Over 8 Feet:

1. Line Posts: 2.875" o.d. steel pipe, Class 1 Grade A or B; or 1.875" x 1.625" x 2.28 lbs/ft Class 3.

2. Corner and Terminal Posts: 4.0" o.d. steel pipe, Class 1 Grade A or B.

3. Rails and Bracing: 1.66" o.d., plain end steel pipe, Class 1, Grade A or B; or 1.625" x 1.25" x 1.35 lbs/ft Class 3. Use manufacturer's longest lengths. Join using 6" sleeves.

4. Provide posts @ 10'-0" maximum o.c. Provide top rail and bottom tension wire, as specified herein. Provide mid-rail at 12 feet high fence.

2.04 ACCESSORIES

A. Gates:

1. Gate Frame: 1.90" O.D. steel pipe Class 1, Grade A or B for welded fabrication. Welded or damaged areas shall be cleaned and coated with two coats of zinc rich paint. Provide same fabric as for fence. Install diagonal cross-bracing using 3/8" truss rods.

2. Gate Posts for Swing Gates shall be as follows:

Gate Leaf Width	Gate Post Dimensions
6' or less	2.875" O.D. - 4.64 lbs/ft
over 6' to 12'	4.000" O.D. - 6.56 lbs/ft
over 12' to 18'	6.625" O.D. - 18.02 lbs/ft
over 18' to 24'	8.625" O.D. - 27.12 lbs/ft

3. Gate Hardware: See Plans for special hardware requirements of Fire Access and Panic hardware per CBC Section 1008.2, 11B-206.5 and 11B-404.1.

   a. In Path of Travel: Fork type latch lever hardware, locking hardware shall be at +30"-44" above finish floor mount height. Provide 10 inches minimum high, 16 gauge galvanized metal kickplate attached to the bottom of the gate. (No drop rods at gates accessible to disabled persons).

   b. Gates in the path of travel must comply with exit door requirements (CBC Section 11B-206.5 and 11B-404.1). Specify lever hardware that does not require pinching, grasping, or twisting motion to operate (CBC Section 11B-404.2.7 and 11B-309.4). Provide solid kick plates 10" minimum high 3" maximum from the paving on both sides of the gate, 5 lbs maximum opening pressure and door maneuvering clearances.

4. Fittings and accessories shall be galvanized in accordance with ASTM A153, Table I.

5. Post Caps: Weathertight caps shall be supplied for each post. Shall be cast steel or malleable iron, galvanized. Caps shall have a loop to receive top rail.

B. Rolling Gates: When rolling gates are indicated, they shall be fabricated and installed complete with tracks, track wheels, double front wheel assembly, locking devices, gate bumpers, etc. Double wheels shall roll on and be supported by a continuous concrete track. Concrete shall be 8 inches thick with two #4 continuous steel reinforcing bars.

1. Rolling gate posts shall be 2.875" o.d. steel pipe weighing 5.79lb/ft. Guide posts of 2.375" o.d. steel pipe, weighing 3.65lb/ft. shall be installed in line with the gate posts. Line posts to support the tracks shall be spaced not over 5'-0" on center.

C. Provide 12” wide x 4” deep continuous flush concrete mow strips at all fencing locations.

2.05 FINISHES

A. Hot Dipped Galvanized. ASTM A153-09 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567, follow the lines, grades, and details as indicated.

B. Posts shall be set in concrete with the diameter to be four times the largest cross section of the post. The depth shall be a minimum of 24 inches plus an additional 3 inches for each 1 foot increase in fence height over 4 feet. Terminal posts shall be braced on fences 7 feet or above in height, and on fences without top rail, regardless of height.

1. Provide concrete for setting posts. Refer to paragraph 2.01A. Specification Section 03 30 00, Cast-in-Place Concrete. Portland Cement shall be Type I, II, or V concrete per paragraph 2.01A. Specification Section 03 30 00, Cast-in-Place Concrete, and shall conform to ASTM C150. Concrete aggregates shall conform to ASTM C33. The maximum size aggregate shall be 1-1/2 inch. Mix shall be 1 part cement and 6 parts well-graded aggregate. Dig holes 3 inches deeper than

bottom of post. Make slight crown at top of concrete, 2 inches minimum above finish grade, to shed water.

2. Terminal posts must not have gates hung on them.

3. Erect fencing straight and plumb, following the finish grade. Place no post in ditches, dips, or mounds.

C. Remove all excess materials, debris, rocks, dirt, concrete, etc., and rake grade to within 2 inches of the bottom of the fabric. Dispose of all debris and other refuse off-site in a legal manner.

END OF SECTION