BID DOCUMENTS COVER SHEET

CONTRACT DOCUMENTS

FOR

C-4001 CAMPUS SAFETY CENTER
ELECTRICAL AND LOW VOLTAGE

at
CONTRA COSTA COLLEGE
2600 Mission Bell Drive, San Pablo, CA. 94806

CONTRA COSTA COMMUNITY COLLEGE DISTRICT

DSA File #7-C1
DSA Application #01-116949

ARCHITECT OF RECORD:
LPAS Architecture + Design
2484 Natomas Park Dr., Suite 100
Sacramento, CA 95833

February 9, 2018
SECTION 00007
SEALS PAGE

ARCHITECT &:  LPAS Architecture + Design
LANDSCAPE ARCHITECT  2484 Natomas Park Dr., Ste 100
Sacramento, CA 95833
Troy Pennington
916-443-0335

STRUCTURAL ENGINEER:  Orion Structural Engineering, Inc.
11305 Rancho Bernardo Rd, Ste 121
San Diego, CA 92127
Ryan J. Omer
858-679-1974

MECHANICAL/ELECTRICAL/ PLUMBING ENGINEER:  Cantelmi Engineering
2130 F Street
Bakersfield, CA 93301
Frank Cantelmi
661-324-5252

CIVIL ENGINEER:  BkF Engineers Surveyors Planners
980 9th Street, Suite 1770
Sacramento, CA 95814
Jim McCurdy
916-556-5800

SITE ELECTRICAL/FIRE ALARM ENGINEER:  Canyon Consulting Engineers
1617 Canyon Drive, Suite 201
Pinole, CA 94564
George Arellano
510-206-5444
TEECOM
1333 Broadway Suite 601
Oakland, CA  94612-1906
Andrew Gonzales
510-250-6663

END OF SECTION 00007
SECTION 00010

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END OF SECTION 00010
SECTION 00015
PROJECT DIRECTORY

ARCHITECT &:
LANDSCAPE ARCHITECT
LPAS Architecture + Design
2484 Natomas Park Dr., Ste 100
Sacramento, CA 95833
Troy Pennington
916-443-0335

STRUCTURAL ENGINEER:
Orion Structural Engineering, Inc.
11305 Rancho Bernardo Rd, Ste 121
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1617 Canyon Drive, Suite 201
Pinole, CA 94564
George Arellano
510-206-5444

TECHNOLOGY
TEECOM
1333 Broadway Suite 601
Oakland, CA 94612-1906
Andrew Gonzales
510-250-6663

MODULAR CONTRACTOR
JTS Modular, Inc.
7001 McDivitt Dr.
Bakersfield, CA 93313
Chuck Richmond
661-835-9270
OWNER: Contra Costa Community College District
500 Court Street
Martinez, CA 94553
925-229-1000

FACILITIES PLANNING:
Ray Pyle, Chief Facilities Planner
925-229-6842

Ines Zildzic, Associate Chief Facilities Planner
925-29-6873

Kathleen Halaszynski, Director of Construction Program Control
925-229-6846

Ben Azarnoush, District Design Director
925-229-6844

PROJECT MANAGER: Ron Johnson
CONSTRUCTION MANAGER: Greg Smith
Critical Solutions, Inc.
1801 Oakland Blvd., Suite 300
Walnut Creek, CA 94596
925-944-5060

CCC – BUILDINGS & GROUNDS: Bruce King, Buildings & Grounds Manager
925-229-1000 x44853

CCC – INFORMATION TECHNOLOGY: James Eyestone, Technology Systems Manager
925-229-1000 x43866

END OF SECTION 00015
NOTICE INVITING BIDS

C-4001 CAMPUS SAFETY CENTER – ELECTRICAL AND LOW VOLTAGE

CONTRA COSTA COLLEGE
2600 Mission Bell Drive, San Pablo, CA. 94806

NOTICE IS HEREBY GIVEN that the Governing Board of the Contra Costa Community College District (District), Martinez, California, will receive sealed bid proposals for the furnishing of all labor, materials, equipment, transportation and services for the construction of the project entitled C-4001 CAMPUS SAFETY CENTER – ELECTRICAL AND LOW VOLTAGE, at Contra Costa College.

Construction Cost Estimate (Range): $400,000 to $550,000;
California License Required: B-General Building Contractor, or C-10 Electrical Contractor

Scope:
This Electrical and Low Voltage bid package consists of site electrical, site utilities and fire alarm, communications, and security systems work, within Modular Buildings provided by JTS Modular, Inc.. Work includes, but is not limited to, the following:

- Site electrical including connection to the campus power and communications systems
- Electrical connection of power and communications to the modular building panels
- Providing transformer for the electrical service.
- Fire alarm in the modular building connected to the main campus alarm panel in another building
- Intrusion alarm, door access control and security cameras
- Telcom/data communications including all cabling and connection to the campus MPOE
- Power and data to site automatic gates and irrigation controllers

The Modular building contractor will provide all power and lighting inside the modular building, including the panels. Communications/alarm/security conduit/boxes only are stubbed from walls to the ceiling. The Site Work contractor will grade and lime treat the site. This Electrical and Low Voltage package contractor shall coordinate its work with the other contractors.

The District does not provide hardcopies of bid documents or reimburse cost of printing, delivery, or any expenses related to the bidding process.

