CONTRACT DOCUMENTS
for the

EVENT CENTER PARKING LOT EXPANSION
@
VICTOR VALLEY COLLEGE

VICTOR VALLEY COLLEGE
VICTOR VALLEY, CALIFORNIA

June 27, 2025

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VICTOR VALLEY COLLEGE

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IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 04-124537 INC:
REVIEWED FOR
SS ☐ FLS ☐ ACS ☑
DATE: 08/15/2025

LICENSED ARCHITECT
PEDRO JARAMILLO
NO. C33951
REN. 10-31-25
STATE OF CALIFORNIA

Architect
PCH Architects, Inc.
Pedro Jaramillo C-33951

LICENSED PROFESSIONAL ENGINEER
STEPHEN R. ZAJICEK
E 10372
EXP. 09/30/2026
ELECTRICAL
STATE OF CALIFORNIA

Electrical Engineer
FBA Engineers
Steve Zajicek E-10372

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@
VICTOR VALLEY COLLEGE

Victor Valley College

TITLE
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PART 1 - GENERAL

1.1 SUMMARY OF THE WORK:

A. The work under this Contract necessary for and incidental to the execution and completion all work indicated in the Contract Documents for construction of:

EVENT CENTET PARKING LOT EXPANSION @
VICTOR VALLEY COLLEGE

B. Contract Documents prepared by:

PCH Architects, Inc.
30 South Center Street
Redlands, California 92373

1.2 GENERAL DESCRIPTION OF THE WORK:

A. The work under this Contract includes furnishing of all labor, materials, services and transportation, except as specifically excluded, which is required for completion of the Project in accordance with the provisions of the Contract Documents. All construction shall be complete as indicated in the contract documents. The general scope of the work shall include but not be limited to:

1. General Conditions
2. Temporary Facilities
3. Sawcutting and Demolition
4. Grading and Compaction
5. Utility Trenching, Backfilling and Compaction
6. Soil Export and Import as needed
7. Demolish Existing Tennis Courts, Court Lighting, Court Paving and Perimeter Chain Link Fencing
8. Demolish Site Furniture, Light Poles with Footings, and Trees
9. Decommission, Demo, Haul Away and Dispose Legally Three Existing Modular Classroom Buildings (One @ 48” x 40’ and Two @ 24” x 40’)
10. Improvements to Parking Area:
    a. Install New Concrete Paving, Pavement Patching, Parking Lot Striping and Signage, Concrete Curbs and Gutters, Parking Lot Lighting, Electrical Vehicle Charging Stations and Landscape Improvements

1.3 REQUIREMENTS OF REGULATORY AGENCIES:

A. Construction shall be in conformance with the California Code of Regulations (CCR), as follows:

2022 California Administrative Code, Part 1, Title 24, CCR
2022 California Building Code (CBC), Part 2, Title 24, CCR
2022 California Electrical Code (CEC), Part 3, Title 24, CCR
2022 California Mechanical Code (CMC), Part 4, Title 24, CCR
2022 California Plumbing Code (CPC), Part 5, Title 24, CCR
2022 California Energy Code, Part 6, Title 24, CCR
2022 California Fire Code (CFC), Part 9, Title 24, CCR
2022 California Existing Building Code (CEBC), Part 10, Title 24 CCR
2022 California Green Building Standards Code (CalGreen), Part 11, Title 24 CCR.
2022 California Referenced Standards Code, Part 12, Title 24, CCR
Title 19 CCR, Public Safety, State Fire Marshal Regulations

APPLICABLE STANDARDS:
For a list of applicable standards, including California amendments to the NFPA Standards, refer to CBC Chapter 35 and CFC Chapter 80.

1.4 OCCUPATIONAL SAFETY AND HEALTH ACT REQUIREMENTS:

A. During the entire construction period, it shall be the responsibility of the Contractor to maintain conditions at the Project site so as to meet in all respects the requirements of the State and Federal Occupational Safety and Health Administration (Cal OSHA and OSHA). This provision shall cover the Contractor's employees and all other persons working upon or visiting the site or its vicinity including students and faculty. To this end, the Contractor shall inform himself and his representatives of State and Federal OSHA standards.

1.5 DOCUMENTS AVAILABLE:

A. A soils investigation report was not performed for this project. All structures and foundations have been designed for minimum bearing as allowed by the code.
B. Not used.

1.6 COORDINATION WITH STRUCTURAL REQUIREMENTS:

A. The placement of pipes, conduits, other materials, and the location, size and reinforcement of holes in the building structure shall conform to the Structural Drawings and Specifications. When the requirements of the Mechanical, Electrical, or other sections of the Specifications or Drawings are in conflict with the structural requirements, the structural requirements shall take precedence. Where the safety of the building structure is threatened, due to mechanical, electrical or other construction or holes required for such construction, modifications shall be made as directed by the Architect.

B. It is the Contractor's responsibility to coordinate the work so as to minimize conflicts and optimize efficiency.

1.7 WORK INDICATED AS N.I.C.:

A. The term “NIC” shall be construed to mean that portions of the Project are not to be furnished, installed or performed by the Contractor. The term shall mean “Not in this Contract” or “Not a Part of the Work to be performed by the Contractor” except that coordination and installation of certain NIC items specified shall be the Contractor’s responsibility.

B. “NIC” construction is indicated and specified herein as an aid to the Contractor in scheduling the amount of time and materials necessary for the completion of the Contract.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. This section covers procedures for submittal of requests for substitution for materials specified in this project manual by proprietary names. The Conditions of the Contract and other sections of Division 1 apply to this section as fully as if repeated herein.

1.2 GENERAL REQUIREMENTS:

A. Whenever in the specifications products are by reference standard, any product meeting the standards referenced may be used. Information on such products shall be submitted in accordance with Section 01 33 23.

B. The Contractor shall submit a written request for proposed substitutions, as permitted by Article 30 of the General Conditions, to the Architect not later than 35 days after the Award of Contract. Proposed substitutions relating to a particular subcontract or trade shall be submitted at one time on the Contractor's letterhead, listing proposed items for indicated or specified items, and stating amounts for all variations in costs. If the Architect approves any proposed substitution, such approval will be set forth in a Change Order. No substitution will be considered after this 35 day period.

C. Drawings and Specifications have been detailed in compliance with the ICC Report and/or DSA approvals for material specified. If a proposed substitute material is approved as an equal by the Architect, the Contractor will assume the responsibility for construction modifications and additional costs required by reason of this acceptance.

D. Where materials or items of manufacturer are specified in groups and are made or furnished by one manufacturer, no substitution will be considered that is not made and/or furnished similarly by one manufacturer. Where the Contractor proposes to use a system of equipment other than that specified or detailed on the drawings the substitution shall be proposed as a complete system.

1.3 REQUIREMENTS FOR SUBMITTING SUBSTITUTIONS:

A. The Contractor shall submit with his written request for a proposed substitution all data substantiating his request as well as a "Certificate of Suitability" certifying that the proposed substitution is equal or better in all respects to that specified and that it will, in all respects perform the function for which it is intended. The Contractor shall include with his request all required samples. All written requests and data for proposed substitutions shall be submitted in three (3) copies.

B. It shall be the responsibility of the Contractor to submit complete information to the Architect so that proper evaluation can be made. The burden of proof of equality of the substituted item shall be on the Contractor. Acceptance of such substitutions is entirely at the discretion of the Architect and Owner. All materials or items of manufacture, which the Contractor proposes to substitute for those specified, must be approved by the Architect before they may be ordered.

C. The Architect will issue to the Contractor a list setting forth those items for which substitutions are approved. No substitution will be approved for any materials or item of manufacture called for in the Contract Documents which is not of equal quality and utility and which does not possess equal design or color characteristics to those of the specified material or item.

D. If, in the opinion of the Architect or Owner, the proposed substitution is not equal or better in every respect to that so indicated or specified, or was not submitted for approval in the manner outlined above, the Contractor shall furnish the specified materials.

E. It shall be the responsibility of the Contractor, in proposing a substitution for any item herein specified, to inform all other trades, vendors, and subcontractors of effects said substitution will have upon their work or products. Failure to so notify shall require that the Contractor bear all costs arising from alterations in specified materials or methods necessary to complete the work in an approved and acceptable manner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. This section covers the requirements for pre-construction meeting, progress meetings, specially called meetings and post-construction meetings. The Conditions of the Contract and the other sections of Division 1 apply to this section as fully as if repeated herein.

1.2 CONTRACTOR'S RESPONSIBILITIES:

A. Prepare agenda, notify participants, and make physical arrangements for all meetings.

B. Record minutes, including all significant proceedings and decisions for each meeting. Reproduce and distribute copies of minutes within 5 days after each meeting. Provide copies to the Architect, all other participants in the meeting, and all other parties affected by decisions made at the meeting.

1.3 PRE-CONSTRUCTION MEETING:

A. Prior to issuance of notice to proceed, a pre-construction meeting will be held at a time and location designated by the Architect.

B. Attendance: The meeting shall be attended by the Owner's representative, the Owner's Inspector, the Architect and his professional consultants, the Contractor and his superintendent, all major subcontractors and other persons designated by the Owner.

C. Agenda: The agenda for the meeting shall include the following items as a minimum.

1. Distribution and discussion of the construction schedule including all critical work sequencing.

2. Designation of persons authorized to represent and sign documents for the Owner, Architect and Contractor, with examples of official signature of each.

3. Procedures and forms for processing submittals, field decisions, proposal requests, change orders, applications for payment and revised progress schedules.

4. Procedures for maintaining record documents.

5. Contractor's use of premises including location of office, work and storage areas.

6. Temporary barricades, utilities, sanitary facilities, signs and other temporary facilities required.

7. Safety and first-aid procedures including designation of Contractors safety officer.

8. Security procedures.

9. Housekeeping procedures.

10. Communication procedures between parties.

11. List names, addresses and telephone numbers of those persons authorized to act for the Contractor in emergencies.

12. Construction permit requirements, procedures and posting.

13. Testing laboratory or agency and testing procedures.

14. Establish schedule for progress meetings.

15. Other administrative items as appropriate.

1.4 PROGRESS MEETINGS:

A. Progress meetings shall be held at the dates and times scheduled at the pre-construction meeting unless changes are agreed to by all parties and appropriate notification of such changes has been given.

B. Attendance: The meeting will be attended by the Architect, the Contractor's Superintendent and the Owner's Inspector. When requested by the Owner, the Architect or the contractor; subcontractors, and the Architect's Consultants may also attend.

C. Agenda: The agenda for these meetings will include the following items.

1. Review progress of work since the previous meeting.

2. Discuss field observations, problems and conflicts.

3. Identify problems which impede planned progress and develop corrective measures as required to regain the projected schedule. Revise the progress schedule if necessary.

4. Review progress scheduled during the next work period.

5. Review the progress of sub-contractors.

6. Review changes proposed by the Owner for their effect on the progress schedule and completion time.

1.5 SPECIAL MEETINGS:

A. Upon appropriate notice to other parties, special meetings may be called by the Owner or Architect, at times agreed to by all parties involved.

1.6 POST-CONSTRUCTION CONFERENCE:

A. A post-construction conference will be held prior to final inspection of the work to discuss and resolve all unsettled matters. Bonds and insurance to remain in force, and the other documents required to be submitted by the Contractor will be reviewed and all deficiencies determined. Schedules and procedures for the final inspection process and for the correction of defects and deficiencies shall be discussed and agreed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes the preparation and submission of the schedules and reports specified herein, including the up-to-date maintenance thereof as required. The Conditions of the Contract and the other sections of Division 1 apply to this section as fully as if repeated herein.

1.2 CONSTRUCTION SCHEDULE:

A. Immediately upon being awarded the Contract and before request for a partial payment, the Contractor shall prepare and submit to the Architect a construction progress schedule. The schedule shall be prepared in chart form according to the Critical Path Method (CPM) with the dates for beginning and completion of each trade and activity included. Computer prepared CPM charts are acceptable. The schedule shall conform to the working time and the time of completion established under the terms of the Contract and shall be subject to modification by and approval of the Owner. When, in the opinion of the Owner, it becomes necessary to accelerate the work, the Contractor, when so ordered, shall modify the schedule to conform to such requirements.

B. The Construction Schedule shall be continuously updated and, if necessary, redrawn and submitted simultaneously with the application for progress payments. Each revised schedule shall indicate the work actually accomplished during the previous period and the schedule for completion of the remaining work.

C. A copy of the most recent updated Construction Schedule shall be posted in the Contractor's job office, and copies of all out-of-date schedules shall be kept at the job office at all times for perusal by the Owner.

1.3 SUBMITTAL SCHEDULE:

A. The Contractor shall also furnish a separate schedule along with the Construction Schedule specified above, showing the proposed dates for submittal of all samples, shop drawings, and product data.

B. Submit two copies of the submittal schedule to the Architect.

1.4 SCHEDULE OF VALUES:

A. Immediately upon being awarded the Contract, and before request for payment, prepare and submit to the Architect a Schedule of Values allocated to the various portions of the work. This Schedule of Values, unless objected to by the Architect, shall be used only as the basis for the Contractor's Applications for Payment.

B. The schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction. Follow the table of contents of this Project Manual as the format for listing component items. For each major line item list sub-values of major products or operations under the item, where applicable.

C. Each item shall include a directly proportional amount of the Contractors overhead and profit.

D. For items on which progress payments will be requested for stored materials, break down the value into (1) the cost of the materials, delivered and unloaded, with taxes paid, and (2) the total installed value.

E. The sum of all values listed in the schedule shall equal the total Contract sum.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. This section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples and other Submittals.

B. All submittals shall be submitted electronically, unless actual product materials require review for approval. The Contractor is responsible for submitting required product data, in portable document format (pdf), to the Architect for review.

C. Related Sections include the following:

1. Division 01 Section “Payments and Procedures” for submitting Application for Payment and Schedule of Values.
2. Division 01 Section “Project Management and Coordination” for submitting and distributing meeting minutes and coordination drawings.
3. Division 01 section “Construction Progress Documentation” for submitting schedules and reports, including Contractor’s Construction Schedule and Submittals Schedule.
4. Division 01 section “Photographic Documentation” for submitting construction photographs.
5. Division 01 section “Quality Requirements” for submitting test and inspection reports and mock-up requirements.
6. Division 01 section “Closeout Procedures” for submitting warranties.
7. Division 01 section “Project Record Documents” for submitting record drawings, record specifications and product data.
8. Division 02 through 33 sections for specific requirements for submittals in those sections.

1.2 SAMPLES:

A. Submit samples in accordance with the General Conditions as modified and supplemented herein. Furnish for review samples of the various materials, together with the finish thereon, as specified for and intended to be used on or in the work. Samples shall be sent to the office of the Architect, carriage prepaid.

B. Submit all samples to the Architect for review before purchasing, fabricating, applying, or installing such materials and finishes. The Architect will review and take action on samples within 10 working days of the Contractor's submission. All actions will be by the Architect in writing.

C. Submit all samples, other than field samples, in quadruplicate. A covering letter shall accompany the samples and shall list all items being transmitted, designating their particular usage and location in the project and shall be identified as to manufacturer, trade name, style, model, etc. One approved sample will be returned to the Contractor.

D. Approval of a sample shall not be taken in itself to change or modify any contract requirement. All materials, finishes, and workmanship in the completed building shall be equal in every respect to that of the approved sample.

E. Unless otherwise specified, samples shall be 8" x 10" in size and shall be limited in thickness to a minimum consistent with sample analysis. In lieu thereof, the actual full size item may be submitted.

F. Samples of value may be returned to the Contractor for use in the project after review, analysis, comparison and/or testing as may be required by the Architect, provided that the location is recorded and the samples bear temporary identification as samples.

G. Field samples shall be prepared at the site by the Contractor as specified in the various sections of these Specifications. Affected finished work shall not be commenced until the Architect has given written approval for the field samples.

1.3 SHOP DRAWINGS AND PRODUCT DATA:

A. Shop Drawings: The term "shop drawings" as used herein includes fabrication and installation, layout, and setting drawings; wiring and control diagrams; and other drawings. Submit shop drawings in accordance with the General Conditions as modified and supplemented herein.

1. The Contractor shall check and verify all field measurements and shall submit for review, with such promptness as to cause no delay in his own work or in that of any other contractor or subcontractor, all shop or setting drawings and schedules required for the work of the various trades. Shop drawings shall be prepared at the Contractor's expense and shall be sent to the Division of the Architect, carriage prepaid.

2. Drawings shall show all information required by the applicable Technical Section and shall be in sufficient detail as may be required to show that fabricated materials, equipment or systems, and the positions thereof conform to the Contract Documents.

3. Shop drawings shall establish the actual detail of all fabricated items, indicate proper relation of adjoining work, amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions. Shop drawings shall be drawn to scale and shall be completely dimensioned.

4. Composite Shop Drawings and Field Layouts: Prepare and submit composite Shop Drawings and field layouts as required to solve tight field conditions and when required to coordinate the Work of several trades. Include dimensioned plans, elevations, sections, and details and give complete information particularly as to kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, and structural interferences. Coordinate these composite Shop Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervising field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified for Shop Drawings.

5. Prepare shop drawings on sheet of same size as project drawings or on 8-1/2" x 11" suitable for reproduction.

6. Each shop drawing shall have a title block containing the following information.

   a. Name and location of the project.

   b. Name and address of the Contractor.

   c. Name and address of the subcontractor, manufacturer, supplier or distributor as applicable.

   d. Name and address of Owner.

   e. Date, scale of drawings and identification number.

   f. Space for the Contractor's review and approval stamp.

7. Submit three blue or black line prints and one reproducible transparency of each shop drawing.

B. Product Data: The term "product data" as used herein includes manufacturer's standard drawings, certificates of conformance, substantiating calculations and other data.

1. The data shall include all information required by the applicable technical section and shall be in sufficient detail to show that manufactured materials and equipment conform to the Contract Documents.

2. Catalog Cuts: Clearly mark each copy to indicate the product or model as well as all optional sizes, finishes or other features proposed for use. Delete all inapplicable data.

3. Submittal Preparation: Bind product data with sturdy labeled covers with an index listing the contents. Loose unbound submittals will be returned without review. Submit eight copies of all product data.

C. Architect's Action: The Architect will review the submittals with reasonable promptness and will affix the Architect's initials or signature as follows:

1. Submittals stamped "NO EXCEPTION TAKEN" require no resubmittal and fabrication and/or construction may proceed. The Architect will return to the Contractor, the stamped transparency of shop drawings and four stamped copies of brochures, schedules, materials lists, and other product data, except where required otherwise.

2. Submittals stamped "MAKE CORRECTIONS NOTED", require no resubmittal and fabrication and/or construction may proceed contingent upon all corrections being made as noted.

3. Submittals stamped "REJECTED" or "REVISE AND RESUBMIT", require the Contractor to resubmit them with reasonable promptness and no fabrication or construction may begin. The Architect will return to the Contractor; one stamped transparency and one marked copy of shop drawings and one marked copy and six unmarked copies, all stamped, of brochures, schedules, materials lists, and other product data.

4. Resubmittals. If first or subsequent submittal is stamped "REJECTED" or "REVISE AND RESUBMIT", corrective action shall be taken and resubmittal procedure shall be as same as for first submittal. The Contractor shall direct specific attention in writing on resubmitted shop drawing to revisions other than the correction requested by the Architect on previous submissions.

5. Distribution copies: The Contractor shall be responsible for obtaining required prints and for distribution to Subcontractors. All distribution copies shall be made from the transparency bearing the Architect's completed stamp.

D. The Architect will review and take action on such drawings and schedules only for conformance with the design concept of the project and compliance with information given in the contract documents. When so directed by the Architect, the Contractor shall make corrections required by the Architect.

E. The shop drawings, product data and supporting data shall be prepared by the Contractor or his suppliers and subcontractors, but shall be submitted as the instruments of the Contractor.

F. The Contractor shall check the drawings of his suppliers and subcontractors as well as his own drawings before submitting them. In particular, the Contractor shall ascertain that the drawings meet all requirements of the contract drawings and specifications and conform to the structural and space conditions. If such shop drawings show variations from contract documents, whether because of standard shop practice or other reasons, the Contractor shall clearly describe such variations including other changes required to correlate the work in his letter of transmittal.

G. Shop drawings submitted to the Architect for review shall be accompanied by a written statement signed by the Contractor, that the shop drawings have been checked by him and found to be in accordance with the contract drawings and specifications and that proper provision has been made to accommodate all abutting work. This statement may be in the form an approval stamp bearing the Contractor's signature.

H. Substantiation calculations, when specified, shall be prepared and signed by a California registered Civil or Structural Engineer, employed by the Contractor.

I. The Architect's review of shop drawings will be general only and shall not relieve the Contractor from responsibility for errors of any sort, for deviations from drawings or specifications, or for conflict with the work of others that may result from such deviations. Architect's review of a separate item does not indicate a review of an assembly in which the item functions.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes the preparation and submission of samples, shop drawings and product data as specified herein and in the various sections of these specifications. The requirements specified herein are in addition to any requirements for samples and shop drawings, product data materials lists, substitutions of materials, or other submittals specified elsewhere in these specifications. The Conditions of the Contract and the other sections of Division 1 apply to this section as fully as if repeated herein.

1.2 DEFINITIONS:

A. As used herein, the term "manufactured" applies to standard units usually mass-produced; and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements.

1.3 GENERAL SUBMITTAL PROCEDURES:

A. Scheduling: Submit samples, shop drawings, and product data in accordance with the schedule specified in Section 01 32 16. Extension of Contract time will not be granted because of the Contractor's failure to make timely submittals. Do not purchase materials or equipment or begin work covered by the required submittals until submittals have been reviewed and returned.

B. Transmittal: Accompany each submittal with a dated, signed and sequence numbered transmittal on forms prescribed by the Architect. Include all information required by this form including project identification, name and address of Contractor and of subcontractor or supplier, a list of items included in the submittal, and identification of drawing numbers, specification section and paragraph numbers to which the submittal pertains, and space for Contractors review and approval stamp.

C. Check of Returned Submittals: Check the submittals returned for correction and ascertain if the corrections result in extra cost above that included under the Contract Documents, and give written notice within five days if, in Contractor's opinion, such extra cost results from corrections. By failing to so notify or by starting any work covered by a submittal, Contractor waives all claims for extra costs resulting from required corrections.

1.4 SAMPLES:

A. Submit samples in accordance with Article 32 of the General Conditions as modified and supplemented herein. Furnish for review samples of the various materials, together with the finish thereon, as specified for and intended to be used on or in the work. Samples shall be sent to the office of the Architect, carriage prepaid.

B. Submit all samples to the Architect for review before purchasing, fabricating, applying, or installing such materials and finishes. The Architect will review and take action on samples within 10 working days of the Contractor's submission. All actions will be by the Architect in writing.

C. Submit all samples, other than field samples, in quadruplicate. A covering letter shall accompany the samples and shall list all items being transmitted, designating their particular usage and location in the project and shall be identified as to manufacturer, trade name, style, model, etc. One approved sample will be returned to the Contractor.

D. Approval of a sample shall not be taken in itself to change or modify any contract requirement. All materials, finishes, and workmanship in the completed building shall be equal in every respect to that of the approved sample.

E. Unless otherwise specified, samples shall be 8" x 10" in size and shall be limited in thickness to a minimum consistent with sample analysis. In lieu thereof, the actual full size item may be submitted.

F. Samples of value may be returned to the Contractor for use in the project after review, analysis, comparison and/or testing as may be required by the Architect, provided that the location is recorded and the samples bear temporary identification as samples.

G. Field samples shall be prepared at the site by the Contractor as specified in the various sections of these Specifications. Affected finished work shall not be commenced until the Architect has given written approval for the field samples.

1.5 SHOP DRAWINGS AND PRODUCT DATA:

A. Shop Drawings: The term "shop drawings" as used herein includes fabrication and installation, layout, and setting drawings; wiring and control diagrams; and other drawings. Submit shop drawings in accordance with Article 31 of the General Conditions as modified and supplemented herein.

1. The Contractor shall check and verify all field measurements and shall submit for review, with such promptness as to cause no delay in his own work or in that of any other contractor or subcontractor, all shop or setting drawings and schedules

required for the work of the various trades. Shop drawings shall be prepared at the Contractor's expense and shall be sent to the Division of the Architect, carriage prepaid.

2. Drawings shall show all information required by the applicable Technical Section and shall be in sufficient detail as may be required to show that fabricated materials, equipment or systems, and the positions thereof conform to the Contract Documents.

3. Shop drawings shall establish the actual detail of all fabricated items, indicate proper relation of adjoining work, amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions. Shop drawings shall be drawn to scale and shall be completely dimensioned.

4. Composite Shop Drawings and Field Layouts: Prepare and submit composite Shop Drawings and field layouts as required to solve tight field conditions and when required to coordinate the Work of several trades. Include dimensioned plans, elevations, sections, and details and give complete information particularly as to kinds and types of materials and equipment, size and location of sleeves, inserts, attachments, chases, openings, conduits, ducts, boxes, and structural interferences. Coordinate these composite Shop Drawings and field layouts in the field for proper relationship to work of applicable trades based on field conditions. Contractor shall have competent personnel readily available for coordinating, checking, and supervising field layouts. The procedures for submittals and resubmittals, and final distribution shall be as specified for Shop Drawings.

5. Prepare shop drawings on sheet of same size as project drawings or on 8-1/2" x 11" suitable for reproduction.

6. Each shop drawing shall have a title block containing the following information.

B. Name and location of the project.

C. Name and address of the Contractor.

D. Name and address of the subcontractor, manufacturer, supplier or distributor as applicable.

E. Name and address of Owner.

F. Date, scale of drawings and identification number.

G. Space for the Contractor's review and approval stamp.

1. Submit three blue or black line prints and one reproducible transparency of each shop drawing.

H. Product Data: The term "product data" as used herein includes manufacturer's standard drawings, certificates of conformance, substantiating calculations and other data.

1. The data shall include all information required by the applicable technical section and shall be in sufficient detail to show that manufactured materials and equipment conform to the Contract Documents.

2. Catalog Cuts: Clearly mark each copy to indicate the product or model as well as all optional sizes, finishes or other features proposed for use. Delete all inapplicable data.

3. Submittal Preparation: Bind product data with sturdy labeled covers with an index listing the contents. Loose unbound submittals will be returned without review. Submit eight copies of all product data.

I. Architect's Action: The Architect will review the submittals with reasonable promptness and will affix the Architect's initials or signature as follows:

1. Submittals stamped "NO EXCEPTION TAKEN" require no resubmittal and fabrication and/or construction may proceed. The Architect will return to the Contractor, the stamped transparency of shop drawings and four stamped copies of brochures, schedules, materials lists, and other product data, except where required otherwise.

2. Submittals stamped "MAKE CORRECTIONS NOTED", require no resubmittal and fabrication and/or construction may proceed contingent upon all corrections being made as noted.

3. Submittals stamped "REJECTED" or "REVISE AND RESUBMIT", require the Contractor to resubmit them with reasonable promptness and no fabrication or construction may begin. The Architect will return to the Contractor; one stamped transparency and one marked copy of shop drawings and one marked copy and six unmarked copies, all stamped, of brochures, schedules, materials lists, and other product data.

4. Resubmittals. If first or subsequent submittal is stamped "REJECTED" or "REVISE AND RESUBMIT", corrective action shall be taken and resubmittal procedure shall be as same as for first submittal. The Contractor shall direct specific attention in writing on resubmitted shop drawing to revisions other than the correction requested by the Architect on previous submissions.

5. Distribution copies: The Contractor shall be responsible for obtaining required prints and for distribution to Subcontractors. All distribution copies shall be made from the transparency bearing the Architect's completed stamp.

J. The Architect will review and take action on such drawings and schedules only for conformance with the design concept of the project and compliance with information given in the contract documents. When so directed by the Architect, the Contractor shall make corrections required by the Architect.

K. The shop drawings, product data and supporting data shall be prepared by the Contractor or his suppliers and subcontractors, but shall be submitted as the instruments of the Contractor.

L. The Contractor shall check the drawings of his suppliers and subcontractors as well as his own drawings before submitting them. In particular, the Contractor shall ascertain that the drawings meet all requirements of the contract drawings and specifications and conform to the structural and space conditions. If such shop drawings show variations from contract documents, whether because of standard shop practice or other reasons, the Contractor shall clearly describe such variations including other changes required to correlate the work in his letter of transmittal.

M. Shop drawings submitted to the Architect for review shall be accompanied by a written statement signed by the Contractor, that the shop drawings have been checked by him and found to be in accordance with the contract drawings and specifications and that proper provision has been made to accommodate all abutting work. This statement may be in the form an approval stamp bearing the Contractor's signature.

N. Substantiation calculations, when specified, shall be prepared and signed by a California registered Civil or Structural Engineer, employed by the Contractor.

O. The Architect's review of shop drawings will be general only and shall not relieve the Contractor from responsibility for errors of any sort, for deviations from drawings or specifications, or for conflict with the work of others that may result from such deviations. Architect's review of a separate item does not indicate a review of an assembly in which the item functions.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes testing laboratory services and inspections required during the course of construction, as specified herein and the approved DSA-103. The Conditions of the Contract and Division 1 apply to this section as fully as if repeated herein.

1.2 TESTING LABORATORY:

A. Testing and inspections will be performed by an independent testing laboratory selected and paid by the Owner and approved by the Division of the State Architect.

B. Testing and inspection services which are performed shall be in accordance with requirements of Title 24, Part 2, California Code of Regulations, Chapter 17A as specified herein. Testing and inspection services shall verify that work meets the requirements of the Contract Documents.

C. Test reports shall be signed by a Registered Civil Engineer licensed in the State of California.

1.3 PAYMENTS:

A. Costs of initial testing and inspection, except as specifically modified hereinafter or specified otherwise in technical sections, will be paid for by the Owner, providing such testing and inspection indicates compliance with Contract Documents. Initial tests and inspections are defined as the first tests and inspections as hereinafter specified.

B. In the event a test or inspection indicates failure of a material or procedure to meet requirements of Contract Documents, costs for retesting and reinspection will be paid by the Owner and backcharged to the Contractor.

C. Additional tests and inspections not herein specified but requested by Owner or Architect, will be paid for by Owner, unless results of such tests and inspections are found to be not in compliance with Contract Documents, in which case the Owner will pay all costs for initial testing as well as retesting and reinspection and backcharge the Contractor.

D. Costs for additional tests or inspections required because of change in materials being provided or change of source or supply will be paid by Owner and backcharged to the Contractor.

E. Costs for work which is required to correct deficiencies shall be borne by the Contractor.

F. Cost of testing which is required solely for the convenience of Contractor in his scheduling and performance of work shall be borne by the Contractor.

G. Testing Laboratory will separate and identify on the invoices, the costs covering all testing and inspections which are to be backcharged to the Contractor as specified above.

H. Testing Laboratory will furnish to Owner a cost estimate breakdown covering initial tests and inspections required by Contract Documents. Estimate will include number of tests, man-hours required for tests, field and plant inspections, travel time, and costs.

1.4 TEST AND INSPECTION REPORTS:

A. Testing laboratory will certify in writing that all work specified or required to be tested and inspected conforms to or does not conform to drawings, specifications and applicable building codes.

B. The Testing Laboratory will upload to the DSA Box all test and inspection reports as required.

1.5 REPORTING TEST FAILURES:

A. Immediately upon Testing Laboratory determination of a test failure, the Laboratory will telephone the results of test to Architect. On the same day, Laboratory will send written test results to those named on above distribution list.

1.6 AVAILABILITY OF SAMPLES:

A. Contractor shall make materials required for testing available to Laboratory and assist in acquiring these materials as directed by the Owner's inspector. The samples shall be taken under the immediate direction and supervision of the Testing Laboratory.

B. If work which is required to be tested or inspected is covered up without prior notice or approval, such work, may be uncovered at the discretion of Architect at no additional cost to the Owner. Refer to paragraph 1.3 payments.

C. Unless otherwise specified, Contractor shall notify Testing Laboratory a minimum of ten (10) working days in advance of all required tests, and a minimum of two (2) working days in advance of all required inspections. Extra laboratory expenses resulting from a failure to notify the Laboratory will be paid for by the Owner and backcharged to the Contractor.

D. Contractor shall give sufficient advance notice to Testing Laboratory in the event of cancellation or time extension of a scheduled test or inspection. Charges due to insufficient advance notice of cancellations or time extension will be paid for by the Owner and backcharged to the Contractor.

1.7 REMOVAL OF MATERIALS:

A. Unless otherwise directed, materials not conforming to the requirements of Contract Documents shall be promptly removed from the job site.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TESTS AND INSPECTIONS:

A. Tests and inspections as required by the California Code of Regulations, Title 24, Part 2, for the following will be required, as applicable:

B. Soils and Foundations (CBC Chapter 18A)

1. Earth Fill Compaction: 1803A.5.8

C. Concrete (CBC Chapter 19A)

1. Materials:
Portland Cement Tests: 1903A.1, 1910A.1
Concrete Aggregates: 1903A.5, 1908A.3
Reinforcing Bars: 1903A-8, 1908A.4, 1910A.2
Batch Plant Inspection: 1705A.3.3

2. Concrete Quality:
Proportions of Concrete: 1903A.6, 1908A.2
Mixing and Placing: ACI 318
Strength Tests of Concrete: 1905A.1.15, 1908A.10
Composite Construction Cores: 1909.2.6

3. Concrete Inspection:
Job Site Inspection: 1705A.3.5
Batch Plant or Weighmaster Inspection: 1705A.3.3
Reinforcing Bar Welding Inspection: ACI 318, 1903A.8
Post-Installed Anchors: 1910A.5

D. Masonry (CBC Chapter 21A)

1. Not used.

E. Structural Steel (CBC Chapter 22A)

1. Not used.

F. Wood (CBC Chapter 23)

1. Not used.

3.2 EARTHWORK:

A. The Owner's Soils Engineer will provide continuous inspection of fill and will field test fill and earth backfill as placed and compacted and inspect excavations and subgrade before concrete is placed and provide periodic inspection of open excavations, embankments, and other cuts or vertical surfaces of earth. The Soils Engineer will submit a report indicating that he has observed and tested excavations and fills and that in his opinion the work is in accordance with the project specifications and Geotechnical Report.

B. Contractor shall remove unsatisfactory material, re-roll, adjust moisture, place new material, or in the case of excavations, provide proper protective measures, perform other operation necessary, as directed by the Architect whose decisions and directions will be considered final.

C. Soils Engineer may require deepening of footings and so order such deepening in accordance with Section 31 11 13.

D. Soils Test and Inspection Procedure:

1. Allow sufficient time for testing, and evaluation of results before material is needed. The Soils Engineer shall be sole and final judge of suitability of all materials.

2. Laboratory compaction tests to be used will be in accordance with ASTM D 1557.

3. Field density tests will be made in accordance with ASTM D 1556.

4. Number of tests will be determined by Soils Engineer. Materials in question may not be used pending test results.

5. Excavation and embankment inspection procedure. Soils Engineer will determine bearing values.

3.3 TESTING OF CONCRETE:

A. Concrete Mix Design:

1. The Owner will pay for the sampling of aggregate and preparation of mix design one time for each strength and/or aggregate size specified. Testing cost for additional mix designs will be paid for by the Owner and backcharged to the Contractor. Continuous plant inspection and all tests of materials will be paid by the Owner, but the Contractor will be backcharged for all tests performed on materials that do not meet specification requirements.

2. Test concrete aggregates for mix design only.

3. Deliver samples of approved aggregate to job for comparison with material delivered, if job-mixed concrete is used.

4. Test suitability of aggregates in accordance with ASTM C-88 if material is under suspicion and if so directed by Architect or Division of the State Architect.

B. If compressive test of core specimens fail to show compressive strength specified, remove and replace concrete or adequately strengthen in a manner acceptable to Architect and Division of the State Architect.

C. Certification shall be made before Notary Public that tests, whose results shall be shown, were made in accordance with provisions of Rules and Regulations of Division of the State Architect.

D. Make all tests, take samples, and prepare samples in accordance with the latest standards adopted by American Society for Testing and Materials, referred to as ASTM.

E. Concrete mixed at certified automatic concrete batch plants shall have quality control as follows:

1. Laboratory designed mixes using adequate cement factors.

2. The testing laboratory shall perform continuous batch plant inspection.

F. Concrete mixed at non-certified plants shall have quality control as follows:

1. Laboratory designed mixes using adequate cement factors.

2. Continuous batch plant inspection.

3. Measure all water, including wash water, so total on truck does not exceed 95% max. allowed in mix design.

4. Legible, certified weighmaster's certificates shall be provided the Inspector for all structural and non-structural concrete.

5. At end of job, furnish affidavit to Division of State Architect on form provided, certifying that all concrete furnished conformed in every particular to requirements of California Code of Regulations, Title 24, Parts 1 and 2.

G. Owner's Inspector shall do the following:

1. Inspect placing of reinforcing steel and concrete at job.

2. Obtain load ticket and identify mix before accepting load. Keep daily record of pour, identifying each truck load, time of receipt, and location of concrete in structure. Keep record until completion of structure and have available for inspection by Division of the State Architect if testing laboratory is making

inspection. Forward two copies of Public Weighmaster's record to the Division of the State Architect immediately.

3. During progress of work, take reasonable number of test cylinders as directed by Architect, but at least one set of cylinders for each 100 cu. yds. or fractional part thereof for each class of concrete and at least one set of each day's pour. Test cylinders need not be made for concrete used in walks.

4. One set of cylinders shall consist of three samples all taken from same batch, one to be tested at age of 10-days and one at 28-days.

5. Make and store cylinders according to "Making and Curing Concrete Compression and Flexural Strength Test Specimens in the Field," ASTM C31.

6. Deliver cylinders to laboratory or store cylinders in a suitable protected environment for pick-up by laboratory personnel.

7. Make slump test of wet concrete according to test for slump of Portland cement concrete, ASTM C143, at least at the same frequency that the cylinders are taken.

3.4 REINFORCING STEEL:

A. Tests:

1. Tests shall be performed prior to the delivery of steel to job site. Steel not meeting specifications shall not be shipped to the job.

2. Testing procedure shall conform to ASTM A 615.

3. Sample at the place of distribution, prior to shipment. Make one tensile test and one bending test from samples out of 10 tons, or fraction thereof, of each size and kind of reinforcing steel, where taken from bundles as delivered from the mill and properly identified as to heat number. Mill analysis shall accompany report. Where identification number cannot be ascertained, or where random samples are taken, make one series of tests from each 2-1/2 tons, or fraction thereof, of each size and kind of reinforcing steel. Samples shall include not fewer than two pieces, each 18 inches long, of each size and kind of reinforcing steel No. 5 and larger. Inspection of welding of reinforcing steel shall be done in the presence of a specially qualified laboratory inspector.

B. Owner's Inspector will inspect all reinforcement for concrete work for size, dimensions, locations and proper placement.

3.5 STRUCTURAL STEEL:

A. Not used.

3.6 MASONRY:

A. Not used.

3.7 ROOFING:

A. Not used.

3.8 GLUED LAMINATED LUMBER:

A. Not used.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. Furnish and install all required temporary facilities as shown or specified herein plus such facilities as required for proper performance of the Contract. All such temporary facilities shall be located where directed and maintained in a safe and sanitary condition at all times until completion of the Contract. The Conditions of the Contract and the other sections of Division 1 apply to this section as fully as if repeated herein.

1.2 REQUIREMENTS OF REGULATORY AGENCIES:

A. Comply with governing regulations and utility company regulations and recommendations.

B. Comply with pollutions and environmental protection regulations for use of water and energy, for discharge of wastes and storm drainage from project site, and for control of dust, air pollution and noise.

C. Temporary work shall conform to all the requirements of State, County, and local authorities and underwriters which pertain to operation, health, safety, and fire hazard. Contractor shall furnish and install all items necessary for conformity with such requirements, whether or not called for under the separate divisions of these specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TEMPORARY SANITARY FACILITIES:

A. Provide temporary sanitary facilities in accordance with Article 44 of the General Conditions.

3.2 TEMPORARY ELECTRIC FACILITIES:

A. Provide and maintain during the progress of the work all electrical lighting and power requirements to facilitate the work of all trades and services connected with the work. Lighting levels shall be adequate to permit workmen to properly perform their work, to permit detection of flaws in finishes, and to allow for reading of specifications.

B. Provide temporary electricity in accordance with Article 43 of the General Conditions.

3.3 TEMPORARY WATER:

A. Provide for all water required for construction purposes and for testing, disinfection and flushing of the water supply system. Furnish and install piping or hose to carry water to every point where needed on the project. All water used on the project shall be potable water. Closest availability of water shall be determined by the Contractor.

B. Provide temporary water in accordance with Article 43 of the General Conditions.

3.4 TEMPORARY HEATING AND VENTILATING:

A. Provide all temporary heat as necessary for the drying out of the building, the proper installation of all work and materials, and the protection of all work and materials against injury from dampness and cold. The permanent building heating system shall not be used for any temporary heating unless first approved by the Architect. If approved for use, filters shall be replaced before final acceptance of the work.

B. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

C. Provide temporary gas, if required, in accordance with Article 43 of the General Conditions.

3.5 CONSTRUCTION EQUIPMENT:

A. Contractor shall erect, equip, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, rules and regulations of authority having jurisdiction.

B. Contractor shall provide, maintain and remove upon completion of the work all temporary rigging, scaffolding, hoisting equipment, rubbish chutes, ramps, stairs, runways, platforms, ladders, railings, and other temporary work as required for all work hereunder.

3.6 FENCES AND BARRICADES:

A. Prior to start of work at the project site, install a 6 foot high chain link fence or solid plywood and wood frame enclosure fence with locked entrance gates. Locate the fence to enclose substantially the entire project site, or that portion the Contractor establishes as required to encompass the entire project construction operation.

B. Construct and maintain planking, barricades, lights, and warning signs as required by local authorities and State safety ordinances, and as necessary for the protection of the public. Provide walks around obstructions made in a public place for carrying on the

work covered in this contract. Leave protection in place and maintain in good condition until removal is authorized.

C. Provide barriers to protect trees and plants on the site and immediately adjacent to the site which are designated to remain. Construct temporary barriers to a height of 6 feet around each tree or plant or each group of trees or plants.

3.7 STORAGE:

A. Operations of the Contractor, including storage of materials, shall be confined to areas approved. Contractor shall be liable for damage caused by him during such use of property of the Owner or other parties. Contractor shall save the Owner, its officers and agents, and the Architect and his employees free and harmless from liability of any nature or kind arising from any use, trespass, or damage occasioned by his operations on premises of third persons. Storage facilities shall provide protection of products from excessive cold, heat, moisture, humidity or physical abuse as specified in the respective sections for the products stored.

3.8 TEMPORARY JOB OFFICE:

A. Contractor shall provide and maintain, in good condition, on the site a temporary job office of suitable size for himself and for project meetings. Job office shall be weatherproof and secure and shall be provided with adequate lighting, heat, and ventilation. The meeting area shall be furnished with a conference table and sufficient chairs for all participants. Provide plan rack and files for storage of project record documents.

3.9 TEMPORARY OFFICE FOR OWNERS INSPECTOR:

A. Provide temporary office for Owner's inspector in accordance with Article 41 of the General Conditions.

3.10 PROJECT SIGN:

A. Provide one painted sign not less than 96 square feet in area with painted graphic content to include project title and the names and titles of the Owner, Architect, Professional Consultants, Prime Contractor, and Major Subcontractors involved. Graphic design, style of lettering and colors shall be as selected by the Architect. No other advertising will be permitted at the project site.

B. Paint all exposed surfaces of sign including supports and framing with one coat of primer and one coat of exterior paint. Painting of graphics shall be by a professional sign painter.

C. Install the sign on the site at a location of high public visibility as approved.

3.11 REMOVAL AT COMPLETION:

A. Upon completion of the work, or prior thereto, when so directed by the Architect, Contractor shall remove all temporary facilities, structures and installation from the Owner's property. Similarly, return exterior areas utilized for temporary facilities to substantially their original state, or when called for on the drawings, complete the areas as shown or noted. Sanitary facilities shall be properly disinfected and evidence of same removed from the site.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Layout of the work

2. Verification of work

a. OWNER reserves the right to verify any work that INSPECTOR deems necessary.

b. Other sections that require Surveyor to verify or measure installed work and related item. Surveyor shall perform such verifications or measurements at CONTRACTOR'S expense. CONTRACTOR shall furnish a certification, signed by both Surveyor and CONTRACTOR, to INSPECTOR.

B. Related Requirements:

1. Section 01 11 00 - Summary of Work.

2. Section 01 31 13 - Project Coordination.

3. Section 01 32 13 - Construction Schedule.

4. Section 01 33 00 - Submittal Procedures.

5. Section 01 77 00 - Contract Closeout.

1.02 SURVEY CONTROLS

A. Vertical Control shall use same benchmark used in the preparation of topographic survey. When Work consists of both on-site and off-site and benchmarks differ, an equation shall be indicated on Drawings.

B. Horizontal control for existing structures shall be the property line.

1.03 LAYOUT OF WORK

A. All work related to staking shall be by a Land Surveyor, or Civil engineer, registered with the State of California to perform land surveying and employed by CONTRACTOR.

B. Before commencement of Work, surveyor shall locate all reference points and benchmarks to be used for vertical and horizontal control.

C. Surveyor shall lay out entire Work, set grades, lines, levels, control points, elevations, grids and positions.

1.04 RECORD DOCUMENTS

A. Maintain complete and accurate log of all control and survey documentation as work progresses.

B. Record, by coordinates, all utilities onsite with top of pipe elevations, at major grade and alignment changes, rim, grate or top of curb and flow line elevations of all drainage structures and sewer manholes.

C. Indicate reference and control points on record drawings. The basis of elevation shall be one of the established benchmarks.

D. Upon Substantial Completion, obtain and pay for reproducible plans. Deliver plans to OAR. Clearly indicate all differences between original drawings and completed work within specified tolerances.

1.05 SUBMITTALS

A. Surveyor: Shall submit name, address and license number to OWNER, including any changes as they occur.

B. Field notes: Upon request by OAR, submit copies of cut sheets, coordinate plots, data collector printouts, marked-up construction staking plans and other documentation as available to verify accuracy of field engineering work during and at completion of project. Submittals to OWNER must be signed and sealed by Surveyor and counter-signed by CONTRACTOR

C. Statement of Compliance: CONTRACTOR shall submit a statement of certification signed and sealed by Surveyor, counter-signed by CONTRACTOR indicating compliance with grades and alignment of construction plans at rough grade, fine grade and top of rock stages. INSPECTOR shall approve survey submittals for each stage of construction prior to proceeding with work

D. Upon Substantial Completion, CONTRACTOR shall obtain and pay for reproducible survey drawings (or “As Built”).

E. Completed record drawings shall be signed and certified as correct and within specified tolerances by licensed surveyor. Originals and two sets of blueprints shall be submitted to OWNER.

PART 2-PRODUCTS – NOT USED

PART 3-EXECUTION

3.01 PREPARATION

A. Pre-mark areas of excavation in accordance with the requirements of “Dig-Alert”. Request locators 2 days before commencing excavation.

B. Before commencing Work, establish all horizontal and vertical reference points used in Contract Documents according to existing field conditions.

C. Preserve established reference lines and benchmarks.

D. Differentiate school and city datum as applicable.

E. Relocate bench marks that may interfere with Work.

F. Reset and re-establish reference marks damaged or lost during construction.

3.02 SURVEY REQUIREMENTS GENERAL

A. Establish a minimum of two permanent horizontal and vertical control points on Project site, remote from construction area, referenced to data established by control points.

B. Indicate reference points, relative to benchmark elevation, on record drawings.

C. Provide grade stakes and elevations to construct over excavation and re-compaction, rough and final grades, paved areas, curbs, gutters, sidewalks, building pads, landscaped areas, and other areas as required.

D. Calculate and layout proposed finished elevations and intermediate controls as required to provide smooth transitions between spot elevations indicated on Drawings.

E. Provide stakes and elevations for grading, fill, and topsoil placement.

F. Provide adequate horizontal and vertical control to locate utility lines, including but not limited to, storm, sewers, water mains, gas, electric and signal and provide vertical control in proportion to the slope of the line as required for accurate construction. Dry utilities will be based upon adequate horizontal and vertical control layout. Prior to trench closure, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished concrete or asphaltic concrete (AC) surfaces at key locations such as beginning-of-curve (BC), end-of-curve (EC), grade breaks, corners or angle points in sufficient number to demonstrate the Work complies with the intent of the Contract Documents.

G. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.

H. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within the building pad perimeter adequate to control both over excavation and re-compaction and the final sub-grade elevation of the building pad.

I. Submit a certification signed by the surveyor confirming the elevations and locations of improvements are in conformance with the Contract Documents. The statement shall include survey notes for the finish floor and building pad, showing the actual measured elevations on the completed sub-grade, recorded to the nearest 0.01 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.

J. Establish a minimum of two permanent horizontal and vertical control points on Project site, remote from building area, referenced to data established by survey control points.

K. Mark boundaries for rights-of-way dedications and easements for utilities prior to making location of buildings and utilities.

L. Layout all lines, elevations and measurements needed for construction or installation of buildings, grading, paving utilities according to the following:

1. Identify site boundary, property lines.

2. Provide working benchmarks.

3. Set stakes for Bottom of Excavated Plane (B.E.P.).

4. Set gridlines, radii, working points etcetera, for foundation.

5. Set and verify building pad elevations.

6. Set finish floor elevations.

7. Stake location and elevations for exterior ramps and stairs.

8. Set gridlines, radii, working points, etcetera, for all floors of multi-story buildings.

9. Set storm drain and sanitary sewer inverts and other utilities as needed at 5-foot off-set from building lines.

10. For new facilities, establish permanent onsite Benchmark with 2-inch diameter brass disk. Location of Benchmark to be determined by OWNER.

3.03 SURVEY REQUIREMENTS FOR GRADING

A. Provide grade stakes and elevations as follows:

1. Removal limits (cut lines).

2. Rough grade staking: 60-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.

3. Fine grade for top of dirt: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.

4. Verify fine grade for top of rock: 30-foot maximum grid plus additional stakes at grade changes and pertinent locations. Flag all grade changes including ridges, flow lines and grade breaks.

5. Finish grade marks on all buildings, structures and at pertinent locations

6. Finish grades and offsets for all concrete work, utilities, landscape areas, and structures.

7. Provide controls and baselines for playground striping.

8. Offsite improvements: set grades and provide grade sheets as required by local authorities.

B. Provide a minimum of two permanent horizontal and vertical control points onsite, remote from building area, referenced to data established by survey control points.

3.04 SURVEY REQUIREMENTS FOR UTILITIES

A. Locate "wet" utility lines and provide vertical control proportionate to slope of line as required for accurate construction. "Dry" utilities shall have adequate horizontal and vertical control layout supplied by others.

B. Prior to back-filling trench, survey and record invert and flow line elevations. Survey and record top of curb and flow line elevations on finished surfaces at key locations (such as Back of Curbs, grade breaks, corners or angle points) in sufficient number to demonstrate Work complies with intent of Contract Documents.

C. Provide horizontal and vertical control for batter boards for drainage, utility, and other on-site structures as required.

1. Set grades for vaults one inch higher than adjacent surrounding design grades, unless noted otherwise.

D. Leave all trenches open until required inspection is completed.

3.05 SURVEY REQUIREMENTS FOR STRUCTURES

A. Furnish building corner offsets as required to adequately locate building pads. Provide cut and fill stakes within building pad perimeter adequate to control both over excavation and re-compaction and final sub-grade elevation of building pad.

B. Submit a certification signed by surveyor confirming elevations and locations of improvements are in conformance with Contract Documents. Statement shall include survey notes for finish floor and building pad, showing actual measured elevations on completed sub-grade, recorded to nearest 0.01 of a foot. Building pad tolerance will be plus or minus 0.1 of a foot.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes the furnishing and installing of cutting and patching as necessitated by the work described in the drawings and the sections of this specification. The General Conditions and Division 1 apply to this section as fully as if repeated herein.

1.2 SUBMITTALS:

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of the project
2. Integrity of weather-exposed or moisture-resistant element.
3. Efficiency, maintenance or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.

B. Include in request:

1. Identification of project.
2. Location and description of affected work.
3. Necessity for cutting or alteration.
4. Alternatives to cutting and patching.
5. Description of proposed work and products to be used.
6. Effect on work of Owner or separate Contractor.
7. Written permission of affected Contractor

PART 2 - PRODUCTS

2.1 MATERIALS

A. Primary Products: Those required for original installation, unless specifically approved otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Inspect existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. Confirm status and current warranties and guarantees.