For information directly from the District, you may log in to the District Website: [http://www.4cd.edu/webapps/PurchasingViewBids/default.aspx](http://www.4cd.edu/webapps/PurchasingViewBids/default.aspx). Project documents available include, but are not limited to, plans, specifications, addenda, bidders lists, bid results, etc., and can be viewed on this District webpage.

All questions related to this project must be in writing and are directed to:

Jovan Esprit, Contracts Manager
Contra Costa Community College District
500 Court St., Martinez, CA 94553
Email: jesprit@4cd.edu
Facsimile: 925-370-7512;

Each bid shall be made on the Bid Form, which is included in the Bid Documents and when submitted, shall be accompanied by a Bid Bond or Certified Cashier’s Check in the amount of 10% of bid (made payable to the Contra
Contra Costa Community College District. The District reserves the right to forfeit Bid Bond submitted for failure of the successful bidder to secure Payment & Performance Bonds.

**IMPORTANT INFORMATION:**

Pre-Bid Meeting and Job Walk: February 22, 2018, at 11:00 AM - MANDATORY

Pre-Bid Meeting and Job Walk, Location: Buildings and Grounds Conference Room
Contra Costa College
2600 Mission Bell Drive, San Pablo, CA, 94806

Last Date / Time for Bidder’s Requests for Information: February 27, 2018, prior to 5:00PM

Last Day to Issue Addendum: March 6, 2018

**BIDS DUE NO LATER THAN:** March 13, 2018, prior to 3:00 PM

Bids Must Be Received at: Contra Costa Community College District (Lobby)
500 Court St.
Martinez, CA 94553
Attn: Jovan Esprit – Contracts Manager (CCCCD)

Bids must be received by the District prior to the time and by the date noted above. Bids that are not received by the District prior to the time and by the date noted above will not be accepted, and will be returned to the Bidder unopened.

The successful bidder will be required to furnish a labor and material bond in an amount equal to one hundred percent (100%) of the contract price and a faithful performance bond in an amount equal to one hundred percent (100%) of the contract price, said bonds to be secured from a surety company acceptable to the Contra Costa Community College District and authorized to execute such surety in the State of California.

This project is a public works project and is subject to prevailing wage rate laws. A copy of the prevailing rates of wages is on file with the Contracts & Purchasing Office of the Contra Costa Community College District. Said rates of wages shall be included in the contract for the work by this reference.

Attention is directed to Section 4100 through 4113 of the Public Contract Code concerning Subcontractors, with emphasis on Section 4104, known as the “Subletting and Subcontracting Fair Practices Act, effective July 1, 2014.

Attention is directed to Labor Code Section 1725.5 regarding Department of Industrial Relations (DIR) contractor registration process including registration criteria and implementation of DIR registration requirements. Labor Code Section 1771.7 establishes contractor’s obligation to submit Certified Pay Roll (CPR) to the Department of Labor and Standards Enforcement (DLSE) and public works monitoring and enforcement. Labor Code Section 1773.3 requires the District to submit a PWC-100 to DIR for all public works contract awarded effective January 1, 2015.

Attention is directed to Section 00600, Construction Agreement, Article 5, and GENERAL CONDITIONS, Article 8, paragraphs 8.4.1 and 8.4.2, regarding liquidated damages. Liquidated Damages shall be set for $1,000 Dollars for each calendar day the work is delayed beyond the Contract Substantial Completion date. The Governing Board of the Contra Costa Community College District reserves the right to reject any and all bids and/or waive any informality or irregularity in any bid received. No bidder may withdraw their Bid for a period of ninety (90) days after the date set for opening thereof.

**END OF SECTION 00100**
SECTION 00200
INSTRUCTIONS TO BIDDERS

1.1 ISSUING OF DOCUMENTS
A. Bidding Documents may be examined at the Contra Costa Community College District, 500 Court Street, Martinez, CA 94553. By Appointment: Georgette Stewart, Facilities Department, phone: (925) 229-6847.

1.2 QUALIFICATIONS OF BIDDERS
A. Bidders may be required to furnish evidence satisfactory to the District and the Architect that he has sufficient means and has had sufficient experience in the class of work called for to enable him to complete the Contract in a satisfactory manner.
B. Bidders shall be Contractors properly licensed in accordance with the laws of the State of California.
C. The successful Bidder shall furnish satisfactory Certificates of Insurance coverage as specified in the Contract Documents.

1.3 RECEIPT AND OPENING OF BIDS
A. Contra Costa Community College District hereinafter referred to as the District, will receive Bids at the same time and place specified in the Notice inviting Bids.
B. Complete the Bid Form included in the Project Manual.
C. The envelopes containing the Bids shall be sealed, addressed to the District, and designated as “C-4001 Campus Safety Center – Site Work – Contra Costa College”. The envelope shall contain the name and address of the Bidder.
D. Bids that are mailed shall have the previously described envelope placed inside an envelope addressed to: CONTRA COSTA COMMUNITY COLLEGE DISTRICT, 500 Court Street, Martinez, CA 94553 ATTENTION: JOVAN ESPRIT, Contracts Manager. Bids should be mailed in time to be received prior to the time set forth in the Advertisement for Bids.
E. Bids which are conditional (or which make alterations, omissions, or reservations to the terms of the Bidding Documents) may be rejected as non-responsive.
F. All monetary figures are required, both in writing and in numerals. In event of conflict between written quotations and numerical quotations, written quotations shall govern.
G. Type or print all bid data legibly in ink except signatures which shall be in script. Mistakes may be crossed out and corrections inserted, if each is initialed in ink by signer of Bid.
H. Bidder's business address and signature shall be on the Bid. A Bid by a partnership shall furnish the full names of partners and be signed in the partnership name by one member of the partnership, or by authorized representative, followed by the signature and designation of the person signing. Bids by corporations, with corporate seal affixed, shall be signed with the legal name of the corporation followed by the name of the state of incorporation and by the signature and designation of the person authorized to bind it to the matter. The name of each
person signing shall also be typed or printed below the respective signatures. When required by the District, satisfactory evidence of authority of the office signing in behalf of the corporation shall be furnished.