B. After uncovering existing work, inspect conditions affecting performance of work.

1. Prior to cutting, boring or drilling through new or existing structural members or elements including reinforcing bars, Contractor shall prepare detailed drawings for review by the Architect and approved by the DSA.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION:

A. Provide temporary support to ensure structural integrity of the work. Provide devices and methods to protect other portions of the project from damage.

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

C. Maintain excavations free of water.

D. Where the work requires sandblasting or existing surfaces in order to receive new materials secured by cementitious, adhesive or chemical bond, completely remove existing finishes, stains, oil, grease, bitumen, mastic and adhesives or other substances deleterious to the new bonding and/or fastening of the new work. Utilize wet sandblasting for interior surfaces and for exterior surfaces where to prevent objectionable production of dust.

3.3 PERFORMANCE:

A. General: The word “cutting” as used in the Contract Documents includes, but is not limited to, cutting, drilling, chopping, and other similar operations and the word “patching” includes, but is not limited to, patching, rebuilding, reinforcing, repairing, refurbishing, restoring, replacing or other similar operations. Unless indicated otherwise on the drawings, perform all cutting and patching as indicated below.

B. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay. Carefully remove existing work to be salvaged and/or reinstalled. Protect and store for reuse in the work. Verify compatibility and suitability of existing substrates before starting the work.

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

1. Where cutting, use hand or small power tools designed for sawing or grinding, not hammering or chopping. Cut holes and slots as small as possible, neatly to size required and 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 a diamond–core drill. Saw cut reinforcing bars and paint ends with bituminous paint except where bonded into concrete or masonry.

4. Concrete site paving: Cut and remove entire panels to nearest joint.

5. Woodwork: Cut and or remove to a panel or joint line.

6. Sheet Metal: Remove back to a panel or joint line. Secure loose or unfastened ends or edges and seal watertight.

7. Glass: Remove cracked, broken or damaged glass and clean rabbets and stops of setting materials.

8. Plaster: Cut back to sound plaster on straight line, and back bevel edges or remaining plaster. Trim existing lath and prepare for new lath.

9. Gypsum Wallboard: Cut back on straight line to undamaged surfaces with at least two opposite cut edges centered on supports.

10. Acoustical Ceilings: Remove hanger wires and related appurtenances where ceilings are not scheduled to be installed.

11. Tile: Cut back to sound tile and backing on joint lines.

12. Flooring: Completely remove flooring and clean backing of prior adhesive. Carefully remove wood flooring for patching and repairing of existing wood flooring shown to remain.

D. Patching: Patch with durable seams that are as invisible as possible. Comply with required tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation. Verify conditions of existing substrates prior to executing work.

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

3. Concrete: Maintain cut edges in a moist condition for twenty-four hours prior to the placement of new concrete. In lieu of this, an epoxy adhesive may be provided. Finish placed concrete to match existing unless noted otherwise. Concrete shall have a compressive strength of 3,000 psi where installed to repair and/or match existing improvements, unless noted otherwise.

4. Trench backfill and compaction is required prior to patching concrete and asphalt site paving. All trenches shall be backfilled above utilities and/or encasement to the bottom of pavement section or within 12" of finished grade with damp sand, placed in 6-inch layers and compacted to minimum relative density of 90 percent. Attain compaction by any method (other than water jetting) that will obtain the minimum specified relative densities, without damaging the buried lines.

    a. If trenching occurs in landscaped area, remainder of backfill shall be native soils having no stones or aggregate greater than 3 inches diameter. Native soils in landscape areas shall be compacted to minimum relative density 80 percent.

5. Meal Fabrications: Items to remain exposed shall have their edges cut and ground smooth and rounded.

6. Sheet Metal: Replace removed or damaged sheet metal items as required for new work.

7. Glass: Install matching glass and re-seal exterior window assemblies.

8. Lath and Plaster: Install new lath materials to match existing and fasten to supports at 6 inch on center. Provide a 6 inch lap where new lath adjoins to existing lath. Fasten new lath as required for new work. Restore paper backing as required to provide moisture protection. Apply a bonding agent on cut edges of existing plaster. Apply three-coat plaster of the type, thickness, finish and color to match existing.

9. Gypsum Wallboard: Fasten cut edges of wallboard. Install patches with at least two opposite edges centered on supports and secure at 6 inches on center. Tape and finish joints and fastener heads. Patching shall be non-apparent when painted and/or finished.

10. Acoustical Ceilings: Comply with the requirements for new work specified in related sections of the contract documents.

11. Resilient Flooring: Completely remove flooring and prepare substrate for new material.

12. Ceramic Tile: Install new ceramic tile to match adjacent installation. Use full tiles with grout joints of same size. Color of tile shall approximate that of adjacent surfaces. Where color does not match, obtain direction from the Architect prior to proceeding.

13. Paint: All patched areas where adjacent surfaces are painted, shall be prepared and painted to match per Section 09 90 00. Entire surfaces where patches occur shall be painted. Painting shall occur from joint-to-joint, or corner-to-corner.

E. Fit work air tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

F. At penetrations of fire-rated walls, partitions, ceiling or floor construction, completely seal voids with fire-rated devices or materials in accordance with Section 07 84 00.

G. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For and assembly, refinish entire unit.

3.4 SLEEVES AND HANGERS:

A. Provide conduit, outlets, piping sleeves, boxes, inserts or other materials, or equipment necessary to be built into the work.

B. Upon subsequent installation of sleeves or other material, install fill materials to completely seal voids with fire-rated devices or moisture-resistant material, to full thickness of the penetrated element. Necessary expenditures incurred for boxing out or filling shall be without extra cost to the Owner.

3.5 QUALITY CONTROL:

A. Do not backfill underground utility lines until:

1. The "As-Built" elevations and dimensions are recorded on "Record Drawings" and verified.

2. The utility lines have been inspected and satisfactorily tested.

B. Backfill compaction tests will be performed by the Owner's Geotechnical Engineer, in accordance with Section 01 45 00, at locations and depths as directed. If the required minimum relative compaction density has not been obtained, excavate and re-backfill the deficient portion of the trench.

3.6 CLEANUP:

A. Pick up and transport unsuitable and deleterious material to an off-site legal disposal area. Place acceptable excess earth in on-site areas as compacted fill.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. This section specifies diversion of Construction and Demolition (C&D) waste from the landfill.

1. Waste Management Goals: a minimum of 65% of the total project waste should be diverted from landfill, in order of preference 1) weight, 2) volume, whichever is most feasible to measure.

2. Provide contract documents, including a waste management plan, to show evidence of recycling, and reuse of recovered materials.

3. Inform Owner and architect where Construction and Demolition (C&D) Waste Management requirements could detrimentally impact C&D schedule.

4. Provide separate itemization of cost related to C&D Waste Management.

5. Effect optimum management of solid wastes via a materials management hierarchy.

6. The materials management hierarchy shall be: reduce, reuse, and recycle.

7. Prevent environmental pollution and damage.

B. Related Documents:

1. None.

1.2 DEFINITIONS:

A. Inert Fill – A permitted facility that accepts inert waste such as asphalt and concrete exclusively.

B. Class III Landfill - A landfill that accepts non-hazardous waste such as household, commercial, and industrial waste, including construction, remodeling, repair, and demolition operations.

C. Construction and Demolition Waste – Including solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting form construction, remodeling, repair, and demolition operations.

1. Rubbish: Including both combustible and noncombustible wastes, such as paper, boxes, glass, crockery, metal and lumber scrap, tin cans, and bones.

2. Debris: Including both combustible and noncombustible wastes, such as leaves and tree trimmings that result from construction or maintenance and repair work.

D. Deconstruction - The process of removing existing building materials from renovation and demolition projects for the purposes of reuse, and recycling, in a efficient and safe manner possible.

E. Divert – Using material for any purpose other than disposal in a landfill.

F. Waste Materials – Large and small pieces of listed materials which are excess to contract requirements and generally include materials to be recycled and/or recovered from existing construction and items of trimmings, cuttings, and damaged goods resulting from new installations, which can be effectively used in the Work.

G. Reuse – Using a material or product that is recovered from construction, renovation, or demolition activities.

H. Recycling – The process of collecting and preparing recyclable materials in their original form or in manufacturing processes that do not cause the destruction/contamination of recyclable materials in a manner that precludes further use.

I. Recovery – Any process that reclaims materials, substances, energy, or other products contained within or derived from waste on-site. It includes waste-to-energy, composting, and other processes.

J. Sources Separation – Sorting the recovered materials into specific material types with no or a minimum amount of contamination on site.

K. Time-Based Separation – Collecting waste during each phase of construction or deconstruction which results in primarily one major type of recovered material. The material is removed before it becomes mixed with the material from the next phase of construction.

L. Commingled or Off-site Separation – Collecting all material types into a single bin or mixed collection system and separating the waste materials into recyclable material types in an off-site facility.

1.3 SUBMITTALS:

A. C&D Waste Management Plan: Before the start of demolition, submit a C&D waste management plan to the Owner and the architect for approval and it shall include the following:

1. Indicate how the Contractor proposes to recover at least 65% of the C&D wastes for reuse and recycling.

2. The C&D Waste Management Plan should coordinate the recovery effort with the construction, and renovation / demolition schedule.

3. Indicate compliance with section 1.5 QUALITY ASSURANCE.

4. Include a list of reuse facilities, recycling facilities and processing facilities that will be receiving the recovered materials (including take back by Owner or on-site auctions.)

5. If some of the materials will be donated or sold on-site auctions, describe the process and identify the organizations that may receive the materials.

6. Identify materials that are not recyclable or not recovered which will be disposed of in a landfill (or other means acceptable by the State of California and local ordinance and regulations) and explain why the materials are not recovered.

7. List the permitted landfill, or other permitted disposal facilities, that will be accepting the disposed waste materials.

8. Indicate instances or situations where compliance with the requirements of this specification do not apply or do not appear to be possible.

9. Identify each type of waste material to be reused or recycled and estimate the amount, by weight.

10. Provide estimate of time requirements for demolition and for the removal of valuable reusable items and materials.

11. Prepare building engineering survey and worker safety plan, assessment of building condition and all potential hazards.

12. Provide a C&D site management plan.

13. Provide final accounting of disposition of recovered materials upon completion of project for final payments.

B. C&D Waste Management Summary Reports: Provide the C&D Quality Manager with delivery receipts for the recovered materials and waste materials sent to the permitted recycling facilities, processing facilities, or landfill with the following information:

1. Name of firm accepting the recovered materials or waste materials

2. Specify type of facility (e.g. retail facility, recycler, processor, Class III landfill, MRF)

3. Location of the facility

4. Type of materials

5. Net weights (or volume) of each type of material

6. Date of delivery

7. Value of the materials or tipping fee paid

C. Application for Progress Payment: The following should be submitted with the Application for Progress Payment:

1. C&D Waste Management Summary Report as stated above in section 1.3 SUBMITTALS, B. C&D Waste Management Summary Reports, with the C&D Quality Manager approval on each of the report.

2. Prepare 3-ring binder with rebate information and product documentation as required for Owner to qualify for rebate program; submit binder with final closeout submittals.

3. Payment could be withheld until diversion goals are met. The Contractor is ultimately responsible for implementation of the C&D Waste Management Plan and achieving the diversion goals.

1.4 RECYCLING PROGRAM:

A. The recycling program could utilize one or a combination of any of the following common waste diversion strategies:

1. Sources Separation

2. Time-Based Separation

3. Commingled or Off-site Separation

4. Back haul of packaging

5. On-site sales auctions and removal.

B. Waste Material management hierarchy can be viewed as: reuse on-site, recycle on-site, reuse off-site, and recycle off-site.

C. Other innovative approaches to achieve the minimum diversion rate are encouraged and should be specified and described in the C&D Waste Management Plan.

D. Minimum diversion rate may be achieved by recovering and recycling the following materials:

1. Asphalt

2. Concrete and concrete blocks

3. Brick, tile and masonry materials

4. Ferrous metal

5. Non-ferrous metal, copper, aluminum

6. Wood

7. Trees and shrubs

8. Soil

9. Electric fixtures, motors, switch gear and other similar equipment

10. Others as appropriate

1.5 QUALITY ASSURANCE:

A. Regulatory Requirements: Comply with applicable requirements of the State of California, local ordinances and regulations concerning management of construction, clearing, and inert materials.

1. CCR Title 24 Part 11, California Green Building Standards

B. Disposal Site, Recyclers and Waste Materials Processors: Use only facilities properly permitted by the State of California, and/or by local authorities where applicable.

C. Pre-C&D Waste Management Meeting: Prior to beginning work at the site, schedule and conduct a meeting to review the C&D Waste Management Plan and discuss procedures, schedules, coordination and specific requirements for waste materials recycling and disposal. Discuss coordination and interface between Contractor, sub-contractors, architect, engineers, project manager, Owner, and other C&D activities. Identify and resolve problems of compliance with requirements. Record minutes of the meeting, identifying conclusions reached and matters requiring further resolution. Maintain waste management as an agenda item at future construction meetings.

1. Attendees: Contractor and related contractor personnel associated with work of this section, including personnel in charge of the waste management program; C&D Quality Manager; architect; engineers; material and equipment suppliers where appropriate; and such additional Owner personnel as Owner deems appropriate.

2. Plan Revision: Make revisions to C&D Waste Management Plan agreed upon during the meeting and incorporate resolutions agreed to be made subsequent to the meeting. Submit revised plan to architect or the Owner personnel as Owner deems appropriate for approval.

D. Implementation:

1. Designate an on-site party responsible for instructing workers and implementing the C&D Waste Management Plan.

2. Distribute copies of C&D Waste Management Plan to job site foreman and each subcontractor.

3. Include waste management and recycling in worker orientation.

4. Provide on-site instruction on appropriate separation, handling, recycling, and recovery methods to be used by all parties at the appropriate stages of the work at the site.

5. Also include discussion of waste management and recycling in regular job meeting and job safety meetings conducted during the course of work at the site.

E. The Contractor will be responsible for ensuring that the appropriate governmental entities are notified of the work.

F. Remove and relocate reusable materials to be reinstalled or retained in a manner to prevent damage or contamination.

G. Conduct construction and demolition in such a manner to minimize damage to trees, plants and natural landscape environment.

H. Arrange for adequate collection, and transportation to deliver the recovered materials to the approved recycling center or processing facility. Maintain records accessible to the architect or C&D Quality Manager for verification of diversion of recovered waste materials.

1.6 STORAGE AND HANDLING:

A. Site Storage:

1. Remove materials for recycling and recovery from the work locations to approved containers or storage area as required. Failure to remove waste or recovered materials will be considered cause for withholding payment and termination of Contract.

2. Position containers for recyclable and recoverable waste materials at a designated location on the Project Site. If materials are sorted on site, also provide a sorting area and necessary storage containers.

3. Change-out loaded containers for empty containers, as demand requires.

4. If recovered materials are stored on-site for project duration provide adequate security from pilferage.

B. Handling

1. Deposit indicated recyclable, and recoverable materials in storage areas or containers in a clean (no mud, adhesive, solvents, petroleum contamination), debris-free condition. Do not deposit contaminated materials into the containers until such time as such materials have been cleaned.

2. Ensure all recovered materials are made safe for handling and storage.

3. If the contamination chemically combines with the material so that it cannot be cleaned, do not deposit into the recycle containers. In such case, request resolution

by the C&D Quality Manager for disposal of the contaminated material. Directions from the C&D Quality Manager do not relieve the Contractor of responsibility for compliance with all legal and regulatory requirements for disposal, nor shall such directions cause a request for modification of the Contract.

1.7 PROJECT CONDITIONS:

A. Environmental Requirements:

1. Transport recyclable and recoverable waste materials from the Work Area to containers and carefully deposit in the containers without excess noise and interference with other activities, to minimize noise and dust.

2. The Contractor shall ensure adequate erosion control and storm water control, if required, to prevent or minimize the negative impact to its surrounding environment.

3. Provide measures to ensure the containment of lead-based paint and dust, nails, asbestos-based products and any biological contaminants that may affect environmental health and safety conditions.

B. Site Condition:

1. Signs and instructions should be clear, and easy to understand. All recycling containers should be clearly labeled and lists of acceptable and unacceptable materials will be posted throughout the site. Whenever possible, they should be in multiple-languages, especially in Spanish, and in graphic symbols.

2. The Contractor shall ensure the safety of all personnel involved in the C&D process.

3. A C&D site management plan shall be created including: work areas, materials processing areas, materials storage and disposal areas, worker hand-washing and changing stations, first aid and medical information.

PART 2 - PRODUCTS

2.1 SALVAGED AND REUSE MATERIALS:

A. The following components and fixtures are collected for reuse:

1. Not used.

2.2 RECYCLED MATERIALS:

A. The following materials are collected for recycling:

1. Asphalt

2. Concrete and concrete blocks

3. Brick, tile and masonry materials

4. Ferrous metal

5. Non-ferrous metal, copper, aluminum

6. Wood

7. Trees and shrubs

8. Soil

9. Electric fixtures, motors, switch gear and other similar equipment

10. Others as appropriate

PART 3 - EXECUTION (N/A)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes the furnishing of all labor, materials, equipment, and services, and performing all operations necessary for, and properly incidental to, cleanup during construction and final cleaning of the building prior to acceptance by the Owner, including waxing and polishing as specified herein and in other sections when specified. The Conditions of the Contract and the other sections of Division 1 apply to this section as fully as if repeated herein.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Use only cleaning materials which will not create hazards to health or property and which will not damage materials. Use only cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned. Use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

PART 3 - EXECUTION

3.1 CLEANUP DURING CONSTRUCTION:

A. It is required that the entire site be kept in a neat and orderly condition, and the Architect may, at any time during construction, order a general cleanup of the site as a part of the work under this section.

B. Dispose of waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris on the site will not be permitted.

C. Location of dump for trash and debris and length of haul is the Contractor's responsibility.

3.2 FINAL CLEANING OF BUILDING:

A. Prior to final inspection by the Architect and after all construction work is essentially complete, thoroughly clean the building, utilizing professional building cleaners. Items to be cleaned include, but are not limited to; all glass, plastic, doors, opening frames, grilles, trim, exposed non-ferrous metal surfaces, floor covering, light fixtures and plates, plumbing fixtures and trim, and all finish surfaces throughout the construction. Thoroughly remove ink trademarks from laminated plastic surfaces. Vacuum-clean the

building and remove all spots, smears, dust, debris, handprints and defacements of every sort, including those of vandals. Follow the recommendations of the manufacturer of the materials and items to be cleaned for all cleaning, polishing, and treatment such as waxing.

3.3 FINAL SITE CLEANUP:

A. Also prior to final inspection, thoroughly clean the entire site and put it into a neat, acceptable condition. Remove from the entire site all construction waste and unused materials, dunnage, loose rock and stones, excess earth, roots, weeks, and all debris of any description resulting from the work. Hose down and scrub where necessary all new concrete and asphalt pavement and walks dirtied as a result of the work. Thoroughly remove mortar droppings from concrete walks and other pavements.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes performing all operations necessary for and properly incidental to closing out the project and assisting in Owner's final inspection as hereinafter specified. The Conditions of the Contract and the other sections of Division 1 apply to this section as fully as if repeated herein.

1.2 REQUIREMENTS PREPARATORY TO FINAL INSPECTION:

A. All temporary facilities shall be removed from the site as specified in Section 01 50 00.

B. The building and site shall be thoroughly cleaned as specified in Section 01 74 23.

C. All plumbing and mechanical equipment shall operated quietly and free from vibration. Properly adjust, repair, balance, ore replace equipment producing objectionable noise or vibration in the occupied areas of the building. Provide additional brackets, bracing, other methods to prevent objectionable noise or vibration. All systems shall operate without humming, surging, or rapid cycling.

D. All operating instructions for equipment shall be properly mounted and posted as specified in their respective sections.

E. Record (As-built) drawings shall be completed, signed, and submitted to the Architect as specified under Article 1.4 of this section.

F. The Material and Equipment maintenance instructions, as specified in the body of the Specifications, shall be submitted to the Architect.

G. All guarantees and warranties shall be submitted to the Architect as specified in the General Conditions.

1.3 FINAL INSPECTION:

A. After all requirements preparatory to the final inspection have been completed as hereinbefore specified, Contractor shall notify the Architect to perform the final inspection. Notice shall be given at least three (3) working days in advance of the time the final inspection is to be performed.

B. The Contractor or his principal superintendent, authorized to act in behalf of the Contractor, shall accompany the Architect and Owner on the final inspection tour, as well as principal subcontractors that the Architect or Owner may request to be present.

C. If the work has been completed in accordance with the Contract Documents, and no further corrective measures are required, the Owner will accept the Project and will file for the Notice of Completion.

D. If the work has been substantially completed in accordance with the Contract Documents, and only minor corrective measures are required, the Architect will prepare a punch list of work to be corrected and the Owner will conditionally accept the Project and will file for the Notice of Completion based upon the Contractor's assurance that the corrective measures will be completed within the shortest practicable time period.

E. If the work has not been substantially completed in accordance with the Contract Documents, and several corrective measures are still required, the Owner will not accept the Project or file for the Notice of Completion. Instead, a punch list will be prepared, based on the information gathered from the final inspection, and the Contractor will be required to complete this work and then call for another final inspection, following the procedure outlined above.

F. Upon acceptance of the Project by the Owner, Contractor shall submit his request for the final and acceptance payment. Final payment will not be made by the Owner, however, until thirty-five (35) days after filing for the Notice of Completion.

1.4 RECORD DRAWINGS (AS-BUILT DRAWINGS):

A. The Contractor shall provide Record Drawings which shall clearly show all differences between the contract work as drawn and as installed for all concealed work, as well as work added to the contract which is not shown on the Contract Drawings.

B. Concealed shall mean work installed underground or in an area which cannot be readily inspected by use of access panels, inspection plates or other removable features.

C. The Contractor shall maintain a set of Record Drawings at the job site. These shall be kept current and legible and shall be available for inspection at all times by the Architect. Show all changes in the contract work, or work added on the Record Drawings in a contrasting color.

D. At the conclusion of work, the Contractor shall provide one (1) USB drive with electronic files of the Record Drawings and the Operations and Maintenance Manuals (pdf format). Additionally, provide one (1) complete set of Operations and Maintenance Manuals in a 3-ring binder. If multiple buildings are within a project, provide separate manuals for each building. Each building should be identified on the binders.

E. In showing changes in the work, or added work, use the same legends that are used on the Contract Drawings. Indicate exact locations by dimensions and exact elevations. Give dimensions from a permanent reference point. Prepare all changes to scale.

1.5 OPERATION AND MAINTENANCE DATA SUBMITTAL:

A. As outlined above (1.4D), data shall be submitted a minimum of thirty (30) days prior to completion of the contract. The contract shall not be considered complete until this data has been reviewed by the Owner.

B. Assemble all data required herein, except that to be mounted in frames, in three-ring loose-leaf binders, complete with index, index dividers, and permanently attached exterior label on cover.

C. Data Required:

1. Manufacturer's Manuals: Complete installation, operation, maintenance and service manuals, and printed instructions and parts lists for all materials and equipment where such printed matter is regularly available from the manufacturer. This includes but is not limited to such service manuals as may be sold by the manufacturer covering the operation and maintenance of his items, and complete replacement parts lists sufficiently detailed for parts replacement ordering to manufacturer. Bound publications need not be assembled in binders.

2. Equipment Nameplate Data: A typewritten list of all mechanical and electrical equipment showing all equipment nameplate data exactly. Identify equipment by means of names, symbols, and numbers used in the contract documents.

3. System Operating Instructions: Typewritten instructions covering operation of the entire system as installed (not duplicating manufacturer's instructions for operating individual components). Include schematic flow and control diagrams as appropriate and show or list system valves, control elements, and equipment components using identification symbols and numbers. List rooms, area of equipment served, and show proper settings for valves, controls, and switches.

4. System Maintenance Instructions: Typewritten instructions covering routine maintenance of system. List each item of equipment requiring inspection, lubrication, or service and briefly describe such maintenance, including types of lubricants and frequency of service. It is not intended that these instructions duplicate manufacturer's detailed instructions. Give name, address and phone number of nearest firm authorized or qualified to service equipment or provide parts.

5. Wall-Mounted Data: Frame one set of typewritten system instructions and diagrams as required under Paragraphs .3 and .4 above, covered with glass and mounted in locations as directed by the Owner. This set of instructions is in addition to the five required hereinbefore.

1.6 INSTRUCTION OF OWNER'S MAINTENANCE PERSONNEL BY THE CONTRACTOR:

A. After work under this contract is completed, tested and prior to acceptance, and not less than five (5) days after submittal of the operation and maintenance data required in Paragraph 2.6, the Contractor shall operate all systems for a period of three 8-hour days

during which time he shall keep on the project a competent man or men familiar with the items installed whose full-time assignment will be to instruct the Owner's maintenance personnel in the operating and maintenance of the equipment and systems.

B. Any instructions from manufacturer's representatives required under other sections of this specification shall be conducted during this period. This instruction period shall not be conducted prior to completion of all piping and equipment labeling required by the contract.

C. All arrangements and notices for operation and instruction periods shall be made through the Owner.

D. This three-day instruction period shall be in addition and subsequent to any period of operation, test and adjustment called for elsewhere in this specification.

1.7 MANUFACTURERS' WARRANTIES:

A. Deliver all the manufacturers' warranties required by the Contract Documents, with Owner named as the beneficiary. In addition, for all equipment and machinery, or components thereof, bearing a manufacturers' warranty that extends for a longer time period than the Contractor's warranty, secure and deliver the manufacturers' warranties in the same manner.

B. Form of Warranty: Written warranties, except manufacturers' standard printed warranties, shall be on the Contractor's, subcontractor's, material supplier's, or manufacturer's own letterhead, addressed to the Owner. All warranties shall be submitted in duplicate, and in the form shown on the following page, modified as approved to suite the conditions pertaining to the warranty.

C. Submission of Warranties: Collect and assemble all written warranties into a bound booklet form and deliver them to the Owner's Counsel for final review and approval.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes performing all operations in connection with demolition work as shown and noted on the drawings and as specified. The General Conditions and Division 1 apply to this section as fully as if repeated herein.

1.2 STANDARDS:

A. Except as modified by governing codes and regulations and the requirements specified herein or details on the drawings, demolition work shall conform to the following standards:

B. Safety Code for Building Construction ANSI A.10.2

PART 2 - SPECIAL CONSIDERATIONS

2.1 SCHEDULING:

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

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

2.2 PROTECTION:

A. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any 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 workmen engaged in demolition operations, occupants of the building, public 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 such openings are closed by permanent work.

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 department requirements.

G. Do not close or obstruct exitways, walkways, passageways, or stairways without authorization of the Owner and local fire department. Do not store or place materials in passageways, stairs or other means of egress. Conduct operations with a minimum traffic interference.

H. Be responsible for any damage to the existing structure or contents as a result of insufficient protection provided.

PART 3 - EXECUTION

3.1 WORKMANSHIP:

A. Demolition, removal, and alteration work shall be as shown on the drawings. Perform such work required with due care, including shoring, bracing, etc. Be responsible for any damage that may be caused by such work to any part or parts of existing structures or items designated for reuse. Perform patching, restoration, and sections of the specifications.

B. Materials or items designated to become the property of the Owner shall be as shown on the drawings. Remove such items with care and store them in a location at the site to be designated by the Owner.

C. Materials or items designated to be reinstalled shall be as shown on the drawings. Remove such items with care under the supervision of the trade responsible for reinstallation; protect and store until required. Replace material or items damaged in its removal with similar new material.

D. Materials 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.

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

F. In general, demolish existing work in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.

G. Where alterations occur, cut, remove, patch repair, or refinish the adjacent surfaces or so much thereof as is required by the involved conditions, and leave in as good a condition as existed prior to the commencing of the work. The materials and workmanship employed in the alterations, unless otherwise shown or specified, shall be performed by the various respective trades that normally perform the particular items of work.

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

I. Where existing equipment and/or fixtures are indicated to be reused, repair such equipment and/or fixtures and refinish to put in perfect working order. Refinish as directed.

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

K. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the work. Cut and fold back existing built-up roofing. Cut and remove insulation, etc. Provide temporary weathertight protection as required until roofing and flashings are installed. Consult the Owner to ascertain if existing guarantee bonds are in force and execute the work so as not to invalidate such bonds.

3.2 NOISE CONTROL:

A. All motorized equipment on the site, including hauling trucks, shall be equipped with sound control devices at all times. The sound level measured at a distance of 25 feet from any piece of equipment shall not exceed 60 decibels.

B. Materials shall be lowered in fully enclosed chutes acoustically lined to maintain the sound level within the limits prescribed above.

C. Workmen's voice communication shall be kept under control at all times.

3.3 CLEANING UP:

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

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolishing designated site construction.
   2. Cutting and alterations for completion of the Site Work.
   3. Protecting items designated to remain on site.
   4. Removing demolished site materials.

1.2 SUBMITTALS

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

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

C. Shop Drawings:
   1. Indicate demolition and removal sequence.
   2. Indicate location of items designated for reuse and Owner's retention.
   3. Indicate location and construction of temporary work.

1.3 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Contract Closeout: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

1.4 QUALITY ASSURANCE

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.

C. Obtain required permits from authorities having jurisdiction.

1.5 PRE-INSTALLATION MEETING

A. Section 01 31 19 – Project Meetings: Preinstallation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.6 SCHEDULING

A. Schedule Work to coincide with new construction.

B. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation and activities in adjoining spaces.

C. Coordinate utility and building service interruptions with Owner.
   1. Do not disable or disrupt building fire or life safety systems without three days prior written notice to Owner.
   2. Schedule tie-ins to existing systems to minimize disruption.
   3. Coordinate Work to ensure fire sprinklers, fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.7 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions of the work in place before beginning work; report existence of hazardous materials or unsafe structural conditions.

3.2 PREPARATION

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

B. Mark location and termination of utilities.

C. Existing Utilities:
   1. General: Coordinate disconnection and capping of existing gas, water, sewer and electrical utilities; verify work is complete before starting demolition work affecting those utilities. Do not interrupt existing utility service to operating facilities, except when authorized in writing by Owner. Provide not less than 72 hours' notice to Owner if shutdown of service is required. Make provision for temporary service during interruption of existing utility service, acceptable to Owner.

2. Mechanical: Refer to Division 22 – PLUMBING; disconnecting, removing and capping existing gas, water and sewer utilities.
3. Electrical: Refer to Division 26 – ELECTRICAL; disconnecting, removing, and capping existing electrical utilities. Owner will make arrangements with telephone company concerning their equipment and lines.

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

E. Prevent movement of structures; provide temporary bracing and shoring required to ensure safety of existing structures.

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

G. Do not close or obstruct building egress path.

H. Do not disable or disrupt building fire or life safety systems without 3 days prior written notice to Owner.

I. Hazardous Materials:
1. General: Identify, collect, and legally dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
2. Asbestos: If asbestos or materials containing asbestos are encountered, stop work immediately and contact the Owner. Do not proceed with demolition until directed by Owner.
3. Lead: If lead or materials containing lead are encountered, stop work immediately and contact the Owner. Do not proceed with demolition until directed by Owner.

J. Protection:
1. Site: Protect existing adjacent installations not scheduled for demolition from damage; take measurems to prevent damage to existing turf, paving, trees, streets, curbs, walks, sewers, etc., during demolition and construction.

2. Trees:
   a. General: Protect trees adjacent to and overhanging the Project Site from impact of any kind.
   b. Repair and Replacement: Per City of Anaheim Municipal Code.
   c. Tree Preservation:
      1) General: Owner's Representative shall designate the following:
      2) Tree Enclosure Area: Material, topsoil, vehicle or equipment not permitted within tree enclosure area.
      3) Tree Canopy Area: Do not alter ground under and around designated area.
      4) Retained Trees: Irrigated, aerated and maintained as required to ensure survival.

d. Trenching and Excavation: Report the encounter of any tree root system to the Owner. Owner will provide services of an Arborist to repair major damage to root systems.

3. Safety Precautions: Prevent damage to existing elements to remain or to be salvaged, and prevent injury to the public and workmen engaged on site. Demolish roofs, walls and other building elements in such manner that demolished materials fall within foundation lines of building being removed. Do not allow demolition debris to accumulate on site. Pull down hazardous work at end of eachday; do not leave standing or hanging overnight, or over weekends.

3.3 SALVAGE REQUIREMENTS

A. General: Not applicable.

3.4 DEMOLITION

A. General: Perform demolition as shown and remove from the site. Use methods required to complete Work within limitations of governing regulations. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
   1. Conduct demolition to minimize interference with adjacent and occupied building areas.
   2. Maintain protected egress from and access to adjacent existing buildings at all times.
   3. Do not close or obstruct roadways or sidewalks without permits.

B. Explosives: Use not permitted.

C. Cutting and Removal: Remove existing work as shown; cut in neat straight lines, parallel to adjacent elements or plumb to vertical surfaces; grind smoot saw cut edges of concrete slabs or walks. Neatly remove existing finish materials back to clean straight line on nearest support to facilitate installation of new matierials, patches or repairs. Use methods that prevent damage to other work, and provide proper surfaces for installation of repairs and new work.

D. Prepare and follow an organized plan for demolition and removal of items.
   1. Shut off, cap, and otherwise protect existing public utility lines in accordance with the requirements of the public agency or utility having jurisdiction.
   2. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.
   3. Completely remove items scheduled to be so demolished and removed, leaving surfaces clean, solid, and ready to receive new materials specified elsewhere.

4. In all activities, comply with pertinent regulations of governmental agencies having jurisdiction.

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

F. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

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

H. Remove temporary Work.

3.5 DISPOSAL

A. General: Demolished materials become property of the Contractor and shall be removed from premises, except those items specifically listed to be retained by Owner.

B. Haul Routes:
   1. General: Establish haul routes in advance; post flagmen for the safety of the public and workmen.
   2. Maintenance: Keep streets free of mud, rubbish, etc., assume responsibility for damageresulting from hauling operations; hold Owner free of liability in connection therewith.

3.6 SCHEDULES

A. Owner will remove, store and protect the following materials and equipment for reinstallation in the project.
   1. Not applicable.

B. Remove the following equipment and materials for Owner's retention. Deliver to location designated by Owner.
   1. Not applicable.

C. Protect the following materials and equipment remaining.
   1. Exisitng asphalt concrete and surface improvements beyond project limts,

D. Demolish the following materials and equipment.
   1. Existing asphalt concrete and surface improvements witih project limits to facilitate new construction of modular buildings, utilities, playground and apparatus, and walking path.

3.7 REPLACEMENT

A. In the event of demolition of items not so scheduled to be demolished, promptly replace such items to the approval of the Architect and at no additional cost to the Owner.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes the furnishing and installing of all miscellaneous metal work and related connections complete as shown and noted on the drawings and specified. The General Conditions and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES:

A. The editions referenced herein of the standards and specifications published by the following organizations, apply to the work only to the extent specified by the reference.

B. American National Standards Institute

C. American Institute of Steel Construction (AISC).

D. American Society for Testing and Materials (ASTM).

E. American Welding Society (AWS).

F. National Association of Architectural Metal Manufacturer's (NAAMM).

1.3 SUBMITTALS:

A. Shop Drawings:

1. Submit fully detailed shop drawings of all miscellaneous metal work giving sizes; details of fabrication and construction; methods of assembly and bracing; and locations of hardware, anchors, and all accessories.

2. Drawings shall include all shop and erection details, including cuts, copes, connections, holes, bolts and welds. All welds, both shop and field, shall be indicated by standard welding symbols in AWS /Latest Edition. Drawings shall show the size, length and type of each weld. All materials to be brazed or soldered shall have connections indicated by symbols which are industry standards.

3. Contractor shall be responsible for all fabrication and for correct fitting of mental members shown on shop drawings. No materials shall be fabricated or delivered to the site until the shop drawings have been approved and returned to the Contractor.

1.4 REGULATORY REQUIREMENTS:

A. Not used.

1.5 FIELD MEASUREMENTS AND TEMPLATES:

A. Secure all field measurements required for proper and adequate fabrication and installation of the work. Furnish templates for exact location of items to be embedded in concrete and masonry and setting instructions required for all installation.

1.6 DELIVERY AND STORAGE OF MATERIALS:

A. Deliver material in time to insure uninterrupted progress of the work. Materials shall be stored in a manner to preclude damage and permit ready access for inspection and identification of each shipment. Steel materials, either plain or fabricated, shall be stored above the ground upon platforms, pallets, skids, or other supports. Materials shall be kept free from dirt, grease, and other foreign matter, and shall be protected from corrosion. Materials showing evidence of damage will be rejected and shall be immediately removed form the work.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Steel, Rolled Shapes, Bars and Plates: Standard structural sections, conforming to ASTM A 36/A36M.

B. Galvanized sheet steel: Conform to ASTM A 653/A653M, Classification SS.

C. Steel pipe: Conform to ASTM A 53/A 53M, grade B.

D. Steel tubes: Conform to ASTM A501/A 501M or A500/A 500M, grade B, and shall be seamless tube.

E. Anchors, Bolts, and Fastenings: Bolts and nuts shall conform to ASTM A307, Grade A and ASTM A563/A 563M.

F. Electrodes: All arc-welding electrodes shall conform to AWS A5.1 or A5.5 E60XX or E70XX.

G. Shop primer for steel, other than galvanized, shall meet Federal Specification TT-P-86G, or TT-P 645 (zinc chromate).

H. Treatment for damaged galvanized surfaces shall be Rust-Oleum, Bright Galvanizing Compound or equal.

I. Pipe Sleeves: Pipe sleeves through concrete walls and footings shall be standard weight, wrought iron, mild steel, or cast iron sleeves with not less than 1/2 inch space all around between the sleeve and pipe.

J. Steel Grating: Grating shall be smooth surface welded steel grating with 2 inch by 3/16 inch bearing bars. Bearing bars shall be spaced 1 3/16 inches on center. Cross bars shall be spaced 4 inches on center. Grating shall be galvanized. Design grating to support 100 pounds per square foot. Brodhead Steel Products, Blaw-Knox or equal.

K. Galvanizing: Zinc coating shall conform to ASTM A 123/A 123M-17. Zinc coating for threaded products shall conform to ASTM A 153/A 153M-16a.

L. Quick setting hydraulic cement shall be one of the following or equivalent approved by the Architect.

1. "Por-Rok" as manufactured by Hallemite/Lehn and Fink.

2. "Thorogrip" as manufactured by Thoro Systems Products.

3. "Masterflow 713" as manufactured by Master Builders.

2.2 FABRICATION:

A. Materials shall be fabricated and assembled in the shop to the greatest extent possible. Shearing, flame cutting, and chipping shall be done carefully and accurately. Coordinate all connection details to concrete or masonry. Verify all lines, levels, and dimensions, where possible, just prior to commencing fabrication of connection details. Correct any work that does not fit. Schedule and coordinate work under this section with that specified elsewhere in order to produce a workmanlike installation. When not otherwise shown or specified, comply with all applicable requirements of AISC "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings". Finished surfaces of all exposed members shall be smooth and free of any markings, burrs, or other defects.

B. Connections shall be bolted, brazed or welded as indicated. One-sided or other types of eccentric connections will not be permitted unless shown in detail and approved on the shop drawings.

C. Holes shall be cut, drilled, or punched at right angles to the surface of the metal and shall not be made or enlarged by burning. Holes in base or bearing plates shall be drilled. Holes shall be provided in members to permit connecting the work of other trades.

D. Guard Posts (pipe bollard): Guard posts shall be galvanized extra heavy weight (Schedule 80) steel pipe set in a concrete foundation and filled with concrete. Concrete shall be 2000 psi in accordance with Section 03 30 00.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

A. General: All steel and miscellaneous metal work shall conform with the applicable requirements of the hereinbefore referenced "Codes and Standards". All details shown are typical. Similar details apply to similar conditions. Drawings shall be checked with the architectural drawings for dimensions, elevation, size, and location of all installations. All miscellaneous metal items shall be supplied in ample time for incorporation in the work. Include all reinforcing angles, plates, straps, brackets, hangers, clips, lugs, holes, sleeves, shims, etc., as shown or required for erection of steel and miscellaneous metal work and as required to complete the work as shown on the drawings.

3.2 WELDED CONNECTIONS:

A. All welders shall be certified qualified welders. All welders welding light gauge mental shall be qualified for light gauge metal welding.

B. Welded connection shall be made in strict accordance with AWS D1.1:2020. All welding shall be done in the shop unless otherwise shown or specified.

C. All welds and other connection exposed in the finished work shall be ground and dressed smooth and so that the shape and profile of the item welded is preserved.

3.3 INSTALLATION:

A. Miscellaneous metal items shall be installed as rapidly as the progress of other work will permit. Splices and field connections shall be made with bolts, except where welding or brazing is indicated or approved on the shop drawings. Fasteners shall be installed as specified hereinafter.

B. Metal work shall be set accurately at the established lines and levels. Installation shall be in strict accordance with approved drawings and actual condition, true and horizontal or perpendicular as the case may be, level and square with angles and edges parallel with related lines of the building.

C. Anchor bolts, anchors, block-outs and sleeves shall be properly located and built into connecting work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

3.4 GALVANIZED FINISH:

A. Touch up all damaged galvanized finish due to installation, welding, threading or other work with treatment specified herein.

END OF SECTION

PART 1 - GENERAL

1.1 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. Electrical General Provisions and Requirements for electrical work.

3. Division-1; General Requirements; General Conditions.

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 Sub-Contractors or in establishing the extent of work to be performed by any trade.

1.2 GENERAL SUMMARY OF ELECTRICAL WORK

A. The Specifications and Drawings are intended to cover the 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 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.

1.3 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. Coordinate and cooperate in every way with other trades to avoid interference and ensure a satisfactory job.

C. 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.

1. Pothole 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.

2. 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 In-Building Investigation; Identified by the Underground Detection Services performed; or any existing work damaged as a result of failure to comply with all the Referenced Requirements.

D. Underground Detection Services Existing Utility Structures

1. Detection/location services shall be provided utilizing the latest detection equipment available. Services shall be performed by a company regularly engaged in the business of existing Underground Utility Structure Detection for the past 5-years.

2. Prior to excavation and prior to directional boring the following work shall be performed:

a. Contractor to mark excavating, trenching and directional boring 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 location and 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, both 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. The Contractor shall add this information to the existing conditions site plan.

3. Exercise extreme caution in directional boring, excavating and trenching on this site to avoid existing underground utilities and structures, and to prevent hazard to personnel and/or damage to existing underground utilities or structures. The Contract Documents, 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 Common Ground Alliance (CGA) telephone #811 "Know What's Below-Call Before You Dig" and Underground Service Alert (USA), not less than 72-hours prior to excavation. Contractor shall not excavate until verification has been received from CGA and USA that existing underground utilities serving the site have been located, identified, and marked.

E. 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.

1.4 QUALITY ASSURANCE

A. Work and materials shall be in full accordance with the latest Recommendations, Rules and Regulations. The 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 National Electrical Code – NEC/NFPA 70.

5. Underwriter's Laboratory – UL.

6. Other applicable State and Local Government Agencies Laws and Regulations.

7. 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-90: Recommended Practices for Commissioning Building Electrical Systems

   c. NECA/NEIS-407: Recommended Practice for installing Panelboards

   d. NECA/NEIS-409: Recommended Practice for installing and Maintaining Dry-Type Transformers

   e. NEIS/NECA and IESNA-501: Recommended Practice for installing Exterior Lighting Systems

   f. NECA/NEMA–605: Recommended Practice for installing Underground Nonmetallic Utility Duct

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 are 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.

1.5 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". Substitutions: Section 01 60 00 - Product Requirements.

   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 more than one Manufacturer for any one item of equipment, or listing items "as specified",

without either make and model or type designation, is not acceptable. Shop Drawings shall not be submitted before reviewing 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. 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. Substitutions: Section 01 60 00 - Product Requirements.

3. 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 by 17-inches or smaller in size shall be bound in 3-ring binders. Divider tabs shall be provided in the 3-ring binders identifying and separating each separate Shop Drawing submittal item. Shop Drawings larger than 11-inches by 17-inches, Shop Drawing pages/sheets submittals shall be sequentially numbered with unique alphanumeric numbering system to facilitate correspondence referencing identification of individual sheets.

4. 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 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-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.

5. 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 insure 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.

6. 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 26 05 01 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: 10/09/98 Original Submittal #4 Resubmittal Revision R2 Contents: Transformer Resubmittal Specification Section 26 05 01 Paragraph 2.11, etc.).

   c. Contractor shall provide a written response narrative with each resubmittal. Describe each response-action, resubmittal addition, change and deletion. Correspond to each response to A/E specific review comment.

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. Substitutions: Section 01 60 00 - Product Requirements.

D. The Contractor shall pay, upon request by the Owner's Representative, a fee for the Owner's Representative time involved in the review of substitution submittals and design changes resulting from the Contractor's requested substitutions. The fee shall be not less than $125.00 per hour but, in no case, less than stated in Division-1, whichever is greater. Substitutions: Section 01 60 00 - Product Requirements.

E. Maintenance and Operating Manuals

1. The Contractor shall furnish three copies of type-written maintenance and operating manuals for all electrical equipment, fire alarm equipment, sound system equipment, etc., to the Owner.

2. Instruct Owner's personnel in correct operation of all equipment at completion of project. Provide the quantity and duration of instruction class as specified; but in no case less than two 4-hour duration separate instruction classes for each individual equipment group furnished as part of the Contract. Instruction classes shall be presented by Manufacturer's Authorized Field Service Engineer at the project site. Instruction class size shall be at the Owner's discretion, not less than one or more than fifteen students shall attend each instruction session. Submit fifteen written outline copies of the proposed instruction class curriculum, 14-days prior to the class-scheduled dates.

a. Each of the individual instruction classes shall be recorded to provide a permanent instruction reference for the Owner. The recordings shall be made using audio and color full motion high-definition (HD) video with audio-video digital recording, battery operated cameras, for each instruction session.

b. Provide each instruction presenter with a personal portable "wireless" single channel FM microphone system, battery operated, transmit the audio voice to the camera audio input and insure voice and video are synchronized. Provide a matching receiver(s) for each video camera.

c. Provide a minimum of four standard High-Definition (HD), and audio-video DVD-ROM recordings of each instruction session. Identify and label each DVD-ROM with date and instruction session name.

3. Maintenance and operating manuals shall be bound in three-ring, hard-cover, plastic binders with table of contents. Manuals shall be delivered to the Owner's Representative, with an itemized receipt.

F. Portable or Detachable Parts: The Contractor shall remain 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.

G. 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 benchmarks. 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.

1.6 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.

1.7 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.

1.8 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.

3. Prior to penetrating, coring, drilling or cutting existing building elements, concrete and/or masonry, provide imaging equipment examinations of each specific location. The imaging process shall identify existing internal embedded components and locations, including structural elements/anchors, conduit, and piping that are present. Do not penetrate or damage the existing internal embedded elements.

   Imaging shall employ one of the following, with GPR methodology preferred:

   a. Non-invasive imaging employing high frequency, Ground Penetrating Radar (GPR), single side echo reflection technology.

   b. Non-invasive imaging employing x-ray radiography, through-and-through imaging technology.

B. Excavation Temporary Cover

1. Excavations for Contract Work occurring in streets, vehicular drive areas, parking lots, sidewalks; any paved surface; or any area accessible to the public; 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) (12 feet lane width) for vehicular traffic at all times during construction, for vehicle access to all areas.

1.9 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. Provide nameplate label on electrical service entrance equipment describing available short circuit information calculated by the Contractor, including:

   a. Calculation date, month-day-year.

b. Calculate maximum available short circuit fault current.

c. Description of parameters and changes affecting the Requirements for recalculation of the fault current information.

3. 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.

4. Nameplates shall be engraved laminated phenolic, rated UV-resistant for wet locations and outdoor locations, fade resistant. 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.

5. 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 coverplate.

2. Lock switches.

3. Pilot light switches.

4. Switches in locations from which the equipment or circuits controlled cannot be readily seen.

5. Where so indicated on the Drawings.

6. Receptacles other than standard 15-amp 120-volt duplex receptacles shall indicate circuit voltage, ampere, phase and source circuit number.

C. For equipment and access doors or gates to equipment containing or operating on circuits of more than 100 volts AC or DC 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 #6AWG 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 #6AWG 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 inside 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 numbers 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 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 Authority's 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, bus-ways, 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

PART 1 - GENERAL

1.1 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.

1.2 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Submit product data sheets for all outlet boxes, wiring devices, device plates, relays, contactors, and timeswitches.

B. Submit Material List for outlet boxes.

PART 2 - PRODUCTS

2.1 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 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. 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.

5. 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.

6. 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.

7. Provide isolation barriers in outlet boxes:

   a. Between line voltage and low voltage devices.

   b. Where more than one device is installed in an outlet box.

   c. Between 277-volt and 120-volt devices.

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.

2.2 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 pull boxes 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 pullbox 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.

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.

2.3 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.

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, childcare/daycare/ 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 Weatherproof (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 at 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 is 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 in a 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 indicated on plans.

4. On exposed conduit runs, provide weatherproof ground fault circuit interrupter type GFCI receptacles installed in "FS" condulet water tight cast metal body, with weather-proof spring door type covers, gasket water tight. 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.

2.4 PLATES

A. Metal cover plates for devices

1. Provide cover plates for every line voltage switch, receptacle, 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.

2. Plates shall be as manufactured by P&S; or Hubbell; or Leviton; or General Electric.

2.5 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.

2.6 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.

2.7 RELAYS, CONTACTORS AND TIMESWITCHES

A. Individual Control Relays (HVAC Plumbing of the Control Functions)

1. Individual control relays shall have convertible contacts rated a minimum of 10-amp, 600 volts regardless of usage voltage. Coil voltage, number and type of contacts shall be verified and supplied to suit the specific usage as shown in the wiring diagrams and/or schedules on the Electrical and Mechanical Drawings. Coil control circuit shall be independently fused, sized to protect coil. Relays shall be installed on prefabricated mounting strips. Each relay shall have a surge suppressor to limit coil transient voltages. Furnished in the NEMA Type I enclosure unless indicated otherwise.

2. The following relays are approved:

Manufacturer	Type
Cooper-Arrow/Hart	IMP
General Electric	Class CR 2811
Square D Co.	Class 8501, Type A
Westinghouse	Bul. 16-321, Type NH
Allen Bradley	Approved Equal

B. Contactors and/or Relays

1. Contactors and/or relays for control of lighting shall be 600-volt AC, electrically operated, mechanically held units, open type for panel mounting with number of poles and of size as indicated on the Drawings. Provide auxiliary control relay for operation of each contactor and/or relay with a 2-wire control circuit.

2. Contactors and/or relays shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor and/or relay cabinets as called for on the Drawings. Contactors and/or relays shall be installed on Lord sound absorbing rubber mounts.

3. Contactors and/or relays shall be Automatic Switch Co. Bulletin #920 Series for 2-pole and 3-pole, Automatic Switch Co. Bulletin 917 Series with poles as indicated on Drawings. Coil control circuit shall be independently fused, sized to protect coil.

4. Contactors and/or relays shall be equipped with a switch, in the proper configuration, to disconnect the control circuit controlling the coil of the respective device. Control circuit disconnect switch shall be labeled showing function of device.

C. Time-Switches

1. All timeswitches shall have synchronous motor drive for operation on 120 or 277 volts, 60Hz, AC and shall be furnished with a 10-hour, spring-driven, reserve-power motor. Contacts shall be rated 40 amp per pole.

   a. Timeswitches for control of air conditioning or plumbing equipment shall have 7-day dial and shall be Tork WL Series or District approved.

2. All timeswitches shall be mounted in separate section in top of panelboards under separate lockable door unless otherwise indicated on Drawings. Clear opening for timeswitch shall be a minimum of 12-inches by 12-inches.

2.8 TRANSFORMERS

A. General

1. Provide dry type transformers constructed to meet Underwriters' Laboratories Specification UL 506 and tested in accordance with ANSI and NEMA Standards. Performance on transformers equal to or better than ANSI, NEMA, IEEE and CEC published criteria.

   a. 60Hz AC line and load.

2. UL Class 220°C insulation with maximum winding temperature rise of 150°C in 40°C ambient at 100% continuous rated capacity with overload capacity per ANSI C57.12 and C57.96 vacuum impregnated core and coil insulation. Transformer efficiency shall meet or exceed NEMA-TP1 (latest revision) Requirements.

3. Transformers shall be equipped with not less than five 2.5% full capacity voltage taps, two above and three below normal voltage. Line and load terminals shall be accessible, located behind removable front cover plate. Transformer connects shall terminate in "conductor-lugs" to match line side incoming and outgoing secondary side conductors, shall occur on a common (same) side of transformer on insulated supports.