I. No Bids will be received after the date and time set forth in the Notice Inviting Bids.

1.4 BID SECURITY
A. Submit with the Bid a Bid Security in the amount of 10 percent (10%) of the Bid.
B. The District reserves the right to forfeit the Bid Bond submitted for failure of the successful bidder to secure Payment & Performance Bonds.

1.5 SURETY BONDS
A. The successful Bidder shall furnish a Labor and Material Payment Bond in the amount equal to one hundred percent (100%) of the Contract Price and a faithful Performance Bond in the amount equal to 100 percent (100%) of the Contract Price as security for the successful performance of the work and payment of persons performing labor and furnishing materials. The Bonds shall be executed by a surety company or companies acceptable to the District and authorized to execute such in the State in which the Project is located and shall be furnished within 10 days after Notice of Acceptance of said Bid. Surety shall be made in favor of the District and shall cover the guarantee periods as well as the construction period.

1.6 WITHDRAWAL OR REVISIONS OF BID
A. This Bid may be withdrawn or revised prior to the scheduled time for receipt. Bids not withdrawn prior to the scheduled time for receipt may not be withdrawn for a period of 90 days.

1.7 BID PROTESTS
A. Inquiries or questions based on alleged patent ambiguity of the plans, specifications or estimate must be communicated as a bidder inquiry prior to bid opening. Any such inquiries or questions, submitted after bid opening, will not be treated as a bid protest.
B. Bidder may file a protest with the District against the Bid of other Bidder or Bidders (“Bid Protest”) subject to the provisions of this Article. The procedures and time limits set forth in this Article are mandatory and are a Bidder’s sole and exclusive remedy in protesting other Bidders’ bids. Failure to comply with these procedures shall constitute a waiver of any right to pursue a Bid Protest, or to contest the District’s award of the contract for the work that is the subject of the Bid, in any legal proceeding before any authority with jurisdiction.
C. Bid Protests and Responses shall be governed by the following time limitations:
1. Bidder must deliver any Bid Protest to the District in writing before 2:00PM, five (5) working days after the date of bid opening. The District will reject any Bid Protest not received by the District by this deadline. Bidder must concurrently deliver a copy of its Bid Protest to all Bidders against whose Bids the Bid Protest is directed. The Bidder must include with its Bid Protest written proof to the District’s satisfaction that Bidder has
delivered a copy of its Bid Protest to the other Bidder whose bid is the subject of the Bid Protest.

2. A Bidder whose Bid is the subject of a Bid Protest must deliver its written response, if any, ("Response") to the District, before 2:00PM, five (5) working days after the date of bid opening. The District will reject any Response not received by the District by this deadline.

D. Delivery of Bid Protest or Response:
1. Bidder may deliver a Bid Protest to the District by personal delivery or electronic transmission such as by facsimile. Bidder is solely responsible for ensuring that the District receives any Bid Protest or Response by the deadlines set forth herein.

2. The District will not consider Bid Protests or Responses by telephone conversation or any other non-written communication.

3. Bidder shall submit any Bid Protest or Response to: David Wetmore, Director of Purchasing and Contract Services, Contra Costa Community College District, 500 Court Street, Martinez, CA 94553, Facsimile: 925-370-7512.

E. Content of Bid Protest:
1. A Bid Protest must state the basis for the protest and provide supporting evidence.

2. A Bid Protest must refer to the specific portion of the Bid that forms the basis of the protest.

3. A Bid Protest must include the name, address, and telephone number of the person representing the protesting Bidder.

4. A Bid Protest must be clearly identified as a Bid Protest.

1.8 AWARD AND REJECTION OF BIDS

A. In awarding or rejecting Bids, the District reserves the following rights:
   1. Identification of successful Bidder will not be determined at time of opening Bids.
   2. To obtain opinion of counsel on legality and sufficiency of bids.
   3. To reject all Bids, to re-bid, or waive irregularities or informalities in a Bid, and to accept or reject alternates.
   4. Request proof that the successful Bidder can provide performance and payment bonds as required.

1.9 EXAMINE DOCUMENTS AND VISIT SITE

A. Before submitting a Bid, the Bidder shall examine the Bidding Documents, visit the site of the work, attend the required site visit arranged by the District and obtain Certification of Attendance signed by the District, ascertain existing conditions and limitations, including those of labor, and include in the Bid a sum to cover the cost of all items described in the Contract Documents.