4. Provide wall mount and ceiling mount transformers support brackets, platforms and attachment structures for transformers.

5. Dry type transformers shall meet or exceed NEMA TP-1 (latest revision), Class-1 efficiency levels and shall be marked as energy efficient for United States Department of Energy and Environmental Protection Agency DOE/EPA "Energy Star".

6. Transformer windings shall be copper or aluminum.

7. Electrostatic Shield: Provide full width, copper, 100% electrostatic shield (Faraday Shield), between line and load transformer windings, on each transformer phase. Shield shall be low impedance grounded to the transformer metal frame and shall attenuate common mode electrical noise 120dB at 1-500MHz range and transverse mode electrical noise, 30dB at 1-500MHz range. Average effective coupling capacitance of thirty picofarads between line and load sides.

8. Connect transformers by one of the following methods:

   a. Under floor conduit resulting in no rigid connections to transformer (provide ground strap for equipment ground).

   b. Liquid tight flexible metal conduit (provide ground wire for equipment ground).

   c. Pullbox or wireways from transformer, which are isolated from transformer with an approved sound absorbing neoprene gasket (provide ground strap for equipment ground).

9. The physical dimensions of the transformer shall not exceed the size shown on the Drawings.

10. Transformer and transformer mounting shall be designed and tested and comply with install location seismic earthquake resistance seismic loads, typical for floor, wall and ceiling mount/suspended transformers. Bolt floor-mounted transformers to floor and mounting brackets, provide isolation rubber mounts, on each attachment contact location.

B. Test Requirements:

1. The transformers shall be subjected to the following production tests:

   a. Applied Potential

b. Induced Potential

c. No Load Loss.

d. Voltage Ratio.

e. Polarity

f. Continuity

2. The Manufacturer shall have performed the following additional tests on transformer units identical to the design type being supplied to this Specification. Proof of performance of these tests in the form of test data sheets shall be provided at the Time Shop Drawings are submitted for approval.

a. Sound Levels

b. Temperature

c. Full Load and 50% Load Losses for linear and nonlinear loads

d. Voltage Regulation

e. Impedance

C. Transformer Housing

1. Metal, air cooled enclosure

a. Removable metal NEMA 1 enclosure, indoor location

b. Removable NEMA – 3R enclosures, outdoor locations, with vent shields.

c. Provide screen protected ventilation for all openings, including bottom of housing, to prevent accidental contact with internal components and prevent rodent/insect entrance.

2. Manufacture's rust inhibitor primer and standard finish paint.

3. Removable lifting and skidding provisions.

4. Provide wall mount and ceiling mount transformers support brackets, platforms and attachment structures for transformers.

D. Sound Levels: Transformer sound levels, between no load to full load, shall be guaranteed by the Manufacturer not to exceed the following values:

9kVA and below	40dBA
10kVA to 50kVA	45dBA

E. Seismic Earthquake and Wind Loading Withstand, Testing and Certification (Additional Requirements)

1. The complete transformer assembly; including housings/enclosures, accessories, supports/anchors etc., shall be designed, manufactured and tested for wind loading for outdoor locations; earthquake seismic rated withstand for indoor and outdoor locations.

2. Shall withstand, survive and maintain continuous non-interrupted energized operation (running) during the seismic event occurrences. Continued normal energized operation after the wind event and seismic event occurrences have abated.

3. Shall include demonstrations of successful operation and run test after completion of seismic event shake-table simulation.

4. Provide three-dimensional finite element analysis demonstrating anchorage and operational withstand of wind loading as follows:

    a. 110MPH – West Coast States USA and Hawaii, per ASCE/SEI 7-16.

5. Acceptance test seismic qualification of proposed equipment shall employ triple axis shake-table simulation of the Required Response Spectrum (RRS) seismic event motion, certified and approved by the AHJ.

6. Seismic test shall be performed by a third-party independent test laboratory. Wind Analysis and Seismic Testing and Reports shall be certified, signed and "stamped" by PE Professional Engineer licensed and in good standing in the State, Civil Engineer or Structural Engineer.

2.9 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. Else-where, 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

3.1 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. The neutral of each transformer shall be grounded by individual separate ground conductors in individual conduits as follows:

1. Conductor and conduit shall be grounded to building main ground bus.

2. Conductor and conduit shall be grounded to nearest available effectively grounded building structural steel member or grounded metal cold water pipe.

C. The transformer neutral ground conductors for secondary side of the transformers shall be copper and shall be sized according to the following table:

Secondary Total Equivalent Size Copper	Neutral Ground Wire Size Copper
#2 or smaller	#6-1-inch conduit
1 or 1/0	#4-1-inch conduit
2/0 or 3/0	#2-1¼-inch conduit

D. Each pullbox 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.

E. The maximum resistance to ground shall not exceed 5 ohms.

3.2 OUTLET AND JUNCTION BOXES

A. General:

1. Accurately place boxes and securely fastens 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. Provide single piece multi-gang cover plate for close mounted outlet boxes.

2. Surface mounted outlets shall be attached to concrete or masonry walls by means of expansion shields.

3. Provide metal outlet box for each device. Install devices in metal outlet boxes. Typical for all wiring devices including switches, receptacles, and devices.

3.3 SWITCHES AND RECEPTACLES-DEVICES

A. General

1. Provide outlet boxes for all devices, switches, receptacles, both line-voltage and low-volt-age.

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 device after installation and circuit connection is complete.

   b. Test all devices for correct polarity and proper electrical energization.

7. Install and adjust all coverplates to be flush and level, with correct device identification.

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.

3.4 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 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.

2. Exposed lighting pole bases shall be filled, and sack finished to a smooth finish.

End of Section

PART 1 – GENERAL

1.1 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.

1.2 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

2.1 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. 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).

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.

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 lock-nut).
6) Emerson-OZ/Gedney-TWL (compression type) Series (90-degree angle with lock nut).

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 locknut).
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. 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:

       <u>Straight</u>
       Thomas & Betts-5331 GR Series.
       <u>45- and 90-Degree Angle Connectors</u>

Thomas & Betts-5341GR & 5351GR Series
Straight
Appleton-STB & STN-L Series; for use with preformed "knockouts".
45- and 90-Degree Angle Connectors
Appleton-STB-L & STN-L Series for use with preformed "knockouts".
Straight
Emerson- OZ/Gedney-4QSeries.
45- and 90-Degree Angle Connectors
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

E. 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.

F. 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.

2.2 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 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.

C. 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.

2.3 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. Insulation of branch circuit conducts installed in light fixtures; insulation shall be rated for 90 degrees centigrade.

7. 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.

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.

PART 3 - EXECUTION

3.1 TRENCHING, FOOTINGS, SLEEVES

A. Provide trenching, concrete encasement of conduits, back-filling, and compaction for the underground electrical work, in accordance with applicable Sections of this Specification.

B. Provide footings for all post and/or pole-mounted lighting fixtures: concrete shall conform to the applicable Sections of this Specification.

3.2 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 1-ohms from any location in the electrical system. The maximum ground resistance of the grounding electrode to earth shall not exceed 5-ohms.

D. Ground/Bond Conductors

1. Provide 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/ raceway, 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, 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.

3.3 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 other-wise: 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, pullboxes 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 two.

B. RMC Installation Locations. RGS, IMC conduits and RGS, IMC fittings shall be installed in the following locations:

1. Exterior of building for exposed conduit locations.

2. Damp or wet locations exposed or concealed locations.

3. Exposed on roofs.

4. 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. Exposed inside interior enclosed crawl spaces.

2. Exposed interior locations placed 9-feet or higher above finished floors (except as described in paragraph below at lower heights).

3. Any location where FMC is described to be installed, except as the final connection to rotating or vibrating equipment.

D. 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.

E. 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. Non-metal type raceways and RNMC type conduit shall not be installed inside buildings.

F. 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. Non-suspended conduit methods:

1) Provide common “C" channel support for all multiple raceways/ 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.
2) The use of toggle bolts is prohibited.

d. Provide conduit anchoring, conduit support and conduit bracing systems conforming to Earthquake Seismic Zone 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.

3. Conduit concrete encasement:

a. Conduits which run underground exterior to building slab shall be continuously concrete encased except, 15-amp and 20-amp power branch circuit conduits underground 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.

4. 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 back-filled 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 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. 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. Ground water 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.

5. 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.

6. 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.

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. Conduit risers, bends or offsets entering into a building shall be PVC.

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.

7. 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.

8. Provide metallic or plastic closure caps on all conduit ends during construction, until installation of conductors in the respective conduit.

9. 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.

10. RNMC conduit:

    a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.

11. 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.

G. 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.

3.4 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 and light poles 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 with plastic ties at 3-inches on centers. Tag all spare conductors.

3.5 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

PART 1 - GENERAL

1.1 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 Division 26.

2. General Provisions and Requirements for electrical work.

1.2 SUBMITTALS (ADDITIONAL REQUIREMENTS)

A. Provide Manufacturers catalog data for panels, cabinets, and circuit breakers.

B. Provide Shop Drawing showing panel circuit arrangements, size, voltage, ampacity, overcurrent protective devices, etc.

C. Provide nameplate engraving schedule.

D. Short Circuit, Coordination and Arc-Flash

1. Perform and submit engineered settings for each equipment location, fuse and adjustable circuit breaker device, showing the correct time and settings to provide the selective coordination within the limits of the specified equipment, per the latest applicable standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations.

2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an Engineering Narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.

3. 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. Shall comply with, but not limited to:

a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.

b. IEEE-399, Recommended Practice for Industrial and Commercial Power System Analysis.

c. IEEE-1584, Guide to Performing Arc-Flash Hazard Study.

d. CEC

4. Electrical equipment including switchgear, switchboards, electrical panels, and control panels, transformers, dis-connects, etc., shall each be labeled by the Manufacturer with "Electrical-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, to wear the correct protective equipment/clothing (PPE) when working "Live" or operating "Live" equipment and circuits.

1.3 SEISMIC EARTHQUAKE AND WIND LOADING WITHSTAND, TESTING AND CERTIFICATION (ADDITIONAL REQUIREMENTS)

A. General

1. The complete panels and terminal cabinets' assemblies; including circuit protection devices, meter, housings/enclosures, accessories, supports/anchors etc., shall be designed, manufactured and tested.

a. Wind loading all outdoor equipment locations.

b. Earthquake seismic and CBC/IBC Seismic withstand all indoor and all outdoor equipment locations.

2. Shall withstand, survive and maintain continuous non-interrupted energized operation during seismic event occurrences and wind event occurrences. Continued normal energized operation after the wind event and seismic event occurrences have abated.

3. Shall include demonstrations of successful operation and run test after completion of seismic event shake-table simulation. Acceptance test seismic qualification shall employ triple axis shake-table simulation of the Required Response Spectrum (RRS) seismic event motion, certified and approved by the AHJ.

4. Provide three-dimensional finite element analysis demonstrating anchorages and operational withstand of wind loading not less than as follows and as required by AHJ:

a. 110MPH – West Coast States USA and Hawaii, per ASCE/SEI 7-16.

5. Seismic test shall be performed by a third-party independent Test Laboratory. Wind analysis and seismic testing and reports shall be certified, signed and "Stamped" by PE Professional Engineer licensed and in good standing in the State, Civil Engineer or Structural Engineer.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND DISTRIBUTION PANELS

A. Shall be flush, or surface mounting as indicated with group -mount circuit protection devices as shown on panel schedule, hinged lockable doors, index cardholders and proper bussing.

1. Panelboards shall comply with the latest versions:

a. NEMA – PB1.

b. UL – 50 and 67.

c. CEC/NEC.

d. ASTM-B187.

2. Where indicated on the Drawings shall be furnished with subfeed breakers and/or additional conductor lugs, split bussing, contactors, time switches, relays, etc., as required.

a. Branch circuit panels up through 42-circuits shall be single section, to accommodate all the circuits and components.

b. Distribution panels shall be single section or multi-section, to accommodate all the circuits and components.

3. Panels shall be “Service-Entrance” equipment rated when the panel main incoming supply feeder originates from one of the following:

a. Originates outdoors exterior of the building in which the respective panel is located.

b. Originates from an electrical supply source not located in the same building as the respective panel.

B. Housing and Painting, Panels and Terminal Cabinets

1. Shall be finished with one coat of rust inhibitor zinc chromate and coat of primer sealer after a thorough cleaning.

2. Finish color paint as selected by Owner’s Representative where exposed to public view (e.g., corridors, covered passages, offices, etc.). Prime coated panelboard shall be painted to match surroundings after installation in public areas.

3. Manufacturer’s standard color in electrical rooms/closets, janitors, HVAC and storage rooms.

4. Shall be fabricated of sheet steel of the following minimum gauges.

   a. Full height hinged, locking door. Trim #12-gauge steel; enclosure - code gauge steel.

   b. Panels installed in indoor dedicated electrical equipment rooms and dedicated electrical equipment closets, omit full height hinged locking panel door. Dead front cover behind omitted panel door shall remain.

5. NEMA-1 Metal Housing, for indoor locations.

6. NEMA-3R Metal Housing, tamper resistant, for outdoor locations.

7. Furnish all panels and terminal cabinets with the Manufacturers flush locks and keys except where indicated otherwise herein. Keys and locks shall be interchangeable for all panels. Provide two latches and two locks for door heights exceeding 36-inches.

8. Fasten the trim to panel and terminal cabinets by means of concealed, bolted or screwed fasteners accessible only when the door is open.

C. Panels 208/120 volt, three phase, 4-wire, S/N or 120/240-volt, single phase, 3-wire, S/N. Branch circuit panel as manufactured by:

1. Cutler Hammer "Pow-R-Line 1 or 2" Series

2. General Electric "A" Series

3. Square D "NF/NQ" Series

4. Siemens "P1/P2" Series

D. Branch circuit panels for 480/277 volt, three phase, 4 wire, S/N. Panelboard as manufactured by:

1. Cutler Hammer "Pow-R-Line 2" Series

2. General Electric "A" Series

3. Square D "NF" Series

4. Siemens "P1/P2" Series

E. Distribution panels as manufactured by:

1. Cutler Hammer "Power-R-Line 3 or 4" Series

2. General Electric "Spectra" Series

3. Square D "I-Line" Series

4. Siemens "P4/P5" Series

F. Top and bottom gutter space shall not be less than 6-inches high. Provide 6-inches additional gutter space in all panels where double lugs are required or where cable ampere size exceeds bus ampere size.

G. Panel dimensions.

1. Panels with buss sizes 50 amp thru 400 amp.

a. Shall be 20-inches wide. Surface or flush mounting as indicated.

b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.

c. Depth shall be 5.75-inches nominal. Height of panel as required for devices.

2. Panels with buss sizes greater than 400 amp.

a. Narrow panels 24-inch (maximum) wide by 6.5-inches (maximum) deep units. Wide panels' 25-inch to 44-inches (maximum) wide by 8-inches to 15-inches (maximum) deep units. Nominal 90-inch panel height.

b. The wider units shall be used only at locations where the narrow unit is not available with the quantity or size of large-ampere frame branch/sub-feed circuit protective devices shown on the panel schedules, or where the main breaker size exceeds the narrow panel maximum.

c. Distribution panels shall be floor standing and supported from behind the panels at walls.

H. Distribution panels and branch circuit panels maximum load rating

1. Panelboards and Distribution Panels exceeding 800-amp load rating shall not be permitted.

2. Provide Distribution Switchboards instead of Distribution Panels for bus load and circuit load ratings exceeding 800-amp.

I. Panel Auxiliary Cabinets

1. Panelboards shown on the Drawings with relays, time clocks or other control devices shall have a separate auxiliary metal barriered compartment mounted above panel.

2. Panelboards with circuits controlled by low voltage remote control relays shall be provided with separate auxiliary cabinets to contain the relays, adjacent to the panelboard.

3. Provide auxiliary cabinets with separate hinged locking door to match panelboard.

4. Provide mounting subbase in cabinet for control devices and wiring terminal strips.

J. Panels shall have a circuit index cardholder removable type, with clear plastic cover. Index card shall have circuit numbers imprinted to match circuit breaker numbers.

1. The panel identification nameplate shall describe the respective panel name and voltage, corresponding to the Contract Documents.

2. The electrical power source, name and location of each panel supply-feeder and supply equipment name shall also be identified and described on the respective panel name-plate.

K. SPD - Surge Protection Device

1. Provide each of the following branch circuit panel and distribution panel types with a SPD and RF filtering:

a. 208/120 volt - single phase and/or three phase.

b. 120/240 volt - single phase.

c. 480/277 volt - single phase and/or three phase.

2. The SPD shall be installed inside the respective panel housing and shall be factory connected to each main phase, ground and neutral bus inside the panel.

3. The SPD monitor/annunciator indicators shall be visible only when the panel access door is in the open position.

4. Provide a 20-amp 3-pole (2-pole for single-phase panels) branch circuit protection device in each panel for SPD connection.

5. The SPD device and panel shall be UL labeled and listed for combined use. See related Specification Sections for Additional SPD Requirements.

2.2 SHORT CIRCUIT RATING

A. Circuit protective devices and bussing as indicated on the Drawings. All devices and bussing shall have a short circuit fault withstand and interrupting capacity not less than the maximum available fault current at the panel and as indicated on the Drawings, plus a 25% additional capacity (safety margin). However, in no case shall the short circuit fault interrupting and withstand capacity be less than the following symmetrical short circuit.

	C/B and/or Bus Rating	Circuit Voltage	Short Circuit Amp
1.	400A and less	240V and below	10,000A

2.	400A and less	over 240V and below 600V	14,000A
3.	Over 400A, 800A & below	240V and below	42,000A
4.	Over 400A, 800A & below	over 240V and below 600V	30,000A

B. Panel Short Circuit Fault Rating

1. General

a. Provide a "fully rated" for short circuit fault interrupt and full load ampere main circuit breaker in each branch circuit panel and/or each distribution panel. Provide the main circuit breaker whether or not a main circuit breaker is shown otherwise on the Drawings, schedules or diagrams. The "utility-source" plus the "motor-load" transient contributions shall be used to establish the available fault duty values, unless indicated otherwise on the Drawings.

b. The panel main circuit breaker full load ampere capacity rating shall equal the respective panel main bus ampere rating.

c. The panel assembly, buss and circuit protection devices bolted fault short circuit withstand and bolted fault short circuit interrupt ratings shall not be less than 125% greater (including a 25% safety margin) than the available utility-source symmetrical and asymmetrical bolted fault short circuit current when "series combined rated" with the panel main circuit breaker.

d. The main circuit breaker rated "bolted-fault" short circuit fault interrupt and withstand short circuit rating shall not be less than 125% (including a 25% safety margin) of the upstream main service entrance "bolted-fault" available (symmetrical and asymmetrical) short circuit current.

2. Distribution Panelboards

a. Distribution panel, main circuit breaker, all feeder circuit breakers, and all branch circuit breakers shall be "fully-rated" (plus safety margin) for the available bolted fault short circuit current (including safety margin).

b. Shall provide time/current-tripping coordination with downstream equipment and upstream equipment.

3. Non-emergency branch circuit panelboards 400-amp buss and smaller; Non-emergency branch circuit panelboards 400-amp trip main circuit breaker and smaller.

a. The branch circuit panel main circuit breaker shall be "fully-rated" (plus safety margin) Current Limiting Circuit Breaker type (CLCB). Shall provide time/current- tripping coordination with upstream equipment.

b. The branch circuit panel main circuit breaker shall be "series-rated" with the panel downstream branch circuit devices and panel bussing. "The series-rating" shall provide short circuit bolted fault current withstand protection and short circuit bolted fault interrupt rating protection during a downstream 3-phase line-to-line and/or single-phase line-to-ground short circuit bolted faults.

c. Typical for branch circuit panelboards connected to normal-power (non-emergency) power circuits.

2.3 PANEL CIRCUIT BREAKERS, CIRCUIT PROTECTION DEVICES

A. Circuit Breakers General, for Distribution Panels and Panelboards

1. NEMA-AB1 and AB3 comply with latest revision.

2. UL-1087, UL-489 and IEC-60.947.2 rated devices comply with latest revision.

3. 5Hz AC closing and 3Hz AC trip and clear.

4. Main circuit breakers for distribution panels exceeding 400 amp and larger.

a. Shall be Insulated Case Circuit Breaker type ICCB.

5. Main circuit breakers for branch circuit panelboards 400-amp buss and smaller.

a. Shall be Current Limiting Circuit Breaker type-CLCB for non-emergency panelboards.

b. Shall be Molded Case Circuit Breaker type-MCCB for emergency panelboards.

6. Branch circuit breakers and feeder circuit breakers smaller than 100-amp trip shall be Molded Case Circuit Breakers type-MCCB and/or Current Limiting Circuit Breakers type-CLCB.

7. All circuit breakers 100 amp and larger trip shall employ sensors and solid state digital electronic automatic trip system. Short-time and long-time Time/current curve shaping field adjustable functions and adjustable instantaneous trip. Typical for Molded Case Circuit Breaker type-MCCB, Insulated Case Circuit Breaker type-ICCB and Current Limiting Circuit Breaker type-CLCB.

B. Manufacturer

1. Circuit breakers as manufactured by the following companies only are acceptable:

a. Cutler Hammer

b. General Electric Co.

c. Square D Co.

d. Siemens

C. Configuration

1. 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.

2. 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.

3. Panelboard circuit protection devices shall be bolt on type for connection to panel bus. Removable and installable without disturbing adjacent devices.

4. Provide conductor wire terminations (lugs) on each circuit protection device for incoming main feeder, branch circuits and outgoing feeder circuits. Dual rated copper/aluminum and compatible with the respective conductor size, type and quantity.

5. 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.

6. Branch circuit panels shall be field convertible for bottom entry main incoming feeder or top entry main incoming feeder.

7. Each panel section, the feeder and branch circuit protection devices (3-phase and/or 1-phase) shall be “twin-mount”, side-by-side double row construction for the following circuit sizes:

a. 480/277 volt, 60-amp circuit size and smaller.

b. 240 volt – 208/120-volt, 100-amp circuit size and smaller.

D. Lock-Off and Lock-On

1. All circuit breakers shall be pad-lockable in the "off" position.

2. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall also be furnished with lockout clips, mounted in the “on” position. The breakers shall be able to trip automatically with lockout clips in place.

3. Provide lock-on clips on branch circuit breakers supplying fire alarm equipment and fire alarm panels. Provide identification of the dedicated "fire alarm" circuit function and operation. Color-code the circuit breakers to comply with AHJ Requirements.

4. 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 the Owner's Representative.

E. Switch and Fuse Feeder Protective Devices for Distribution Panels

1. Locations where the Drawings show distribution panels employing switch-fuse circuit protection devices.

2. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class “R” fuses Current Limiting Fuses (CLF). Switches with ratings up to and including 100-amp at 240 volts shall be twins mounted. Switches rated through 60-amp and 480 volts shall be twins mounted. Provisions for padlocking in the “on” and/or “off” positions. Switches shall be removable from front of panel without disturbing adjacent units or panel bus structure.

3. Fuses shall be time delay current limiting types, UL Class RK-1 unless otherwise indicated on the Drawings.

   Provide one spare set of fuses of each size and type in each Distribution Panel.

4. Provide auxiliary contact on switch for remote status (on-off) signaling and monitoring. Provide conductor lugs to accept conductor temperature rating, sizes and quantities shown on Drawings.

5. Switch and fuse devices shall be permitted only in distribution panels and only where specifically indicated on the Drawings for feeders.

2.4 PANEL BUSSING

A. Bus Material

1. Bussing shall be rectangular cross section tin-plated copper. As directed by Owner, aluminum panel busing shall not be permitted.

2. Bussing shall be non-tapped, full length of the enclosure.

B. Ground Bus

1. Each panel 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.

2. Provide additional isolated ground bus in each panel with connecting isolated ground feeders and/or connecting isolated ground branch circuits.

C. Provisions

1. Provide space and all hardware and bus mounting attachments for future devices as indicated on the Drawings.

D. Neutral Bus

1. The ampere rating of the neutral bus of panels and distribution panels shall be a minimum of 100% greater ampere capacity than the ampere rating of the corresponding phase bus, where the panel is indicated to be provided with an "oversize-neutral" or "200%" neutral on the Drawings.

2.5 TERMINAL AND AUXILIARY CABINETS

A. Cabinets

1. 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, provide the quantity of 2-way Feed through conductor terminals required for termination of all conductors, plus 15% spares of each type.

2. Cabinet locks to operate from same key used for panel-boards. The trim to cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door into cabinets. All cabinets shall have ⅝-inch plywood backing, finished with fireproof intumescent primer and finish coat paint. Provide equipment ground bus in each cabinet.

3. 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.) finish color paint to match surrounding and manufacture's standard gray color in switchboard, janitors, heater, and storage rooms.

4. Provide grounded metal barriers inside cabinet to isolate and separate line voltage and low voltage from each other inside the cabinet.

B. Cabinet dimensions.

1. Unless indicated otherwise on Drawings.

a. Shall be 20-inches wide. Surface or flush mounting as indicated.

b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.

2. Depth shall be 5.75-inches nominal. Height of cabinet as required for devices, plus 25% spare unused interior space for future use, but not less than 36-inches high.

C. Terminals

1. Non-digital analog circuits; line and low voltage modular signal systems, 15-amp dual row with isolation barriers, screw-down terminals insulated strips, heavy duty.

a. As manufactured by: Molex, or ITT-Cannon, or General Electric.

2. Digital circuits; low voltage signal systems, ANSI/EIA/TIA Category-6, 110-Block or 66-Block gas-tight punch down style, heavy duty.

    a. As manufactured by: Leviton, Ortronics, or AMP.

D. Identification (Additional Requirements)

1. Provide engraved nameplate on each cabinet indicating its designation and system (i.e., “Life Safety System - Panel 2LS”, etc.).

2. Identify each terminal landing with unique circuit number and provide corresponding alphanumeric text-index card inside panel access door

PART 3 - EXECUTION

3.1 MOUNTING

A. Flush mounted panelboards and terminal cabinets shall be securely fastened to at least two studs or structural members. Trim shall be flush with finished surface.

1. Panels and cabinets installed flush (recess or semi-recess) into fire rated or smoke rated walls. The wall recess shall be fully wrapped inside the recess with fire/smoke rated materials. The wrap-materials shall provide the same fire and/or smoke protection rating as the respective wall.

B. Surface mounted panels and terminal cabinets shall be secured to walls by means of preformed galvanized steel channels securely fastened to at least two studs or structural members.

C. Panelboards and terminal cabinets 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.

3.2 IDENTIFICATION (ADDITIONAL REQUIREMENTS)

A. Provide a red and white Bakelite nameplate with ½-inch 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. Manufacturer shall stencil the panel/cabinet number identification on the inside of door to correspond with the 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.

3.3 SPARE CONDUITS (ADDITIONAL REQUIREMENTS)

Provide three 1-inch conduit only stubs from each panel and terminal cabinet into accessible ceiling space. Where floor level below panel or terminal cabinet is accessible, also provide an additional three 1-inch conduit only stubs into accessible floor space.

End of Section

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes Subgrade preparation, including clearing, grading, excavation, filling and compaction and dewatering, as shown and noted on the drawings and specified. Subgrade is that area on which concrete, aggregate base, paving, asphalt, or other non-organic material is to be placed. The General Conditions and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES:

A. The editions referenced herein of the standards and specifications published by the following organizations, apply to the work only to the extent specified by the reference.

B. Caltrans Standard Specifications. Reference to "Caltrans Standard Specifications" shall mean the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.

C. ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

D. ASTM D4318-17e1 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.3 RELATED REQUIREMENTS:

A. Section 31 22 00 - Grading

B. Section 32 13 13 - Site Concrete

1.4 STIPULATIONS:

A. The finished surface of the subgrade, at any point, shall not vary more than 0.05 feet above or below the elevation indicated on the drawings.

B. Finish Surface Tolerance: 1/4-inch maximum variation in 10 feet.

1.5 SUBMITTALS:

A. Shop Drawings:

1. Material list and product data of all items proposed to be provided under this Section.

2. Certificates (certified analysis of certificate of compliance) signed by the material producer.

1.6 SOILS REPORT:

A. Per the soil investigation report that has been prepared for the adjacent project entitled:

1. Geotechnical Exploration, prepared for Victor Valley College District Proposed Sports Field Building Additions, 18422 Bear Valley Road, Victorville, CA, dated January 17, 2025 by Verdantas Inc., Project No. 038.0000027181

B. This report is available in the office of the Architect and the Construction Manager for inspection by the Contractor. It is intended that all work be performed in accordance with the recommendations of this report.

1.7 SOILS BORINGS:

A. Subsurface soils investigations have been made at the site and logs of the test holes are available with the soils report. Such investigations have been made for the purposes of design only, and neither the Architect, the Owner, nor the Soils Engineers guarantee adequacy or accuracy of the data, or that data are representative of all conditions to be encountered. Such information is made available for general information only and shall not relieve the Contractor of the responsibility for making his own investigations

1.8 PROJECT CONDITIONS:

A. Coordination: Coordinate this work with the work of other Sections to avoid delay and interference with other work.

B. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.

C. Underpin adjacent structure(s), including utility service lines, which may be damaged by excavation operations.

D. Promptly repair damage to adjacent facilities caused by earthwork operations. Cost of repair at Contractor's expense.

E. Promptly notify the Inspector of unexpected subsurface conditions.

1.9 PROTECTION:

A. Furnish, place and maintain all supports, shoring and sheet piling which may be disturbed by earthwork operations.

B. Maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.

C. Adjacent streets, sidewalks, and property shall be kept free of mud, dirt, or similar nuisances resulting from earthwork operations.

D. Provide for surface drainage during the period of construction in a manner to avoid creating a nuisance to adjacent areas.

E. Water as required to suppress dust nuisance.

F. Protection of Existing Improvements

1. Provide barricades, covering, or other types of protection necessary to prevent damage to existing improvements indicated to remain in place. Protect improvements on adjoining properties. Repair damaged existing improvements to original condition as approved by authority having jurisdiction.

G. Provide erosion control measures as required.

H. Protection of Other Property: Excavation and other work over, under and adjacent to existing pipelines, cables, conduit runs or structures of any kind shall be procured in such a manner as not to interfere with the safe operation and use of such installations. Should any damage be incurred to existing facilities during the Contractor's operations, the Contractor shall immediately notify the Owner's Representative and authorities, and shall arrange for the immediate repair of same at his own expense.

I. Control of Water: Take measures and provide and operate such pumps or other devices to remove seepage, storm water or sewage that may be found or may accumulate in the excavations during the progress of the work. Keep excavations entirely free from water at all times during the construction of the work, and until the Geotechnical Engineer gives permission to cease pumping.

1.10 FIELD QUALITY CONTROL:

A. Provide adequate notice, cooperate with, provide access to the work, and assist testing agency and their representatives in execution of their function.

B. When, during the progress of work, field tests indicate that installed compacted materials do not meet specified requirements, provide additional compaction until specified density is achieved, or remove and replace defective materials with new materials as directed by the Inspector. Cost of additional labor, materials, and testing to attain specified density at Contractor's expense.

C. Engage a California Registered Civil Engineer or licensed Land Surveyor to perform field engineering.

1.11 TESTING:

A. Testing and Inspection: Testing shall be performed by a qualified independent testing laboratory under the supervision of a registered professional engineer, specializing in soils engineering.

B. The Owner will direct, provide and pay for initial testing and inspection during operations.

C. Provide and pay for re-testing and inspection during operations. Laboratory and inspection service shall be acceptable to the Owner and be a DSA approved LEA laboratory

D. Where reference is made to relative compaction, it shall be the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, determined by the ASTM D1557-12e1 laboratory test procedure. Optimum moisture is the water content that corresponds to the maximum dry density.

E. For structural fills under footings, slabs or pavements, determine moisture-density relationships in accordance with ASTM D1557.

F. Plasticity Index: ASTM D4318-17e1.

1.12 GENERAL REQUIREMENTS:

A. When rain is forecast, temporary measures to protect areas of the exposed subgrade from saturation by rainfall or runoff shall be taken. These include, but are not limited to, covering grading and sloping of subgrade surfaces to prevent ponding, sealing disturbed, uneven subgrade, surfaces with a smooth drum roller, grading and excavating diversionary swales, trenches or detention basins.

B. Failure to comply with the above requirements to take reasonable and adequate measures or exercise sound engineering and construction practices to protect the work from damage. Repair work shall be performed at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION:

A. Remove topsoil, stumps, roots, grasses and weeds and soils containing detrimental amounts of organic material, vegetable matter, other deleterious substances, or rocks or lumps of a greater dimension than 3 inches to the satisfaction of the Geotechnical Engineer. Organics, debris, trash and unsuitable material should be removed from the grading area and hauled offsite. Grind tree roots to 12 inches below final grade.

B. Non-structural areas planned for new asphalt or concrete pavement (such as parking areas or fire lanes), flatwork (such as sidewalks), site walls (less than 8 feet tall) and low retaining walls (less than 4 feet tall), areas to receive fill, and other improvements, should be over excavated to a minimum depth of 2 feet below existing grade or 12 " below proposed subgrade (including the footing subgrade for walls), whichever is deeper. For proposed equipment pads and taller walls, the over excavation shall extend a minimum of 4 feet below existing grade or 2 feet below bottom of proposed foundations, whichever is deeper.

C. All surfaces to receive asphalt concrete paving or concrete slabs-on-grade should be processed and tested to assure compaction for a depth of at least of 12 inches. This may be accomplished by a combination of overexcavation, scarification and recompaction of the surface, and replacement of the excavated material as controlled compacted fill. Compaction of the slab areas should be to a minimum of 90 percent relative compaction. Compaction within the proposed pavement areas should be to a minimum of 95 percent relative compaction for both the subgrade and base course.

D. Removed or over-excavated soils may be moisture-conditioned to near optimum moisture content and re-compacted as engineered fill, except for soils containing detrimental amounts of organic material, vegetable matter, other deleterious substances, or rocks or lumps of a greater dimension than 3 inches. Harrow, dry roll and break clods to achieve a finely divided condition with a maximum particle size of 3 inches. The earth shall be uniform for the full depth and width of the subgrade. Compact fill materials to a minimum of 90% of the maximum dry density per ASTM D1557-12e1.

E. Relative compaction, maximum dry density, and optimum moisture content of fill materials shall be determined in accordance with ASTM Test Method D1557-12e1, "Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using a 10-lb. Rammer and 18-in. Drop.

F. The finished subgrade surface shall be firm and unyielding under the weight of a loaded water truck traveling over the surface.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY:

A. This Section includes, but is not necessarily limited to, incidental to stripping, clearing, excavating, grading, filling, backfilling, and base placement, as shown, described, or reasonably inferred by drawings.

1.2 REFERENCES

A. 2022 California Building Code, including Chapters 18A, 33 and accessibility regulations, chapter 11B.

B. Standard Specifications for Public Works Construction (SSPWC), current edition, as adopted by local jurisdiction.

C. California Department of Transportation (Caltrans), Standard Specifications, current edition.

D. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones", current edition, as adopted by local jurisdiction.

E. ASTM D4829-19 Standard Test Method for Expansion Index of Soils

F. CAL-OSHA Requirements, including all applicable portions of Title 8 and the California Labor Code.

1.2 RELATED

A. Per the soil investigation report that has been prepared for the adjacent project entitled:

1. Geotechnical Exploration, prepared for Victor Valley College District Proposed Sports Field Building Additions, 18422 Bear Valley Road, Victorville, CA, dated January 17, 2025 by Verdantas Inc., Project No. 038.0000027181

B. Section 02 41 19 – Selective Structure Demolition

C. Section 31 11 13 - Subgrade Preparation

1.3 PROJECT AND SITE CONDITIONS

A. Control dust on or near the site resulting from the performance of the work. Moisten surfaces to prevent dust being a nuisance to the public, adjacent uses, and concurrent work on site. Moisture level shall not exceed that amount as specified by Geotechnical Engineer.

B. Verify existing grades and dimensions before starting any grading operations. If any discrepancy exists, notify Architect immediately.

C. Protect and maintain existing features, products, or items designated to remain, including existing benchmarks, as well as all work of this section throughout course of work. In the

event of damage, repair or replace immediately, including accurate re-establishment of monuments or stakes disturbed or destroyed during course of work, to the approval of and at no additional cost to the Owner.

D. Coordinate operations with, and provide access to, the Geotechnical Engineer or designated representative during demolition and construction for purposes of testing, investigation and inspection.

1.4 SUBMITTALS

A. Testing

1. Owner will retain and pay a qualified geotechnical engineer to take field samples and do laboratory testing necessary to verify compliance of the Work to these Specifications or as required by the applicable regulatory agencies. The Geotechnical Engineer shall submit results of all testing done during the course of the Work to the Owner, Architect, and Contractor.

2. Give testing lab at least two working days in advance notice of need to schedule testing.

3. Should testing specified above reveal work which does not satisfy these Specifications, Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.

1.6 REGULATORY REQUIREMENTS

A. Obtain permits, licenses, or agreements required by legally constituted agency, pay for fees and give notices required for the construction of the work.

B. Comply to Rule 1404, South Coast Air Quality Management District.

C. Coordinate clearing Work with utility companies.

PART 2 PRODUCTS

2.1 FILL MATERIAL FOR SUB-GRADE PREPARATION

A. General

1. Fill materials are subject to approval by the Geotechnical Engineer for the particular location and method of placing and compacting.

2. Material excavated on-site may be used as fills, with prior Geotechnical Engineer inspection and approval.

3. Site Materials

a. On-site fill materials shall be free of organic or deleterious products in excess of 3 percent by volume, and shall have an Expansion Index of 20 or less as determined in accordance with ASTM D4829-19 (CBC 1803A-5.3,4). On-site fill material to be approved by Geotechnical Engineer.

b. Fill materials shall not contain lumps over 3 inches or rocks larger than 4 inches in greatest dimension.

c. Not more than 15 percent of fill material products shall exceed 2-1/2 inches in greatest dimension.

d. Moisture content of existing soils may require adjustment for compaction approval.

4. Import Materials

a. Import material shall meet the requirements of 2.01 A and B above.

b. Material shall be granular in nature, Plasticity Index of 12 or less, have an Expansion Index of 30 or less in accordance with ASTM D4829-19 (reference CBC equivalent) and readily compacted without excessive voids.

c. Prior approval by Geotechnical Engineer shall be required before delivering to site.

PART 3 EXECUTION

3.1 SITE CONDITIONS

A. Inspection

1. Verify that work may proceed in complete accordance with the original design.

3.2 PREPARATION

A. Give Owner and affected parties, including serving utilities, two business days advance notice of service discontinuation.

B. Disconnect and remove utilities, services and other underground obstructions as noted on drawings in accordance with the regulations of the utilities concerned.

C. Cap exposed utilities to be removed. The method of capping or plugging will be determined by the type of material encountered on the job and shall be reviewed by the Engineer or the jurisdiction having authority.

D. When piping is exposed and removed, uncover its extensions to a point at least three feet below future finish grade and a minimum of 10 feet beyond line of footing zone of influence. Remove pipes to these points and backfill as specified below.

E. Verify that existing plant life designated to remain is tagged or identified. Protect plants in place. Damaged, dying, and dead plants to remain shall be replaced in-kind at the owner's discretion and addition cost.

3.3 PROTECTION

A. Protect existing structures and site improvements indicated to remain, from damage.

B. Protect Existing Utilities to remain traversing the job-site and serving existing adjacent facilities.

C. Protect existing site furnishings installed for reuse from damage. Damaged furnishings shall be replaced in-kind or repaired at the owner's discretion at no additional cost.

3.4 CLEARING AND GRUBBING

A. Grubbing

1. Remove all surface pavements, rocks, debris, trash, and all trees, stumps, roots, and other vegetation within the extent of construction as indicated by the drawings. Do not remove vegetation designated to remain.

2. Grub soils to a minimum depth of 6 inches.

3. Do not leave any root greater than 1/2 inch in diameter in the ground except as specifically approved by the Architect.

4. Stockpile soils containing organic content in excess of 3 percent by volume for future use in landscaped areas.

5. Removal

a. Remove debris, rock, and extracted plant life from site.

b. Excavate and remove associated plumbing piping.

c. Prior to demolition work, the Contractor shall notify the District Representative to identify the existing items for salvage purposes. The materials identified for salvage shall be returned to the District in a timely manner agreed upon by the District Representative.

3.6 Removed concrete and bituminous materials shall be disposed of off-site Items to be removed shall be disposed of off the property in a legal manner.

A. Bituminous pavement saw cutting shall conform to the provisions of Section 300-1.3.2 (a) of the Standard Specifications (SSPWC). The residue resulting from the saw cutting operations shall not be permitted to flow beyond the specific work location and shall be removed the same day.

B. Removal of concrete curb, or curb and gutter, shall include saw-cutting and removal of a twelve inch wide section of the adjacent bituminous pavement.

3.7 Concrete curb and concrete curb and gutter shall be removed to the lines, grades and locations shown on the plans in accordance with Section 300-1.3.2 of the Standard Specifications (SSPWC).

3.8 Concrete removal in sidewalk and entry areas shall extend to existing score lines unless specifically indicated otherwise on the Plans or in the Project Special Provisions, or unless otherwise approved by the Engineer.

A. Reinforcing or other steel may be encountered in portions of concrete to be removed. No additional compensation will be allowed for the removal of concrete containing reinforcing or other steel.

3.9 EXCAVATION

A. General

1. Make cuts in long uniform passes using appropriate equipment.
2. Edges of cut areas shall be benched so that the resulting overall slope does not exceed 2 horizontal to 1 vertical.
3. Excavate to depths to remove existing slab, footings, and base thickness. Determine actual sub-grade elevations to accommodate excavation of foundation and associated appurtenances. Remove and export excavated material not designated as backfill or stockpiling.
4. Excavation
    a. Excavate existing material as defined in this specification. Surface shall be free of ruts, hummocks, and other uneven surface features.
    b. Stabilize and remove pumping areas, soft spots, organic deposits, undocumented fill soils, slope wash soils, and other unsuitable soils as directed by Geotechnical Engineer. Scarify, compact and fill resulting void as specified below.
    c. Do not excavate beyond line and depth as required by the construction drawings and or this specification. Replace over-excavation with approved fill material and compacted as specified below at no additional cost to Owner.
    d. Excavated surfaces shall be approved by Geotechnical Engineer prior to proceeding with scarification and compaction, and prior to proceeding with any fill placement.
    e. Stabilize areas receiving engineered fill using methods approved by the geotechnical engineer.
    f. Areas receiving fill material, bridging of sub base with fabric and bedding material shall be completed under the direction of the Geotechnical Engineer.
    g. At areas where finish grade will result in a cut of previously placed fill materials, verify that soils within three feet of finish grade have an in-place relative compaction of at least 90 percent. Where soils areas do not exhibit 90 percent relative compaction, remove and re-compact as specified below.
    h. Excavated, cleared and grubbed earthwork surfaces shall be scarified and compacted where directed by the Geotechnical Engineer. Scarify to a depth of twelve inches, moisture condition, and compact to a minimum of 90 percent compaction per ASTM D1557-12e1.
    i. Unnecessary or unsuitable excavated materials shall be exported to a legal disposal site.

3.10 FILL PLACEMENT

A. General

1. Spread and thoroughly blend all fill material, including backfill, in uniform lifts not to exceed 6 inches in depth after compaction.
2. Optimum moisture content and compaction densities shall be as determined by ASTM D1557-12e1.
3. Material containing less than optimum moisture shall be sprinkled with water and thoroughly mixed with the soil by blading or discing before compacting.
4. Allow material containing excess water to dry uniformly to within 3 percent of the optimum moisture content before compacting.
5. Compact each lift of fill to minimum 90 percent uniform relative density throughout each lift.
6. Jetting not permitted in any application for compaction.
7. Tests shall be performed by the Geotechnical Engineer.
8. Sub-Grade Benching
    a. Where slope surface exceeds 5.0 to 1 (H to V) or steeper, bench slope surface in flat benches a minimum of ten (10) feet in width prior to fill placement. Scarify and compact bench as specified above.
    b. Key all fills as specified by Geotechnical Engineer.
9. Compaction Requirements
    a. Structures: Compact fills to at least 95 percent of maximum dry density determined in accordance with per ASTM D1557-12e1. Extend a minimum of 5 feet beyond footings.
    b. Paved Areas: Compact upper 6 inches of fill in paved areas to 95 percent, with remainder compacted to 90 percent.
    c. Landscaped Areas: Compact landscape planting areas to minimum 80 percent, maximum 85 percent per ASTM D1557-12e1, unless areas are within 5 feet of footings as noted above.

3.11 FIELD QUALITY CONTROL: DENSITY TESTING

A. General: Testing shall be the responsibility of the Owner, unless noted otherwise. Cost of initial testing will be paid by Owner. Cost of all convenience testing, or additional testing necessary due to non-compliance with specifications shall be paid by Contractor. Contractor's test lab shall be a DSA approved LEA lab.

B. Density Test
1. Density tests shall be performed by an approved commercial testing laboratory approved per ASTM D1557-12e1.
2. Tests shall be performed in accordance with the referenced Standards.
3. Field and laboratory tests for moisture-density relations shall be determined in accordance with ASTM D1557-12e1.

4. The frequency and location of field density tests will be determined by the Geotechnical Engineer, and as a minimum, as required by local jurisdictional authority.

5. Reopen improperly compacted soils to depth directed, then refill and compact to specified density at no additional cost to Owner.

6. Final earthwork receiving slabs and exterior paving shall be tested to verify in place that densities comply with specified values.

3.12 FINISH SITE GRADING AND PROTECTION

A. Grade surfaces on site where indicated and within construction areas to elevations indicated and as required to insure proper drainage and disposal of surface water. Shape landscape grades to drain away from buildings at minimum 5% slope. Shape paved surfaces to drain away from building at minimum 1% slope. Maximum cross slopes at all walkways shall be 2% for accessible access.

B. After grading is completed, and the Geotechnical Engineer has finished observation of the work, no further earthwork shall be done except with the review of, and under the observation of, the Geotechnical Engineer.

3.13 EARTHWORK TOLERANCES

A. All rough grading shall be placed to a vertical tolerance of plus or minus .08 foot.

B. All rough grading shall be placed to a horizontal tolerance of plus or minus .5 foot.

C. Place final grading to a vertical tolerance of plus or minus 0.05 foot.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes:

1. Completion of earthwork for site improvements, including excavation, compaction, filling, and backfill.

1.2 REFERENCES

A. 2022 California Building Code, including Chapters 18 and 33, and accessibility regulations.

B. Standard Specifications for Public Works Construction (SSPWC), current edition, as adopted by local jurisdiction.

C. California Department of Transportation (Caltrans), Standard Specifications dated 2023.

D. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones", current edition, as adopted by local jurisdiction.

E. Applicable municipal and agency standards regarding excavation, shoring, and dewatering work.

F. CAL-OSHA Requirements, including all applicable portions of Title 8 and the California Labor Code

G. Local jurisdictional and agency Engineering and Public Works regulations and standards.

H. Local Parking and Fire Department regulations.

I. ASTM D 4829-19 Standard Test Method for Expansion Index of Soils

J. ASTM D1557-12e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort

K. ASTM E548 Standard Guide for General Criteria Used for Evaluating Laboratory Competence

L. ASTM C131-14 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

M. ASTM Test Method D2922-5, D3017-5, D1556-15e1, and D2937-17e2.

1.3 RELATED:

A. Per the soil investigation report that has been prepared for the adjacent project entitled:

1. Geotechnical Exploration, prepared for Victor Valley College District Proposed Sports Field Building Additions, 18422 Bear Valley Road, Victorville, CA, dated January 17, 2025 by Verdantas Inc., Project No. 038.0000027181

B. Section 31 22 00 – Grading

C. Section 32 91 13 – Soil Preparation

1.4 PROJECT/SITE CONDITIONS

A. Use all means necessary to control dust on or near site resulting from performance of work. Thoroughly moisten surfaces to prevent dust being a nuisance to public, adjacent uses, and concurrent work on site. Moisture level shall not exceed that amount as specified by the Geotechnical Engineer.

B. Verify existing grades and dimensions before starting any grading operations. If any discrepancy exists, notify Architect and Owner immediately.

C. Protect existing and maintain features, products, or items designated to remain, including existing benchmarks, as well as all work of this section throughout course of work. In the event of damage, repair or replace immediately, including accurate re-establishment of monuments or stakes disturbed or destroyed during course of work, to the approval of and at no additional cost to the Owner.

D. Conduct work so as to avoid injury to persons and damage to adjacent property. Provide appropriate shoring, bracing and barriers, including warning lights when necessary.

E. Coordinate operations with, and provide access to, the Geotechnical Engineer or designated representative during demolition and construction for purposes of testing, investigation and inspection

1.5 SUBMITTALS

A. Samples: Submit samples of materials used for Geotechnical Engineer's review wherever specified or as directed by the Geotechnical Engineer.

B. Testing:

1. Owner will retain and pay a qualified Geotechnical Engineer to take field samples and do laboratory testing necessary to verify compliance of work to these specifications or as required by the Division of the State Architect or other regulatory agencies. The Geotechnical Engineer shall submit results of testing done during course of work to Owner, Architect, Contractor, and Project Inspector.

2. Give testing lab at least two working days in advance notice of need to schedule testing.

3. Should testing specified above reveal work which does not satisfy these Specifications, Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.

4. If, in the opinion of Geotechnical Engineer, unsatisfactory conditions, such as questionable soil, poor moisture condition, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, Geotechnical Engineer is authorized by the Owner to reject work and recommend that construction be stopped until conditions are rectified, at no additional cost to Owner.

D. Certification: Upon completion of the Work, certify in writing that earthwork was performed in accordance with this specification and as shown on drawings.

PART 2 - PRODUCTS

2.1 FILL MATERIAL FOR SUB-GRADE PREPARATION

A. General:

1. Fill materials are subject to approval by the Geotechnical Engineer for the particular location and method of placing and compacting.

2. Material excavated on-site may be used as fills, with prior Geotechnical Engineer inspection and approval.

3. See Section 32 9113 Soil Preparation for additional soil requirements at landscaped areas.

B. Site Materials:

1. On-site fill materials shall be free of organic or deleterious products in excess of 3% by volume, and shall have an Expansion Index of 35 or less per UBC Standard Table 18-I-B.

2. Fill materials shall not contain rocks over 4 inches or lumps over 3 inches in greatest dimension.

3. Not more than 15% of fill material products shall exceed 2-1/2 inches in greatest dimension.

4. Moisture content of existing soils may require adjustment for compaction approval.

C. Import Materials:

1. Import material shall meet the requirements of 2.1 A and B above.

2. Material shall be granular in nature, Plasticity Index of 12 or less, have an Expansion Index of 30 or less in accordance with ASTM D4829-19, and readily compacted without excessive voids.

3. Prior approval by the Geotechnical Engineer shall be required before delivering to site.

2.2 CRUSHED ROCK

A. Per Standard Specifications Section 200-1.2, 1 inch size, Class A per ASTM C131-14.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspection:

1. Prior to performing the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where work may properly commence.

2. Verify that work may proceed in complete accordance with the original design.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Architect.

2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

C. Clearing: Remove any surface grasses or other vegetation established since completion of previous earthwork operations.

D. Pad Grade/Line Review:

1. Prior to beginning building construction, review condition of earthwork, including comparison of certifications required under previous contract and actual conditions.

2. Notify Architect of any discrepancies between grade and line as shown on drawings and actual conditions. Tolerances in evaluating such discrepancies shall be as defined below.

E. Two working days prior to any below grade work, contact Underground Service Alert of Southern California (DIGALERT) (800) 227-2600 to locate and mark all existing below grade utilities.

F. Give Owner and all affected parties two business days advance notice of service discontinuation or interruption.

3.2 EXCAVATION

A. Excavate existing material as defined in this specification and as required by drawings. Surface shall be free of ruts, hummocks, and other uneven surface features.

B. Remove pumping areas, soft spots, organic deposits, undocumented fill soils, slope wash soils, and other unsuitable soils as directed by Geotechnical Engineer. Scarify, compact and fill resulting void as specified below.

C. Do not excavate beyond line and depth as required by this specification. Replace over-excavation with approved fill material and compacted as specified below at no additional cost to Owner.

D. Proof-roll areas receiving engineered fill using heavy smooth drum vibratory or track type equipment under observation of geotechnical engineer.

E. Excavated surfaces, trenches, and footing excavation, shall be approved by Geotechnical Engineer prior to proceeding with earthwork operations and concrete reinforcement installation.