B. No consideration will be granted for alleged misunderstanding of the materials to be furnished or work to be done. The tender of a Bid carries with it the agreement to terms and conditions referred to in the Contract Documents.
1.10 DISCREPANCIES, AMBIGUITIES, OR CONFLICTS
   A. If the Bidder is in doubt as to the true meaning of any part of the Contract Documents; finds discrepancies, errors or omissions therein; or finds variances in any of the Contract Documents with applicable rules, regulations, ordinances and/or laws, a written request for an interpretation or correction thereof must be submitted to the District’s Contract Manager. Bidders are solely responsible for submitting to District’s Contract Manager such request. Ambiguities or inconsistencies arising as a result of separation of sections or portions of the drawings or specifications by or for subcontractor bidding shall not relieve the Contractor for providing the complete Work without increase to or adjustment in the Contract Price or the Time for performance. Interpretations or corrections of the Contract Documents will be by written addendum issued by the Architect. No person is authorized to render an oral interpretation or correction of any portion of the Contract Documents to any Bidder, and no Bidder is authorized to rely on any such oral interpretation or correction. Failure to request interpretation or clarification of any portion of the Contract Documents pursuant to the foregoing is a waiver of any discrepancy, defect or conflict therein.

1.11 ADDENDA
   A. Cost for work included in any Addenda issued during the time of bidding shall be included in the Bid, and will become a part of the Contract. List Addenda received as indicated on the Bid Form.

1.12 FORM OF AGREEMENT
   A. The form of agreement to be used for the Contract is provided by the District and is included in the Project Manual.

1.13 AWARD OF CONTRACT
   A. The District will be allowed a period of ninety (90) days after Bid Opening Date for evaluating the Bids.
   B. Bidders of record will be notified of the results of the District’s evaluation of bids and Award of Contract, if any.
   C. The Contractor shall begin work within ten (10) calendar days of receipt of Notice to Proceed.

END OF SECTION 00200
PART 1 - REPORT AND INFORMATION

1.1 Existence of reports, record drawings, and utility surveys: Contra Costa Community College District, its consultants, and prior contractors may have collected documents providing a general description of the site and conditions of the work. These documents may consist of geotechnical reports for and around the site, record drawings, utility drawings, and information regarding underground utilities. These reports, documents and other information are not part of the Contract Documents and do not show new work to be constructed, rather, they show existing conditions that Contractor may have to address as part of its construction planning.

1.2 Available Documentation: The following existing documentation is available for review through District office for this project:

   A. Existing Drawings
   B. Campus Utilities Maps

1.3 Contractor shall acknowledge and accept that the documents are not a part of the Contract Documents and are made available to bidders for reference only. The District and its representatives are not responsible for any and all discrepancies between the documents and the existing and actual as-built conditions, and do not guarantee the accuracy of the documents.

1.4 The District and Architect assume no responsibility for the completeness or accuracy of the documents or the records compiled there from and the interpretations made from the documents. There is no express or implied guarantee that the conditions indicated in the documents are representative of those existing throughout the building and/or site Conditions differing substantially from those indicated may be encountered.

END OF SECTION 00210
SECTION 00300
BID PROPOSAL FORM

PROJECT NUMBER / NAME: C-4001 Campus Safety Center – Electrical and Low Voltage

CAMPUS / LOCATION: Contra Costa College, 2600 Mission Bell Drive, San Pablo, CA. 94806

DISTRICT: CONTRA COSTA COMMUNITY COLLEGE DISTRICT
500 Court St, Martinez, CA 94553

Herein Referred to as "District"

1. INTRODUCTION

A. The Bidder proposes to perform the Work for the Contract Sum and within the proposed Contract Time, based upon an examination of the site and the Bid and Contract Documents.

B. The Bidder certifies this Bid is submitted in good faith.

C. The Bidder agrees that the Contract Sum and other proposed terms will be considered in evaluating Bids and may be negotiated and adjusted before awarding of Contract.

D. The signed copy of the Certification of the Visit to the Site shall be attached to the Bid Form Submittal.

E. A fully executed Statement of Bidder's Qualifications signed by an authorized officer of the Bidder submitting the Bid shall be attached to the Bid Form.

F. A fully executed Non-Collusion Affidavit signed by an authorized officer of the Bidder submitting Bid shall be attached to the Bid Form.

G. The District shall award the contract to the lowest responsive and responsible Bidder. The evaluation of the low bid shall be based on the total of Item 2.A Base Bid.

H. The District reserves the right to award the Additive/Deductive Alternates, if any, through change orders as budget allows within 30 calendar days after the Award of Contract.

2. CONTRACT SUM

A. BASE BID
   For labor, materials, bonds, fixtures, equipment, tools, transportation, services, sales taxes, and other costs necessary to complete the general construction in accordance with the Contract Documents, for a stipulated Contract Sum in the amount of:

   __________________________________________ Dollars ($__________________________)

Contra Costa Community College District
Contra Costa College
C-4001 Campus Safety Center – Electrical and Low Voltage
3. ALTERNATES - NONE

4. COMPLETION TIME

   A. For establishing the Date of Final Completion the contract time for the Base Bid shall be as indicated in Section 00600, Construction Agreement. This time may be subject to modification to facilitate the work, as mutually agreed upon at a later date.

   B. The Bidder certifies that the Bid is based on the Contract Time for completion as stated in Section 00600, Construction Agreement. Bidder further certifies that the Base Bid amount is sufficient to cover all labor, materials, central office and construction site overhead, profit, and all other costs related to the completion of the Project for the entire Project construction time for both the General Contractor and all Subcontractors, as stated above in paragraphs 2 and 3.

5. ADDENDA

   A. The Bidder acknowledges receipt of the following Addenda, and certifies the Bid has provided for all modifications and considerations required therein.