F. When required by Geotechnical Engineer, excavated, cleared and grubbed earthwork surfaces shall be scarified and compacted. Scarify to a depth of twelve (12) inches, moisture condition as necessary, and compact to a minimum of 90 percent relative compaction per ASTM D1557-12e1.

G. Segregate excavated on-site material to identify material suitable for fill.

H. Legally dispose off-site of excess trench spoils, contaminated soils, and other unnecessary or unsuitable excavated materials at no additional cost to Owner.

3.3 FILL PLACEMENT

A. General:

1. Spread and thoroughly blend fill materials, including backfill, after achieving proper moisture content. Optimum moisture content shall be as determined by ASTM D1557, Procedure A.

2. Place topsoil segregated under previous earthwork operation in uppermost 6 inches of planting areas.

3. Lifts shall not exceed eight (8) inches in uncompacted thickness or 6 inches in compacted thickness.

4. Prior to compaction, bring fill to proper moisture content by aeration or moistening.

5. Compact each lift to uniform compaction throughout each lift.

B. Compaction Requirements:

1. Structures: Compact fills to at least 90 percent of maximum dry density determined in accordance with per ASTM D1557-12e1. Extend a minimum of 5 feet beyond footings.

2. Paved Areas: Compact upper 6 inches of fill in paved areas to 95 percent, with remainder compacted to 90 percent.

3. Landscaped Areas: Compact landscape planting areas to minimum 80 percent, maximum 85 percent per ASTM D1557-12e1, unless areas are within 5 feet of footings as noted above.

3.4 SUB-GRADE COMPACTION

A. Scarify to a depth of 6 inches and compact all sub-grade surfaces to a minimum 90 percent relative density per ASTM D1557-12e1.

B. Compaction for planting areas shall be 85 percent.

3.5 FINAL EARTHWORK

A. Provide excavation, trenching, and other earthwork necessary to complete site earthwork operations and to construct foundations, slab depressions, and other portions of work.

B. Obtain Geotechnical Engineer's approval of each earthwork operation prior to continuing with earthwork sequence.

C. Grade surfaces on site where indicated and within construction areas to elevations indicated and as required to insure proper drainage and disposal of surface water. Shape landscape grades to drain away from buildings at minimum 5 percent slope.

Shape paved surfaces to drain away from building at minimum 1 percent slope. Maximum cross slopes at all walkways shall be 2 percent for disabled access.

D. After grading is completed, and Geotechnical Engineer has finished observation of work, no further earthwork shall be done except with review of and under observation of Geotechnical Engineer.

3.6 FIELD QUALITY CONTROL: DENSITY TESTING

A. Density tests shall be performed by an approved commercial testing laboratory accepted by DSA's LEA program.

B. Tests shall be performed in accordance with referenced Standards.

C. Laboratory tests for optimum moisture-density relations shall be determined in accordance with ASTM D1557-12e1.

D. Frequency and location of field density tests will be determined by Geotechnical Engineer, and as a minimum, as required by local jurisdictional authority.

E. Field in-place density and moisture shall be determined in accordance with ASTM Test Method D2922-5 and D3017-5, ASTM Test Method D1556-15e1, or ASTM Test Method D2937-17e2.

F. Reopen improperly compacted soils to depth directed, then refill and compact to specified density at no additional cost to Owner.

G. Final earthwork receiving slabs and exterior paving shall be tested to verify in place that densities comply with specified values.

3.7 EROSION AND DRAINAGE CONTROLS

A. Provide temporary apparatus, pumps, curbs or ditches to divert or convey water from any source away from work. Do not allow water from any source to accumulate within or damage earthwork.

B. Prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

C. Install such temporary drainage structures, erosion control planting and irrigation, and other erosion control measures.

3.8 EARTHWORK TOLERANCES

A. Place final grading to a vertical tolerance of plus or minus 0.05 foot.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Excavate for necessary or temporary underground services in project area.

B. Backfilling and compacting for utilities outside the building to point of connection with public /or private utility mains.

C. Cap off and seal discontinued utility services and remove from site portions of lines within excavated areas.

D. Place and compact granular beds and fills over services, to rough grade elevations.

E. Dewater excavations as required.

1.2 RELATED:

A. Section 26 05 30 – Conduit and Wire

B. Section 31 22 00 - Grading

C. Section 33 40 00 – Storm Drainage

D. Geotechnical Report

1.3 SITE COMPACTION TESTING

A. Testing of compacted fill materials will be performed by an independent testing laboratory appointed by the Owner and paid for by the Contractor. Testing will be performed so as to least encumber the performance of work.

B. Pay for costs of additional testing as required due to improper performance of work is the responsibility of the Contractor.

C. When work of this section or portions of work are completed, notify the testing laboratory to perform density tests. Do not proceed with additional portions of work until results have been verified.

D. If, during progress of work, tests indicate that compacted materials do not meet specified requirements, remove defective work, replace and retest at no cost to the Owner.

E. Ensure compacted fills are tested before proceeding with placement of surface materials.

F. Perform work in accordance with the Geotechnical Report prepared by the Geotechnical Engineer.

G. CAL-OSHA Requirements, including all applicable portions of Title 8 and the California Labor Code.

1.4 PROTECTION

A. Protect trees, shrubs and lawn, areas to receive planting, rock outcropping and other features remaining as part of final landscaping.

B. Protect bench marks and existing structures, fences, roads, sidewalks, paving and curbs against damage from vehicular or foot traffic. Install and maintain proper bridging or retaining against adjacent structures.

C. Protect excavations by shoring, bracing, sheet piling underpinning, or by other methods, as required to prevent cave-ins or loose dirt from falling into excavations.

D. Underpin or otherwise support adjacent structure(s) which may be damaged by excavation work. This includes service lines and pipe chases.

PART 2 - PRODUCTS

2.1 BED AND FILL MATERIALS

A. Gravel: Angular pit run crushed natural stone; free from shale, clay, friable materials and debris; graded within the following limits using standard sieve size:

Sieve Size	% Passing
2"	100
1"	95
3/4"	95 to 100
5/8"	75 to 100
3/8"	55 to 85
#4	35 to 60
#16	14 to 35
#40	10 to 25
#100	5 to 10

B. Controlled Density Fill: 28-day compressive strength of 1000 psi or less.

C. Sand: Clean natural river or bank sand; free from silt, clay, loam, friable or soluble materials, and organic matter; graded within the following limits:

Sieve Size	% Passing
#4	100
#14	10 to 100
#48	5 to 90
#100	5 to 20
#200	0

D. Sub-soil: Free from roots, rock larger than 3 inches in size and building debris.

E. Fill Under Landscaped Areas: Free from alkali, salt, and petroleum products. Use sub-soil excavated from site only if conforming to specified requirements.

F. Pea gravel shall not be used for fill or backfill.

G. Fill Materials shall conform to the specifications above and to those specifications stated in the Geotechnical Report.

PART 3 - EXECUTION

3.1 PREPARATION AND LAYOUT

A. Establish extent of excavation by area and elevation. Designate and identify datum elevation.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

D. Set required lines and levels.

E. Maintain bench marks, monuments and other reference points.

3.2 UTILITIES

A. Before starting excavation, establish the location and extent of underground utilities occurring in the work area.

B. Notify utility companies to remove and relocate lines which are in the way of excavation.

C. Maintain, re-route or extend as required, existing utility lines to remain which pass through the work area. Pay costs for this work, except those covered by the utility companies.

D. Protect active utility services uncovered by excavation.

E. Remove abandoned utility service lines from areas of excavation. Cap, plug or seal such lines and identify at grade.

F. Accurately locate and record abandoned and active utility lines re-routed or extended, on Project As-Built Drawings.

3.3 TRENCHING

A. Excavate for cast-in-place structures and associated forms or framing, reinforced concrete pipe Ensure trenching does not interfere with normal 45degree bearing splay of any foundation or structure.

B. Excavate in accordance with lines and grades.

C. Cut trenches sufficiently wide to enable proper installation of forming and /or framing and to allow for inspection. Trim and shape trench bottoms and leave free of irregularities, lumps and projections.

D. Do not disturb soil within branch spread of existing trees or shrubs that are to remain. If it is necessary to excavate through roots, perform work by hand and cut roots with a sharp axe.

E. When complete, request the Engineer to inspect excavations. Correct unauthorized

excavation as directed, at no cost to the Owner.

F. Stockpile excavated sub-soil for re-use where directed. Remove excess or unsuitable excavated sub-soil from site.

3.4 DEWATERING

A. Keep trenches dry. Provide necessary equipment including pumps, piping and temporary drains.

B. Direct surface drainage away from excavated areas.

C. Control the grading in and adjacent to excavations to prevent water running into excavated areas or onto adjacent properties or public thoroughfares.

D. Furnish and operate suitable pumps on a 24-hour basis to keep excavations free of water until structures have been placed and backfilling is completed.

3.5 BACKFILLING

A. Do not start backfilling until utilities have been inspected.

B. Ensure trenches are free of building debris, mud or soggy condition, snow, ice, and water and that ground surfaces are not in a frozen condition.

C. Backfill systematically and as early as possible to allow maximum time for natural settlement and compaction.

D. Place and compact fill materials in continuous layers not exceeding 6" loose depth. Use a method so as not to disturb or damage services.

E. Maintain optimum moisture content of fill materials so as to attain required compaction density.

F. Minimum degree of compaction shall be a percentage of maximum dry density as determined by ASTM D1557-12e1. Field tests shall conform to ASTM D1556-15e1 or ASTM D2922-05 and D6937-17a.

G. All fill compaction shall be in accordance with the Geotechnical Report.

H. If sand or gravel or pea gravel is used, place to within 2 feet of sub-grade elevations, compacted to 90% of maximum dry density. Fill remainder of trenches with sub-soil compacted per paragraph above.

I. Remove surplus fill materials from site as directed by Architect/Engineer.

3.6 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping and Conduits:

1. Bedding: Use clean sands in accordance with Greenbook requirements to a depth of at least 1 foot over the pipe.

2. Cover with general fill.

3. Fill up to subgrade elevation.

4. Compact in maximum 6 inch lifts to 90 percent of maximum dry density per Detail A/C002 and 3.5, D.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this Section consists of aggregate base.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced.

B. State of California, Department of Transportation (Caltrans) Standard Specifications dated 2023 Section 26, “Aggregate Base.” Article 26-1.06, “Measurement” and Article 26-1.07, “Payment” shall not apply.

C. ASTM D1557-12e1 Standard Test Method for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lb/cu. ft.)

D. ASTM D2487-17 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.3 RELATED:

A. Section 32 13 13 Site Concrete

B. Section 31 11 13 Subgrade Preparation

1.4 SUBMITTALS

A. Field density tests, sampling and testing reports shall be submitted to the Inspector.

B. Copies of waybills and delivery tickets shall be submitted during the progress of the work. Before the final payment is allowed, file certified waybills and certified delivery tickets for all aggregates actually used.

C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports

1.5 QUALITY ASSURANCE

A. Owner will retain and pay a qualified geotechnical engineer to take field samples and do laboratory testing necessary to verify compliance of the Work. The Geotechnical Engineer shall submit results of testing done during the course of the Work to the Owner.

1.6 DEFINITIONS

A. Aggregate Base: Imported material for use in roadway pavement, grade crossings, curb and gutter, pavers, sidewalk and driveway approaches.

B. Degree of Compaction: Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM 1557-12e1. The compaction required will be abbreviated hereinafter as a percentage of laboratory maximum density.

1.7 STOCKPILING MATERIALS

A. Separate differing materials with dividers or stockpile separately to prevent intermixing

B. Prevent contamination.

C. Protect stockpiles from erosion and deterioration of materials.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials for Aggregate Base shall conform to Caltrans Standard Specifications, Section 26-1.02B, “Class 2 Aggregate Base” - ¾ inch maximum gradation.

B. The use of recycled asphalt concrete and Portland cement concrete materials will be permitted provided that the Contractor submits to the Engineer certified test data that the proposed material meets all the quality requirements of this section and the Engineer approves its use in writing. Data shall be submitted at least 30 days prior to expected use of the proposed material in the work. Samples of proposed materials shall be submitted if requested by the Engineer:

1. Quality Requirements. - Aggregate base shall be clean and free from vegetable matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base.

2. Aggregate base shall conform to the quality requirements as specified in Table I for classes indicated. Aggregate base shall have a maximum percentage of wear of 50 as determined by California Test 211, and a minimum Durability Index of 25 as determined by California Test 229.

Table 1						
Quality Requirements						
R- Value		Sand Equivalent			Crushed Particles %	
Calif. Test 301		Calif. Test 217			Calif. Test 205	
Operating		Indiv.	Operating	Indiv.	Operating	Indiv.
Class	Range	Test	Range	Test	Range	Test
1	-	78	50	45	(a)90	(a)87
2	-	78	30	28(d)	(b)25	(b)23
3	70	68	25	23		

a. Percent by weight.

b. Material retained on the No.4 USA Standard sieve shall consist of material of which at least 25 percent, by weight, shall be crushed particles.

c. Gradation: The percentage composition of aggregate base shall conform to the gradations as shown in Table 2 for the maximum size as specified on the plans or special provisions, when determined by California Test 202. When there is a difference in specific gravity of 0.2 or more, between the coarse and

fine portion of the aggregate or blends of different aggregate, California Test 202 will be modified by California Test, Appendix B.

Table 2						
USA Std. Sieve Size	Percentage Passing Sieves					
	1-1/2" Max.		1" Max.		3/4" Max.	
	Operating Indiv.		Operating Indiv.		Operating Indiv.	
	Range	Test	Range	Test	Range	Test
2"	100	100	----			
1-1/2"	90-100	88-100	100			
1"	----	---	85-100	88-100	100	100
3/4"	50- 85	48- 88	60- 90	58- 93	90-100	88-100
No.4	25- 45	23- 47	30- 50	28- 53	35- 55	33- 57
No. 30	10- 25	8- 28	10- 28	8- 30	10- 30	8- 32
No. 200	2- 9	1- 10	2- 9	1- 10	3- 9	1- 10

2.2 SOURCE QUALITY CONTROL

A. Where aggregate materials are specified using ASTM D2487-17 classification, testing or samples for compliance will be provided before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source through the work.

2.3 SUBGRADE

A. Subgrade preparation shall be as specified in Section 31 1113 of these Specifications.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. When the base is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of

construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 PREPARATION OF UNDERLYING COURSE

A. General Requirements:

1. Before placing base course, the previously constructed underlying course shall be cleaned of foreign substances. The surface of underlying course shall meet the specified compaction and surface tolerances. Subgrade shall conform to Section 31 1113 Subgrade Preparation. Ruts or soft, yielding spots that may appear in the underlying course and areas having inadequate compaction shall be removed and replaced with suitable material or mechanically stabilized with aggregate prior to placement of the base course. Stabilization may be accomplished by mixing base course material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base course is placed.

2. Vertical tolerance for aggregate base placed under asphalt concrete and Portland cement concrete pavement shall be within 0.03 feet of the elevations shown on the plans and as staked per direction from the Engineer.

B. General:

1. Fill materials are subject to approval by the Geotechnical Engineer for the particular location and method of placing and compacting.

2. Material excavated on-site may be used as fills, with prior Geotechnical Engineer inspection and approval.

C. Grade Control:

1. Underlying material shall be excavated to sufficient depth for the required base course thickness so that the finished base course with the subsequent surface course will meet the fixed grade. Finished and completed area shall conform to the lines, grades, cross section, and dimensions indicated.

3.3 INSTALLATION

A. Work for placing aggregate base course material shall comply with Caltrans Standard Specifications 2018, Section 26, Article 26-1.3D, and 26-1.03D Spreading.

B. The finished grade of aggregate base, where not controlled by adjacent structures or features shall not exceed 0.05 foot above or below the planned grade, provided it is uniform and free from sharp breaks. The cross-section of the finished base shall be free from ridges or valleys and be within 0.05 foot above or below the theoretical section shown on the plans at any point on the cross-section. Surfaces will be tested by a 16-foot straight edge applied parallel with and at right angles to the roadway type and in a

condition approved by the Engineer. Segmented or sheeps foot compactors will not be allowed.

C. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

D. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

E. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

F. Apply herbicide per manufacturer requirements.

3.4 TESTING

A. Testing will be performed by a DSA approved independent testing laboratory with a DSA LEA number retained by the Owner. Unless otherwise indicated, field in-place density testing shall be performed in accordance with ASTM D1557. Copies of the density test results shall be submitted to the Project Inspector, Civil Engineer, and Owner.

3.5 TRAFFIC

A. Completed portions of the area may be opened to traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary for construction, and then the area shall be protected against marring or damage to the completed work.

3.6 FIELD QUALITY CONTROL

A. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.

B. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 (“modified proctor”).

C. If tests indicated work does not meet specified requirements, remove work, replace and retest.

D. Proof roll all compacted aggregate and subgrade surfaces. Rework any deforming areas per the geotechnical engineer’s requirements and test observations.

3.7 MAINTENANCE

A. The aggregate base course shall be maintained in a satisfactory condition until accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.8 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat and broom swept condition. Grade stockpile are to prevent standing surface water and cover with plastic sheeting for rain conditions.

B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes concrete paving, fence & light pole footings, and concrete finishes as shown and noted on the drawings and specified. The General Conditions and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES:

A. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS, current edition and revisions.

B. The American Concrete Institute (ACI): "Manual of Concrete Practice," Parts 1, 2 and 3, current edition.

C. ASTM C94-19a Standard Specification for Ready-Mixed Concrete

D. ASTM D1751-18 Standard Specification for Performed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

E. ASTM C09-19

F. ASTM C150 Standard Specification for Portland Cement

G. ASTM C33 Standard Specification for Concrete Aggregates

1.3 RELATED REQUIREMENTS:

A. Section 31 11 13 - Subgrade Preparation

B. Section 32 11 23 - Aggregate Base

1.4 SUBMITTALS:

A. Mix Design:

1. Certified copies of mix designs for each concrete class specified including compressive strength test reports.

2. Weight master Certificates for concrete delivered to the site and used for improvements.

3. Source of aggregate and grading.

B. Integral Colored Concrete:

1. Manufacturers: Davis Color, Solomon Colors Inc., Scofield or equal

2. Full range of available colors for Architect's selection up to 3 colors, physical samples master Certificates for concrete delivered to the site and used for improvements.

3. Product data.

1.5 MOCK UPS:

A. Provide mock up of concrete finishes and colors. Accepted mock-ups shall be kept at the job site to serve as a prerequisite for all finishes.

1. Mock-ups to be four foot square.

2. Provide two additional mock-ups of each finish, of the same size, after initial mock-up has been reviewed by the Architect.

3. The extent of voids, holes and honeycombs in the finish work cannot exceed those in the mock up.

1.6 QUALITY ASSURANCE:

A. Prepackaged concrete not allowed for concrete over 1 cubic yard.

B. Pea gravel (3/8 inch aggregate) is not allowed.

C. Mix designs to be signed by a California licensed civil or structural engineer. C94-19a Standard Specification for Ready-Mixed Concrete

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Supply ready mixed concrete throughout. Batch, mix and transport in accordance with ASTM C94-19a, "Standard Specifications for Ready-Mixed Concrete."

B. Mix and deliver concrete in quantities that will permit immediate use only.
C. Indiscriminate addition of water for any reason will be cause for rejection of the load.

PART 2 - PRODUCTS

2.1 FORMWORK MATERIALS:

A. Forms

1. Forms for vertical concrete to be steel or glass-fiber-reinforced plastic, or other nonabsorptive panel material that provides continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

2. Forms for slabs on grade and support members: Douglas fir, "Standard" grade or better (grade marks not required).e two additional mock-ups of each finish, of the same size, after initial mock-up has been reviewed by the Architect.

3. Form Coatings: Knox-Crete, or equal.

2.2 REINFORCING MATERIALS:

A. References

1. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19A (ACI 318).

2. ACI 301 - Specifications for Structural Concrete for Buildings.

3. ACI 315 (SP-66) - Details and Detailing of Concrete Reinforcement.

4. ACI 314 - Building Code Requirements for Structural Concrete.

5. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

6. ASTM A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

7. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.

8. AWS D1.4 - Structural Welding Code Reinforcing Steel.

9. CRSI - Manual of Practice.

10. CRSI - Placing Reinforcing Bars. A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

B. Quality Assurance

1. Perform concrete reinforcement work in accordance with Concrete Reinforcement Steel Institute (CRSI) Manual of Standard Practice.

2. Conform to ACI 301 and ACI 315 (SP-66).

3. Conform to 2016 CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19A, section 1909A.

C. Submittals

1. Submit mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis to the Project Inspector at time of delivery of material to the site.

2. Do not submit reinforcing bar shop drawings.

D. Materials

1. Reinforcing Steel: ASTM A615, Grade 60. Billet-steel deformed bars, uncoated finish.

2. Welded Reinforcement: ASTM A706, Grade 60, deformed bars, unfinished.

3. Steel Wire: ASTM A1064, plain, cold drawn steel. to 2016 CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19A, section 1909A.

E. Accessory Materials

1. Tie Wire: Minimum 16 gage annealed type.

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

F. Fabrication

1. Fabricate in accordance with ACI 315 (SP-66), providing concrete cover specified on structural general notes, Sheet S-001.4.

2. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

3. Weld reinforcing bars in accordance with AWS D1.4.

G. Installation

1. Before placing concrete, clean reinforcement of foreign particles or coatings.

2. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

H. Field Quality Control

1. Field inspection and testing will be performed as required by Project Inspector. ate in accordance with ACI 315 (SP-66), providing concrete cover specified on structural general notes, Sheet S-001.4.

2.3 CONCRETE MATERIALS:

A. Portland Cement: ASTM C150, Type V.

B. Aggregate: ASTM C33.

C. Coarse Aggregate: Normal weight; 3/4 inch maximum size; clean, uncoated, crushed aggregate, free of materials which cause staining or rust spots.

1. Fine Aggregate: Clean, natural sand.

D. Water: Clear and potable, free from deleterious impurities.

E. Admixtures: Admixtures are optional, must be compatible with color pigments where required. Any proposed admixture shall comply with CBC 19A and ACI 318.

F. Concrete Mixes

1. Strength: 4,000 PSI, unless noted otherwise.

2. Water Cement Ration: Maximum .50

3. Slump 3 to 4 inches.

4. Fly Ash: Maximum 15 percent.

G. Ancillary Materials

1. Expansion Joint Material

a. Fiber Expansion Joint: A non-extruding resilient filler, saturated with high quality bituminous materials having preserving characteristics. W. R. Meadows or equal. Conform to ASTM-D1751-18. Include Joint Sealant.

2. Curing Compound: ASTM C309-19, Water-base type, free of permanent color, oil or wax, or equal. Curing compound shall be compatible with color pigments.

3. Joint Sealant: W. R. Meadows or Sonnebourn 2-part joint sealant or Sikaflex-1a elastomeric joint sealant or equal. Color shall be as selected by the Architect. 3 to 4 inches.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS:

A. Install concrete work true to line and grade as indicated on the drawings.

B. Correct irregularities to the satisfaction of the Project Inspector.

C. Preparation

1. Examine subgrade and test compaction. Start of work indicates acceptance of subgrade.

2. Subgrade shall be kept moist and shall not be allowed to dry out before placement of concrete. Place no material on muddy subgrade.

3. Aggregate base shall be placed and compacted in conformance with CalTrans Standard Specifications 26-1.03D and 26-1.03E.

4. Obtain acceptance of subgrade from Project Inspector prior to placing steel and concrete.

D. Forms

1. Forms shall be constructed in accordance with ACI 347 and shall be of sufficient strength and sufficiently tight to prevent visible distortion or leakage of mortar and fines.

2. Pavement edge forms shall extend full depth of concrete. Curves shall be formed with flexible metal or wood made up of thin laminations. Curve forms shall extend one stake space straight beyond tangent point.

3. Maintain forms within the following tolerances.

a. Top of Form: Plus or minus 1/8 inch in 10 feet and no abrupt variations; at required elevation to plus 3/8 inch.

b. Face of Form: Plus or minus 1/4 inch in 10 feet longitudinal and no abrupt variations; perpendicular to surface plus or minus 1/8 inch.

E. Reinforcement

1. Fabricate and place reinforcement as indicated on the Drawings and in accordance with ACI "Detailing Manual" SP-66.

2. Secure reinforcement in position by suitable supports and by wiring at intersections with tie wire. Supports shall be of sufficient number and strength to

resist crushing or displacement under full load. Metal shall not extend to surface of concrete.

3. At time of placing concrete, reinforcing shall be free of excessive rust, mill scale, or other bond reducing matter. Immediately before placing concrete, check and adjust position, support and anchorage.

F. Joints And Grooves

1. Install joint sealant at fiber expansion joints per manufacturer's specifications.

   a. Allow sufficient time (as recommended by manufacturer) for sealant to cure.

   b. Protect joint sealant until required curing time as expired.

2. Construction Joints: Place construction joints at expansion joints. No other constructions joints are allowed.

   a. Tool concrete edge both sides of construction joint.

3. Saw Cut Control Joints: Begin as soon as concrete has hardened enough to support saw and operator and to allow cutting without raveling, or deforming the surface finish. Use a concrete cutting blade. Form a smooth uniform and straight joint 1/8 inch wide to 1 inch depth unless shown otherwise. Joints shall be cut within 48 hours of pour. Hold saw cuts 1/2 inch from edge of concrete.

G. Finishing

1. Colored Concrete: Add to mix at the plant and comply with manufacturer's recommendations for quantities. Include quantities in mix design.

2. Concrete Slab on Grade Finish

   a. Slip Resistant Broom Finish: After the slab has been float finished, the surface shall be uniformly directional textured by a stable broom to match accepted concrete finishes. Portland cement paving shall be stable, firm, and slip resistant and comply with CBC section 11B-302 and 11B-403ufficient time (as recommended by manufacturer) for sealant to cure.

      i. Light Broom Finish: Typical at paving with slopes 5 percent or less
      ii. Heavy Broom Finish: Typical at ramps and inclines greater than 5 percent

H. Fence Footings

1. Footings to be 3,250 PSI concrete unless noted otherwise.

2. Slightly slope footings away from post or base.

I. Defective Concrete

1. If concrete work does not match the mock up or is not formed as indicated, is under strength concrete, if concrete is out of line, level or plumb, or showing objectionable cracks, honeycomb, rock pockets, voids, spalling or exposed reinforcing, it shall be removed and replaced.

2. Repairs to architectural concrete finishes are not allowed.

J. Curing

1. Cure exposed concrete in accordance with CalTrans Standard Specifications Section 90.

2. Only water or curing compounds that impart no permanent color or gloss shall be used for curing concrete. Pairs to architectural concrete finishes are not allowed.