   None [ ]

   Addendum No.: _________ dated _________________

   Addendum No.: _________ dated _________________

   Addendum No.: _________ dated _________________

   Addendum No.: _________ dated _________________

   Addendum No.: _________ dated _________________

   B. List of Additional Addenda Attached: Yes [ ] No. [ ].

6. DESIGNATION OF SUBCONTRACTORS

   A. The Bidder has set forth a complete list indicating the type of work, name, and business address of each Subcontractor who will perform work in excess of one-half of one percent of the Contract Sum.

   B. Any portion of the work in excess of the specified amount having no designated Subcontractor shall be performed by the Bidder.

   C. Substitution of listed Subcontractors will not be permitted unless approved in advance by the District.

   D. Prior to signing the Contract, the District reserves the right to reject any listed Subcontractor.
7. ACCEPTANCE AND AWARD

A. The District reserves the right to reject this Bid and to negotiate changes before or after execution of the Contract. This Bid shall remain open and shall not be withdrawn for a period of 90 days after Bid Opening date.

B. If written notice of acceptance of this Bid is mailed or delivered to the Bidder within 90 days after the date set for the receipt of this Bid, or other time before it is withdrawn, the Bidder will execute and deliver to the District a Contract prepared by District with the required Surety Bonds and Certificates of Insurance, within 10 days after personal delivery or deposit in the mail of the notification of acceptance.

C. Notice of acceptance or request for additional information may be addressed to the Bidder at the address provided.

8. BID SECURITY

A. The required 10 percent (10%) Bid Security for this Bid is attached in the form of:

   ( ) Bid Bond Issued By: ______________________________

   ( ) Certified or Cashier’s Check No. _________________________

   Issued by: ____________________________________________

9. BIDDER’S BUSINESS INFORMATION

A. Individual [ ]:

   ________________________________________________
B. Partnership [ ]:

Co-partners' Names:

Business Name:

Address:

_______ Zip Code:__________

Telephone: ____________________________

Fax Number: ____________________________

C. Corporation [ ]:

Firm Name:

Address:

_______ Zip Code ____________

Telephone: ____________________________

Fax Number: ____________________________

State of Incorporation: ____________________________

President: ____________________________

Secretary: ____________________________

Treasurer: ____________________________
Manager: ______________________________________________________________________

D. **Power of Attorney:**
   Name: ______________________________________________________________________
   Title: ______________________________________________________________________

E. **Contractor License No.** ___________ **State of** ___________

F. Bidder is submitting this proposal on behalf of a Joint Venture. Names, license numbers, and relevant information are given on a separate attachment:
   Yes [ ] No [ ].

G. Upon request, furnish appropriate documentation to substantiate and/or support the data given.

10. The undersigned hereby certifies under penalty of perjury under the laws of the State of California that all the information submitted by the Bidder in connection with this Bid and all the representations herein made are true and correct.

   Executed this day of _________________________________


____________________________________________________________________________
Contractor’s License No. __________________________ Expiration Date __________________________


____________________________________________________________________________
Firm Name


____________________________________________________________________________
Signature


____________________________________________________________________________
By (Print or Type Name)


____________________________________________________________________________
Title


End of Section 00300
NONCOLLUSION AFFIDAVIT
(TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID)

State of California
County of Contra Costa

_____________________________________________________, being first duly sworn, deposes and says that he or she is
of ____________________________________________________, the party making the foregoing bid that the bid is not made
in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that
the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder
to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or
anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or
indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other
bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage
against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in
the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown
thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any
corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate
a collusive or sham bid.

I certify (or declare) under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: ____________________  Signature: ________________________________

State of California
County of Contra Costa

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

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

WITNESS my hand and official seal.

Date: ____________________  Signature: ________________________________

[SEAL]
SECTION 00450

CERTIFICATION OF SITE VISIT

The Governing Board of the
Contra Costa Community College District
500 Court Street
Martinez, California 94553

Gentlemen/Ladies:

I visited the **C-4001 Campus Safety Center – Electrical and Low Voltage** job site,

on _________________ at ______________ A.M. P.M (Circle one)

to inspect the proposed work, which would be turned over to me in its present condition, with a representative of the Contra Costa Community College District in order to acquaint myself with the proposed work so that I might fully understand the facilities, difficulties, and restrictions attending the execution of the work under the contract, and acknowledge I had the opportunity to check the Record Drawing as-built drawings and/or previous Contract Documents, site conditions and Bid Documents with the authorized representative of the District.

**Owner Representative:**

Project Manager – CCCCD Facilities __________________________ Date __________________________

or

Manager – Buildings & Grounds __________________________ Date __________________________

**Bidder:**

Name of Firm or Company __________________________

Authorized Signatory __________________________

Address __________________________

Phone Number __________________________ Fax Number __________________________

**NOTE:** Any bidder who fails to return this CERTIFICATION, fully executed, including signature of company representative AND a Contra Costa Community College District representative, with the proposal form, may have their bid rejected as non-responsive.

END OF SECTION 00450
PAYMENT BOND
(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

THAT WHEREAS, the Contra Costa Community College District (sometimes referred to hereinafter as “Obligee”) has awarded to ___________________________ (hereinafter designated as the “Principal” or “Contractor”), an agreement for the work described as follows: ___________________________________________________________ (hereinafter referred to as the “Public Work”); and

WHEREAS, said Contractor is required to furnish a bond in connection with said Contract, and pursuant to California Civil Code Section 9550;

NOW, THEREFORE, We, _______________________________________, the undersigned Contractor, as Principal; and ________________________________, a corporation organized and existing under the laws of the State of ________________, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the Contra Costa Community College District and to any and all persons, companies, or corporations entitled by law to file stop notices under California Civil Code Section 9100, or any person, company, or corporation entitled to make a claim on this bond, in the sum of ___________________________ Dollars ($_____________), said sum being not less than one hundred percent (100%) of the total amount payable by said Obligee under the terms of said Contract, for which payment will and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal, its heirs, executors, administrators, successors, or assigns, or subcontractor, shall fail to pay any person or persons named in Civil Code Section 9100; or fail to pay for any materials, provisions, or other supplies, used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or for amounts due under the Unemployment Insurance Code, with respect to work and labor thereon of any kind; or shall fail to deduct, withhold, and pay over to the Employment Development Department, any amounts required to be deducted, withheld, and paid over by Unemployment Insurance Code Section 13020 with respect to work and labor thereon of any kind, then said Surety will pay for the same, in an amount not exceeding the amount herein above set forth, and in the event suit is brought upon this bond, also will pay such reasonable attorneys’ fees as shall be fixed by the court, awarded and taxed as provided in California Civil Code Sections 9550 et seq.

This bond shall inure to the benefit of any person named in Civil Code Section 9100 giving such person or his/her assigns a right of action in any suit brought upon this bond.

It is further stipulated and agreed that the Surety of this bond shall not be exonerated or released from the obligation of the bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, or specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described; or pertaining or relating to the furnishing of labor, materials, or equipment thereof; nor by any change or modification of any terms of payment or extension of time for payment pertaining or
relating to any scheme or work of improvement herein above described; nor by any rescission or attempted rescission of the contract, agreement or bond; nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond; nor by any fraud practiced by any person other than the claimant seeking to recover on the bond; and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given; and under no circumstances shall the Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the Obligee and the Contractor or on the part of any obligee named in such bond; that the sole condition of recovery shall be that the claimant is a person described in California Civil Code Sections 9100, and who has not been paid the full amount of his or her claim; and that the Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned.

IN WITNESS WHEREOF, we have hereunto set our hands and seals this_____________ day of ____________, 20____.

PRINCIPAL/CONTRACTOR:

____________________________________

By: __________________________________

SURETY:

____________________________________

By: __________________________________

Attorney-in-Fact
IMPORTANT: THIS IS A REQUIRED FORM.

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code Section 105, and if the work or project is financed, in whole or in part, with federal, grant or loan funds, Surety’s name must also appear on the Treasury Department’s most current list (Circular 570 as amended).

Any claims under this bond may be addressed to:

(Name and Address of Surety)               (Name and Address of agent or representative for service for service of process in California)

Telephone: ____________________________ Telephone: ____________________________

STATE OF CALIFORNIA  )
 ) ss.
COUNTY OF

On ___________________________ before me, ____________________________, a Notary Public in and for said State, personally appeared ____________________________, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument as the Attorney-in-Fact of the ____________________________ (Surety) and acknowledged to me that he/she/they subscribed the name of the ____________________________ (Surety) thereto and his own name as Attorney-in-Fact on the executed instrument.

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

WITNESS my hand and official seal.

__________________________       (SEAL)
Notary Public in and for said State

Commission expires: ____________________________

NOTE: A copy of the power-of-attorney to local representatives of the bonding company must be attached hereto.
CONTRACT PERFORMANCE BOND
(CALIFORNIA PUBLIC WORK)

KNOW ALL MEN BY THESE PRESENTS:

    THAT WHEREAS, Contra Costa Community College District (sometimes referred to hereinafter as “Obligee”) has awarded to ___________________________________________ (hereinafter designated as the “Principal” or “Contractor”), an agreement for the work described as follows: ____________________________________ (hereinafter referred to as the “Public Work”); and

    WHEREAS, the work to be performed by the Contractor is more particularly set forth in that certain contract for said Public Work dated ______________ ____________________, (hereinafter referred to as the “Contract”), which Contract is incorporated herein by this reference; and

    WHEREAS, the Contractor is required by said Contract to perform the terms thereof and to provide a bond both for the performance and guaranty thereof.

    NOW, THEREFORE, we, ______________________________________, the undersigned Contractor, as Principal, and ________________, a corporation organized and existing under the laws of the State of ________________, and duly authorized to transact business under the laws of the State of California, as Surety, are held and firmly bound unto the Contra Costa Community College District in the sum of _____________________________________ Dollars ($_______________), said sum being not less than one hundred percent (100%) of the total amount payable by said Obligee under the terms of said Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

    THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the bounded Contractor, his or her heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions, and agreements in said Contract and any alteration thereof made as therein provided, on his or her part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill guarantees of all materials and workmanship; and indemnify, defend and save harmless the Obligee, its officers and agents, as stipulated in said Contract, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

    The Surety, for value received, hereby stipulates and agrees that it shall not be exonerated or released from the obligation of this bond (either by total exoneration or pro tanto) by any change, extension of time, alteration in or addition to the terms of the contract or to the work to be performed there under or the specifications accompanying the same, nor by any change or modification to any terms of payment or extension of time for any payment pertaining or relating to any scheme of work of improvement under the contract. Surety also stipulates and agrees that it shall not be exonerated or released from the obligation of this bond (either by total exoneration or pro tanto) by any overpayment or underpayment by the Obligee that is based upon estimates

Contra Costa Community College District
Contra Costa College
C-4001 Campus Safety Center –Electrical and Low Voltage
approved by the Architect. The Surety stipulates and agrees that none of the aforementioned changes, modifications, alterations, additions, extension of time or actions shall in any way affect its obligation on this bond, and it does hereby waive notice of any such changes, modifications, alterations, additions or extension of time to the terms of the contract, or to the work, or the specifications as well notice of any other actions that result in the foregoing.