K. Cleanup

1. During construction, wash off concrete splatter as quickly as possible, do not allow to dry on surfaces.

2. Upon completion, clean exposed surfaces carefully. Brushing and cleaning solution must be preceded and followed with a through rinsing of clear water.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Parking stripes, markings and accessibility symbols.
2. Exterior athletic court markings.
3. Playground markings.
4. Fire lane “No Parking.”
5. Curb marking and red curbs.

B. Related Requirements:

1. Division 01 - General Requirements.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings, indicating location, extent, color and texture of markings.

B. Material Samples: Submit color Samples.

1.03 PROJECT CONDITIONS

A. Do not install markings when adverse weather conditions are forecasted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Paint: Water emulsion-based traffic paint must be approved by Victor Valley College

1. Dunn Edwards: Vin-L-Stripe.
2. Pervo Paint Company: Acrylic Traffic Paint.
3. Sherwin Williams: Setfast Acrylic Traffic Paint.
4. Vista Paint Corporation: Traffic Paint.

5. Equal.

PART 3 - EXECUTION

3.01 PAVEMENT MARKINGS

A. Application of Paint:

1. Prior to application of paint, allow the pavement to properly cure. Clean and prepare in accordance with paint manufacturer's written recommendations.

2. Provide mechanical equipment to apply paint in a uniform, straight or curved pattern, without gaps, holidays, runs, or other defects.

3. Do not permit traffic until paint has completely cured.

4. Apply two coats in thickness recommended by manufacturer.

5. Playground Markings: Submit Samples to Architect for review. Limited color palettes may be submitted.

B. Marking Width and Color: Unless indicated otherwise, marking width and color are as follows:

Location	Width	Color
Parking stall lines	4 inches	White
Traffic markings		
Striping:	4 inches	Yellow
General	4 inches	Yellow
Accessible Parking	4 inches	Blue
International Symbol of Accessibility (ISA)	2 inches	White on blue background
Athletic Court Lines:	2 inches	*White
Letters and numbers:		As indicated

*Where two sets of lines overlap, one set shall be white and the other set shall be yellow.

3.02 PROTECTION

A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 32 17 26
CAST-IN-PLACE TACTILE/DETECTABLE WARNING SURFACE

PART 1 - GENERAL

1.1 SUMMARY: The work includes the furnishing and installing of all tactile/detectable warning surface tile (truncated domes) as shown and noted on the drawings and as specified. The General Conditions and Division 1 apply to this section as fully as if repeated herein.

1.2 DESCRIPTION:

A. This Section specifies furnishing and installing Cast-In-Place Detectable/Tactile Warning Surface Tiles where indicated.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's literature describing products, installation procedures and routine maintenance.

B. Samples for Verification Purposes: Submit two (2) tile samples minimum 6"x6" of the kind proposed for use.

C. Shop drawings are required for products specified showing fabrication details, composite structural system, tile surface profile, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.

D. Material Test Reports: Submit complete test reports from qualified accredited independent testing laboratory's to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. All tests shall be conducted on a Cast In Place Detectable/Tactile Warning Surface Tile system as certified by a qualified independent testing laboratory and be current within a 24 month period.

E. Maintenance Instructions: Submit copies of manufacturer's specified installation and maintenance practices for each type of Detectable Warning Surface Tile and accessory as required.

1.4 QUALITY ASSURANCE:

A. Provide Cast-In-Place Detectable/Tactile Warning Surface Tiles and accessories as produced by a single manufacturer with a minimum of three (3) years experience in the manufacturing of Cast-In-Place Detectable/Tactile Warning Surface Tiles.

B. Installer's Qualifications: Engage an experienced Installer certified in writing by Cast In Place Detectable/Tactile Warning Surface Tile manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for the Project.

C. California Building Code (CBC): Provide only approved DSA-AC detectable warning products as provided in the (CBC) Section 11B-705.

1. Detectable warning surfaces shall comply with CBC Section 11B-705.1.

2. Detectable warning surfaces at transit boarding platform edges, bus stops, hazardous vehicular areas, reflecting pools, and track crossings shall be yellow and approximate FS 33538 of Federal Standard 595C. Detectable warning surfaces at other locations shall be either the aforementioned yellow or a color providing a 70 percent minimum visual contrast with that of the adjacent walking surfaces. The material used to provide visual contrast shall be an integral part of the surface. CBC Section 11B-705.1.1.3.

3. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. Such constraint shall not be required for detectable warning surfaces at curb ramps, islands, or cut-through medians. CBC Section 11B705.1.1.4.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Cast-In-Place Detectable/Tactile Warning Surface Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy plastic wrappings to protect tile from concrete residue during installation and tile type shall be identified by part number.

B. Cast-In-Place Detectable/Tactile Warning Surface Tiles shall be delivered to location at building site for storage prior to installation.

1.6 SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40°F in spaces to receive Cast-In-Place Detectable/Tactile Warning Surface Tiles for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

B. The use of water for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the general public. Provide barricades or screens to protect the general public.

1.7 GUARANTEE

A. Cast-In-Place Detectable/Tactile Warning Surface Tiles shall be guaranteed in writing for a period of five (5) years from date of final completion. The guarantee includes defective work, breakage, deformation, fading and loosening of tiles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Vitrified Polymer Composite (VPC) Cast-In-Place Detectable/Tactile Warning Surface Tile specified is based on Armor-Tile manufactured by Engineered Plastics Inc., or approved equal.

1. The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.3" and 2.4" as measured side by side. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045" high, per square inch; "Armor-Tile" as manufactured by Engineered Plastics Inc. or approved equal.

2. Dimensions: Cast In Place Detectable/Tactile Warning Surface Tiles shall be held within the following dimensions and tolerances:

   a. Length and Width: modular design in 12" x 12" or up to 36" x 36" increments nominal.
   b. Depth: 1.375 (1-3/8") (+/-) 5% max.
   c. Face Thickness: 0.1875 (3/16") (+/-) 5% max.
   d. Warpage of Edge: 0.5% max.
   e. Embedment Flange Spacing: shall be no greater than 3.1".
   f. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.
   g. Slip Resistance of Tile when tested by ASTM C 1028-96 the combined Wet and Dry Static Co-Efficients of Friction not to be less than 0.80 on top of domes and field area.
   h. Compressive Strength of Tile when tested by ASTM D 695-02a not to be less than 28,000 psi.

3. Color: Yellow conforming to Federal Color No. 33538. Color shall be homogeneous throughout the tile.

PART 3 - EXECUTION

3.1 INSTALLATION

A. During Cast-In-Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

B. Prior to placement of the Cast-In-Place Detectable/Tactile Warning Surface Tile system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Engineer.

C. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4-7 inches to permit solid placement of the Cast-In-Place Detectable/Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as concrete blocks or sandbags (25 lb) shall be placed on each tile.

D. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast-In-Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.

E. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.

F. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.

G. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast-In-Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should not be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

H. In cold weather climates it is recommended that the Cast-In-Place Detectable/Tactile Warning Surface Tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of ramp and that the base of domes to allow water drainage. This installation will reduce the possibility of damage due to snow clearing operations.

I. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.

J. While concrete is workable, a 3/8" radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.

K. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external force placed on the tile that may rock the tile causing a void between the underside of tile and concrete.

L. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.

M. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.

N. Bolt individual tiles together using ¼ inch or equivalent hardware to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to ensure that the tile surface remains free of concrete during the installation process.

O. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.

P. Any sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction adhesive. The air gap created between these plates and the bottom of the tile is important in preserving the sound on cane audible properties of the Armor-Tile system as required in various jurisdictions.

3.2 CLEANING, PROTECTING, AND MAINTENANCE

A. Protect tiles against damage during construction period to comply with Tactile Tile manufacturer’s specification.

B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.

C. Clean Tactile Tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Tactile Tile by method specified by Tactile Tile manufacturer.

D. Comply with manufacturers maintenance manual for cleaning and maintaining tile surface and it is recommended to perform annual inspections for safety and tile integrity.

3.3 DEFECTIVE WORK:

A. Repair or replace deficient work as directed by the Architect and at no additional cost to the Owner.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. The work includes the furnishing and installing of all chain link fencing complete, including all fittings, hardware, gates, and operators as shown and noted on the drawings and as specified. The Conditions of the contract and Division 1 apply to this section as fully as if repeated herein.

1.2 REFERENCES:

A. The editions of American Society of Testing and Materials (ASTM) standards referenced herein apply to the work only to the extent specified by the reference.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and installation instructions.

B. Shop Drawings: Submit shop drawings including plans layout with post spacings and details illustrating fence height, location and sizes of posts, rails, braces, gates, hardware, anchorage details.

C. Submittal procedures and quantities are specified in Section 01 33 23.

1.4 REGULATORY REQUIREMENTS:

A. Fences, gates and hardware:

1. Gates that are part of the accessible route shall meet all the requirements of an accessible door in compliance with CBC Section 11B-404.

2. The levers of lever actuated latches or locks for accessible gates shall be curved with a return to within ½” of the gate surfaces to prevent catching on the clothing or person. California Referenced Standards Code. T-24 Part 12, Section 12-10-202, Item (F).

3. Swing doors and gate surfaces within 10” of the finish floor or ground shall have a smooth surface on the push side extending the full width of the door or gate. Parts creating horizontal or vertical joints in these surfaces shall be within 1/16” of the same plane as the other and be free of sharp or abrasive edges. Cavities created by added kick plates shall be capped. CBC Section 11B-404.2.10

PART 2 - PRODUCTS

2.1 FENCE FABRIC:

A. Fabric for fencing shall be woven in a 1-inch mesh from 9 gage zinc coated steel wire and shall conform to ASTM A 392, Class 1. Fabric shall be knuckled on both edges.

B. Fabric for fencing shall be woven in a 2-inch mesh from 9 gage zinc coated steel wire and shall conform to ASTM A 392, Class 1. Fabric shall be knuckled on both edges.

C. Selvages: Top and bottom selvages shall be knuckled.

2.2 POSTS, RAILS AND BRACES:

A. Materials: Provide Schedule 40 steel pipe conforming to ASTM A 53/A 53M with a minimum 1.8 oz./sq. ft. hot-dipped zinc coating, except where fencing in indicated to be colored, posts and rails shall be square tubing.

B. Line Posts:

1. Up to 6’ high: Provide Schedule 40 pipe 2.375" O.D. weighing 3.65 lbs./lin. ft.

2. Over 6’ to 8’ high: Provide Schedule 40 pipe 2.875" O.D. weighing 5.79 lbs./lin. ft.

C. End, Corner and Pull Posts:

1. Up to 6’ high: Provide Schedule 40 pipe 2.875" O.D. weighing 5.79 lbs./linear ft. Square tubing posts for fences indicated to be colored shall be 2.50 inches square, weighing 5.10 lbs./lin. ft.

2. Over 6’ to 8’ high: Provide Schedule 40 pipe 3.50" O.D. weighing 7.58 lbs./linear ft. Square tubing posts for fences indicated to be colored shall be 2.50 inches square, weighing 5.10 lbs./lin. ft.

D. Gate Posts:

1. For gate leaves 5'-0" to 13'-0" wide provide schedule 40 pipe 4.0" O.D. weighing 9.11 lbs./lin. ft.

2. For gate leaves 13'-0" to 18'-0" wide provide schedule 40 pipe 6.625" O.D. weighing 18.19 lbs./lin. ft.

3. For gate leaves over 18'-0" wide provide schedule 40 pipe 8.625" O.D. weighing 24.70 lbs./lin. ft.

E. Rails and Braces: Provide one Schedule 40 pipe 1.66" O.D. weighing 2.27 lbs./lin. ft.

2.3 GATES:

A. Fabricate perimeter frames of members, sizes and shape specified below with additional horizontal and vertical members and trussing to insure proper gate operations and for attachment of fabric, hardware, and accessories. Fabricate gate leaves of Schedule 40 steel pipe 1.90" O.D. weighing 2.72 lbs./lin. ft.

B. Use same fabric as for fence, installed with stretcher bars.

C. Install diagonal cross bracing consisting of 3/8" diameter truss rods with drop forged steel turnbuckles where necessary to insure frame rigidity without sag or twist.

D. Install barbed wire on gates in fences with barbed wire.

E. Swinging Gate Hardware:

1. Hinges: Manufacturer's standard non-lift-off type, offset to permit 180 deg. gate opening.

2. Latch:

a. At accessible gates: Butterfly type latch that can be operated without pinching or grasping. Model CL-BL as manufactured by Hoover Fence Co.

b. At non-accessible gates: Fork type or plunger-bar-type to permit operation from either side of gate, with padlock eye as integral part of latch.

3. Double Gates: Provide gate stops set in concrete to engage center drop rod or plunger bar.

2.4 MISCELLANEOUS MATERIALS:

A. Wire Ties: For tying fabric to line posts, use 9-gage wire ties spaced 12" on-center. For tying fabric to rails and braces, use 9-gage wire ties spaced 24" on-center. For tying fabric to tension wire, use 11-gage hog rings spaced 24" on-center

B. Tension Wire: No. 7-gage zinc coated marcelled or crimped coil spring hard-tempered carbon steel wire.

C. Barbed Wire: Zinc coated steel wire consisting of two strands of 12-1/2 gage twisted line wire with 14-gage 4-point barbs on 5-inch spacings.

D. Barbed Wired Extension Arms: Single 45-degree arms fitted with clips or other means of attaching three strands of barbed wire. Arms shall be of sufficient strength to withstand a weight of 250 lbs. applied at the outer strand of barbed wire.

E. Post Tops: Pressed steel not lighter than 14-gage, wrought iron or malleable iron with openings to accommodate top rail where required.

F. Fittings: Malleable iron or pressed steel, hot-dip, galvanized, of sizes as follows:

Top rail bands	1-1/4" wide – 12-gauge
Brace and truss bands	2" wide – 14-gauge
Stretcher bars	3/4" wide - 1/4" thick
Stretcher bar bands	1" wide – 14-gauge
Nuts and bolts	Minimum 1/6" diameter
Couplings, elbows, tees, plugs, etc.	Compatible with pipe size, hot-dip galvanized steel, threaded.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine the conditions under which fencing is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. General: Do not begin installation before final grading is completed.

B. Post Spacing: Unless otherwise indicated, space posts not to exceed 10'-0" on-centers. Provide corner posts at all changes of direction exceeding 15-degrees. Provide end posts at ends of runs and gate posts on both sides of gates. Provide pull posts as necessary to limit spacing between end, corner, gate and pull posts.

C. Excavation: Unless otherwise indicated, excavate line post holes minimum 10" diameter and to a depth approximately 3" lower than post bottom, with bottom of posts set not less than 30" below grade. Excavate corner, end, pull and gate post holes minimum 12" diameter and to a depth approximately 3" lower than post bottom, with bottom of posts set not less than 36" below grade.

D. Setting Posts: Center and align posts in holes 3" above bottom of excavation. Place concrete around posts and vibrate or tamp for consolidation. Finish concrete 1" above grade, slope away from post for drainage.

E. Top Rails: Run continuously thru post caps. Provide expansion couplings spaced not to exceed 21-inches on-centers.

F. Furnish bracing assemblies at each end, and gate post and on both sides of corner and pull posts. Bracing assemblies shall consist of a horizontal bracing member located at mid-height of fabric and a 3/8" diameter rod with drop forged steel turnbuckle for diagonal truss.

G. Tension Wire: Install tension wires by weaving thru fabric and tying to each post with not less than 6-gage galvanized wire, or by securing wire to fabric. Pull wires taut.

H. Fabric: Leave approximately 2" between finish grade or top of slab and bottom selvage. Pull fabric taut and tie to posts, rails, and tension wires.

I. Stretcher Bars: Thread thru or clamp to fabric 4" on-center and secure to posts with metal bands spaced 15" on-center.

J. Swinging Gates: Install gates plumb, level, and secure. Install as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate as required.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. Perform work and provide related materials, labor, services, and equipment to execute the construction and connection of site utilities as indicated on the drawings, specified herein and as necessary for proper completion, including but not necessarily limited to:

1. All catch basins, area drains, junction structures and appurtenances including connector pipes.

2. All storm drain piping and connections to existing storm drain systems.

1.2 REFERENCES:

A. California Building Code, including Chapters 18 and 33, and accessibility regulations.

B. Standard Specifications for Public Works Construction (SSPWC), current edition as adopted by local jurisdiction.

C. California Department of Transportation (Caltrans), Standard Specifications dated 2023.

D. California Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones", current edition as adopted by local jurisdiction.

E. All applicable municipal standards regarding excavation, shoring, and dewatering work.

F. Uniform Plumbing Code, as adopted by the local jurisdiction.

G. Cast Iron Soil Pipe Institute standard specifications for gray cast-iron pipe current edition.

H. CAL-OSHA Requirements, including applicable portions of Title 8 and the California Labor Code.

1.3 RELATED REQUIREMENTS:

A. Section 31 22 19 - Finish Grading

B. Section 31 23 34 – Trenching, Backfilling and Compacting

C. Section 33 46 00 - Subdrainage

1.4 FIELD CONDITIONS:

A. Field Conditions

1. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent features and report to Engineer conditions which prevent proper execution of this work.

2. The lines are drawn to scale, but some appurtenances are diagrammatic, and shall be followed as closely as actual construction permits. Deviations from drawings required to make this conform to the site conditions, and to the work of others, shall be made as necessary or directed. Verify dimensions with requirements prior to starting work.

3. Accuracy of Data: The data given herein and on the drawings are as exact as could be secured, but their absolute accuracy is not guaranteed. The specifications and drawings are for the assistance and guidance of the Contractor. Exact locations, distances, levels, etc., will be governed by the actual conditions and the Contractor shall use the data contained herein with this understanding.

4. Existing Utilities: Contractor shall be responsible for verification of existing utilities in all areas where work is to be performed. Extreme caution shall be exercised during all excavation to prevent interruption or severance of existing utilities, such interruption or severance being the sole responsibility of the Contractor. When any instructions prevent the installation of this work, the Architect shall be notified. Location of utilities other than those shown which may exist within the site is unknown.

1.5 SUBMITTALS:

A. Record Drawings: Provide record drawings per Section 01 78 39 showing and maintaining an accurate record of the underground piping installation. Locate and size all lines, valves, depths of lines, slope of lines and other pertinent data.

B. Materials List: Within thirty days after award of Contract, provide complete list of proposed materials, fixtures, and equipment. Submittal shall include manufacturer's catalog numbers, type, size and such other information as required to identify items.

1.6 COORDINATION OF WORK:

A. Coordinate work with that of other trades. No extras or additional time will be allowed for delays resulting from coordination problems with the work of other trades.

1.7 PERMT AND FEES:

A. Arrange and pay for inspection costs, construction fees, sterilization charges, installation fees, or other charges necessary to the furnishing of utility services.

1.8 PRODUCT HANDLING:

A. Protect materials before, during, and after installation and to protect the installed work of other trades. In the event of damage, immediately make repairs and replacements necessary to the approval of the Architect, and at no additional cost to the Owner.

B. Provide proper storage facilities during the progress of the work.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA:

A. Improvements shall be constructed per the referenced standards, the improvement drawings, and as specified in this Specification.

B. Where criteria shown on drawings or specified in this specification exceed that of the referenced standards, and the work involves non-public improvements, the more stringent criteria shall apply.

2.2 SYSTEM COMPONENTS:

A. Pipe

1. All on-site storm drainage pipes shall SCH 80 Polyvinyl Chloride Pipe.

2. Polyvinyl Chloride (PVC): All Pipe as per "Standard Specifications" and as shown on drawings.

3. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with “Storm Sewer Service” in large letters. Install trace wire 6 inches above top of pipe.

B. Catch Basins And Junction Boxes

1. All catch basins and manholes shall be as shown on the drawings. Equivalent precast units may be substituted per section 01 2500 Substitution Procedures after receiving approval of Engineer.

C. Grates And Frames

1. All grates, covers, and frames shall be as shown on the drawings and shall be bicycle proof.

2. Cast Iron shall be painted with bituminous paint.

3. Steel shall be hot dipped galvanized after fabrication.

D. Miscellaneous Metal

1. All miscellaneous metal shall be hot dipped galvanized after fabrication, and conform to Sections of this specification.

PART 3 - EXECUTION

3.1 EARTHWORK:

A. The Contractor shall perform all excavation of every description and of whatever materials encountered, to the depths indicated on the drawings or as necessary.

B. Excavation for precast catch basins and similar structures shall be made to allow for a minimum clearance of 12" on all sides.

C. The Contractor shall dispose of the excavated materials not required or suitable for backfill as directed by the Geotechnical Engineer.

D. Perform such grading as may be necessary to prevent surface water from flowing into the trenches.

E. Provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavated areas. If subsurface water is encountered, the Contractor shall utilize approved means to adequately dewater the excavation so that it will be dry for working and pipe laying.

F. Conform to requirements of Section 31 23 34 for trenching and backfill.

3.2 INSTALLATION OF PIPE:

A. General Pipe, Valves, Fittings, and related components shall be installed to conform to the referenced standards.

B. All or part of the work within Public streets, may be required by the City to be bored and jacked. Contractors shall take all necessary steps to comply with the requirements of the City, including all safety and barricade requirements of the Public Works Department.

C. All connections to existing lines shall be made per city regulations.

D. All materials shall be installed as specified in the referenced "Standard Specifications." Provide minimum cover for all piping as specified in referenced standards.

E. Joints: Install per referenced standards and manufacturers recommendations.

F. Dielectric Isolators: Where incompatible piping materials come in contact except for the use of valves, isolate from each other with dielectric unions, line size.

G. Building Footing Clearances: Piping shall cross footings through sleeves. Provide Architect approved seals at all footing sleeving to prevent water migration.

H. Concrete Work: Unless specifically indicated on the drawings to be furnished by others, furnish and install concrete work such as pads, bases, kick blocks, and the like, where shown.

3.3 INSTALLATION OF STRUCTURES:

A. Concrete storm drain structures shall be constructed in accordance with the "Standard Specifications."

3.4 FIELD TESTS:

A. General

1. Storm drain line will be checked by the Owner's or Project Inspector when backfill has reached the top of the pipe. Both external and internal inspections for alignment may be made at this time.

2. The Contractor shall correct at his expense, to the Engineer's satisfaction, any section of the line found to be unsatisfactory in material, alignment, grade, or joints.

3. Final acceptance of the project will be contingent upon complete backfilling and surface repairs, and passage of final alignment and leakage tests.

B. Leakage:

1. After alignment tests are completed, and before flows are allowed in the line, the Contractor shall conduct leakage tests per "Standard Specifications."

2. All costs of leakage tests shall be borne by the Contractor and shall be included in contract price.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY:

A. Work includes, but is not necessarily limited to, underground retaining wall drainage, bioswales, and planter drainage systems.

1.2 REFERENCES:

A. California Building Code, including Chapters 18 and 33, and accessibility regulations.

B. Standard Specifications for Public Works Construction (SSPWC), current edition as adopted by local jurisdiction.

C. California Department of Transportation (Caltrans), Standard Specifications dated 2023.

D. All applicable municipal standards regarding excavation, shoring, and dewatering work.

E. Uniform Plumbing Code, as adopted by the local jurisdiction.

F. CAL-OSHA Requirements, including applicable portions of Title 8 and the California Labor Code.

1.3 RELATED REQUIREMENTS:

A. Section 31 22 19 - Finish Grading

B. Section 31 23 34 – Trenching, Backfilling AND Compacting

C. Section 33 40 00 – Storm Drainage

1.4 SUBMITTALS:

A. Materials List: Within thirty days after award of Contract, provide complete list of proposed materials, fixtures, and equipment. Submittal shall include manufacturer's catalog numbers, type, size and such other information as required to identify items.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS:

A. Pipe

1. All drainage piping of a specific type shall be the product of a single manufacturer.

2. All piping shall be labeled by the appropriate testing or standards organization for the type provided.

3. All fittings and jointing systems shall be compatible with piping provided.

B. Product Characteristics: Plastic Pipe: 4" and greater in diameter.

1. Material: PVC per ASTM D2729

2. Rating: SDR 35

3. Joining System

a. Elastomeric gasketed joints.

b. Solvent cement joints, schedule 40 socket type, acceptable for piping 6 inch diameter or less.

c. Galvanized threaded couplings, nipples, and unions for drain to pipe connection.

4. Perforations at Foundation Perimeter Drainage Piping: Provide 1/4 inch diameter perforations at 12 inches on center. Provide two rows of perforations located at ends of 160 degree arc projecting downward from cross-sectional center point of pipe.

C. Product Characteristics: Plastic pipe up to 4 inch diameter.

1. Material: PVC per ASTM D 1785

2. Rating: Schedule 80

3. Jointing System: Solvent welded

2.2 PRE-CAST COMPONENTS:

A. All components shall be prefabricated, factory pre-cast, and supplied by a single manufacturer. Design is based on products manufactured by Brookes. Equal products of Christy and Quick Crete are acceptable.

2.3 FILTER FABRIC:

A. Mirafi or equal, Series 140N, non woven polyester sheet fabric.

2.4 BACKFILL AND BEDDING:

A. Per Section 31 23 34.

2.5 DRAINAGE AND PROTECTION MAT:

A. Retaining Walls: Provide MiraDrain 6000 or equivalent high-flow dimpled core bonded to a single layer of non-woven filter fabric on the soil side, and a protection sheet on the waterproofing side. All work shall be performed in conjunction with Geotechnical Engineer's recommendations.

2.6 CRUSHED ROCK:

A. Per Standard Specifications Section 200-1.2, 1" size, Class A per ASTM C 131.

2.7 OTHER MATERIALS:

A. Provide all additional products and materials necessary for the completion of work shown on drawings.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS:

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that all surface and drainage conditions comply with Drawings and as necessary for proper execution of the work, including grade fall, line, cover, and clearance.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect/Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PIPE AND STRUCTURES INSTALLATION:

A. Pipe Installation

1. Trench and install bedding for all piping per Section 31 23 34.

2. Install piping per manufacturer's recommendations.

3. Solid grout space between pipe and wall of drainage structure. Shape piping termination to accommodate drainage flow.

B. Backfill

1. Backfill all piping and structures per Section 31 23 34 and as directed by the Geotechnical Engineer.

2. Jetting is not permitted.

3.3 TESTING:

A. Test all drainage lines for positive flow and blockage. Repair as necessary.

END OF SECTION