Whenever Principal shall be, and is declared by the Obligee to be, in default under the Contract, the Surety shall promptly either remedy the default, or shall promptly complete the Contract through its agents or independent contractors, subject to acceptance and approval of such agents or independent contractors by Obligee as hereinafter set forth, in accordance with its terms and conditions and to pay and perform all obligations of Principal under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of liquidated damages; or, at Obligee’s sole discretion and election, Surety shall obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Obligee of the lowest responsible bidder, arrange for a contract between such bidder and the Obligee and make available as Work progresses (even though there should be a default or succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the “balance of the Contract price” (as hereinafter defined), and to pay and perform all obligations of Principal under the Contract, including, without limitation, all obligations with respect to warranties, guarantees and the payment of liquidated damages. The term “balance of the Contract price,” as used in this paragraph, shall mean the total amount payable to Principal by the Obligee under the Contract and any modifications thereto, less the amount previously paid by the Obligee to the Principal, less any withholdings by the Obligee allowed under the Contract.

Surety expressly agrees that the Obligee may reject any agent or contractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Principal. Unless otherwise agreed by Obligee, in its sole discretion, Surety shall not utilize Principal in completing the Contract nor shall Surety accept a bid from Principal for completion of the work in the event of default by the Principal.

No final settlement between the Obligee and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

The Contractor and Surety shall remain responsible and liable for all patent and latent defects that arise out of or are related to the Contractor’s failure and/or inability to properly complete the Public Work as required by the Contract and the Contract Documents. The obligation of the Surety hereunder shall continue so long as any obligation of the Contractor remains.

Contractor and Surety agree that if the Obligee is required to engage the services of an attorney in connection with enforcement of the bond, Contractor and Surety shall pay Obligee’s reasonable attorneys’ fees incurred, with or without suit, in addition to the above sum.

In the event suit is brought upon this bond by the Obligee and judgment is recovered, the Surety shall pay all costs incurred by the Obligee in such suit, including reasonable attorneys’ fees to be fixed by the Court.
IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____________________, 20____.

PRINCIPAL/CONTRACTOR:

________________________________________

By: _____________________________________

SURETY:

________________________________________

By: _____________________________________

Attorney-in-Fact

The rate of premium on this bond is ______________________________ per thousand.

The total amount of premium charged: $__________________________ (This must be filled in by a corporate surety).

IMPORTANT: THIS IS A REQUIRED FORM.

Surety companies executing bonds must possess a certificate of authority from the California Insurance Commissioner authorizing them to write surety insurance defined in California Insurance Code Section 105, and if the work or project is financed, in whole or in part, with federal, grant or loan funds, Surety’s name must also appear on the Treasury Department’s most current list (Circular 570 as amended).

Any claims under this bond may be addressed to:

(Name and Address of Surety)  (Name and Address of agent or representative for service for service of process in California)

________________________________________  __________________________________________

________________________________________  __________________________________________

Telephone: ___________________________  Telephone: ___________________________
STATE OF CALIFORNIA  )
COUNTY OF  ) ss.

On __________________________ before me, ______________________________________
(insert name and title of the officer)

On ____________________________, before me, _________________________, a Notary
Public in and for said State, personally appeared _______________________________, who
proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are
subscribed to the within instrument as the Attorney-in-Fact of the ___________________
(Surety) and acknowledged to me that he/she/they subscribed the name of the
_____________________ (Surety) thereto and his own name as Attorney-in-Fact on the
executed instrument.

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

WITNESS my hand and official seal.

______________________________  (SEAL)
Notary Public in and for said State

Commission expires: ______________

NOTE: A copy of the power-of-attorney to local representatives of the bonding company
must be attached hereto.
SECTION 00510

NOTICE OF AWARD

DATE: _____________________

TO: _____________________________________________

ADDRESS: _______________________________________

PROJECT: ________________________________________

The Contract Sum of your contract is __________________________ Dollars, ($_________________).

You must comply with the following conditions within ten (10) calendar days of the date of this Notice of Award, that is, by ________________.

1. You must deliver to the District two fully executed counterparts of Section 00600, “Construction Agreement.”

2. You must deliver to the District the “Contract Performance Bond,” and “Payment Bond,” executed by you and your surety, which are included in Section 00500.

3. You must deliver to District the insurance certificates required in Section 00700, for insurance required in Section 00600, Construction Agreement.

Failure to comply with these conditions within the time specified will entitle District to consider your bid abandoned, to annul this Notice of Award, and to declare your Bid Security forfeited. Within ten (10) calendar days after you comply with these conditions, the District will return to you one fully signed counterpart of the Construction Agreement.

Contra Costa Community College District

By: _______________________________________________

Title: ____________________________________________

END OF DOCUMENT
SECTION 00600

CONSTRUCTION AGREEMENT

CONTRACT NO. ___________________
(Construction Agreement)

This Agreement shall not be enforceable until ratified and approved by the Contra Costa Community College District’s Governing Board. The estimated board meeting date is March 28, 2018.

(§1.1) Parties: (Public Agency) CONTRA COSTA COMMUNITY COLLEGE DISTRICT
500 Court St, Martinez, CA 94553

Contractor
Address:

(§1.2) Effective Date: _______________________

(§1.3) The Work: C-4001 CAMPUS SAFETY CENTER – ELECTRICAL AND LOW VOLTAGE

(§1.4) Completion Time: 167 Calendar Days from the Notice to Proceed to Substantial Completion, and 35 Calendar Days from Substantial Completion to Final Completion (Remaining Work).

(§1.5.1) Liquidated Damages, Substantial Completion: $1,000 per Calendar Day beyond the Contract Substantial Completion Date.

(§1.5.2) Liquidated Damages, Remaining Work/Final Completion: $500/ per calendar day Remaining Work is delayed beyond the Contract Final Completion Date.

(§1.6) Public Agency’s Agent: CONTRA COSTA COMMUNITY COLLEGE DISTRICT (“District”)

(§1.7) Contract Sum: ____ MILLION ____ THOUSAND, ____ HUNDRED DOLLARS and NO CENTS ($00,000,000.00)

2. SCOPE OF WORK:

This Electrical and Low Voltage bid package consists of site electrical, site utilities and fire alarm, communications, and security systems work, within Modular Buildings provided by JTS Modular, Inc.. Work includes, but is not limited to, the following:

• Site electrical including connection to the campus power and communications systems
• Electrical connection of power and communications to the modular building panels
• Providing transformer for the electrical service.
• Fire alarm in the modular building connected to the main campus alarm panel in another building
• Intrusion alarm, door access control and security cameras
• Telcom/data communications including all cabling and connection to the campus MPOE
- Power and data to site automatic gates and irrigation controllers

The Modular building contractor will provide all power and lighting inside the modular building, including the panels. Communications/alarm/security conduit/boxes only are stubbed from walls to the ceiling. The Site Work contractor will grade and lime treat the site. This Electrical and Low Voltage package contractor shall coordinate its work with the other contractors.

3. **WORK CONTRACT, CHANGES**

(a) By their signatures below, effective on the above date, these parties promise and agree as set forth in this Agreement, incorporating by these references labor and materials contained in Section 2, Scope of Work.

(b) Contractor shall, at Contractor’s own cost and expense, and in a workmanlike manner, fully and faithfully perform and complete the work; and will furnish all materials, labor, services, equipment, and transportation necessary, convenient and proper in order fairly to perform the requirements of this contract, all strictly in accordance with the Public Agency’s- drawings and specifications.

(c) The work can be changed only with Public Agency’s prior written order specifying such change and its cost agreed to by the parties; and the Public Agency shall never have to pay more than specified in Section 1.7 without such an order.

4. **TIME: NOTICE TO PROCEED AND ACCEPTANCE**

(a) Contractor shall start this work as directed in the specifications or the Notice to Proceed and shall complete it as specified in Section 1, Completion Time.

(b) Remaining Work after Substantial Completion. If the Architect or District determines that the work required by the Contract is Substantially Complete during any inspection conducted pursuant to this Agreement or Specification Section 01770, Contract Closeout Procedures, the Contractor shall be notified of that determination and the District shall determine if there is Remaining Work. A list of Remaining Work shall be issued only by the District or the Architect and only after the District has certified Substantial Completion. The District or Architect shall give the Contractor the necessary instructions for correction or completion of the Remaining Work, and the Contractor shall immediately comply with and execute such instructions within the Contract Time. Upon completion of the Remaining Work, another inspection shall be made that shall constitute the Final Inspection, provided the Remaining Work has been completed to the satisfaction of the District. If the remaining work has been completed to the satisfaction of the District, the District shall make the final acceptance and notify the Contractor in writing of this acceptance as of the date of Final Inspection.

(c) Final Acceptance – Upon due notice from the Contractor of completion of the entire project, the District shall make an inspection. If all construction provided for and contemplated by the contract is found to be completed to the District’s satisfaction, then that inspection shall constitute the Final Inspection and the District shall notify the Contractor in writing of final acceptance effective as of the date of the Final Inspection.

(d) Default for failure to Complete Remaining Work in the event the Contract Time expires before the Remaining Work is completed to the satisfaction of the District, the District may provide notice to the Contractor that the Remaining Work shall be completed by Contractor to the satisfaction of the District within ten consecutive calendar days from the date of such notice. The
failure of the Contractor to satisfactorily complete the Remaining Work within the ten days shall entitle to District to declare Contractor in default and thereafter terminate the Contract. The ten-day notice provided under this paragraph shall not be construed as adding any time to the Contract Time and is a time period solely for the purposes of providing notice of default.

(e) Application for Final Payment. After the Contractor has completed all Remaining Work to the satisfaction of the District and delivered all maintenance and operating instructions, schedules, guarantees, warranties, bonds, certificates of inspection, marked-up record documents and other documents as required by the Contract, and after the District or Architect has indicated that the work is acceptable, Contractor may make application for final payment following the Payments Procedures for progress payments. The final application for payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the District) of all liens arising out of or filed in connection with the work on the project.

(f) Final Payment and Acceptance. If the Architect determines that the work has been completed and the Contractor's other obligations under the Contract have been fulfilled, the Architect shall, within ten working days after receipt of the final application for payment, indicate in writing the Architect's recommendation of payment and present the application to District for payment. Thereupon the Architect shall prepare a Certificate of Final Completion. Otherwise, Architect shall return the application to Contractor indicating in writing the reasons for refusing to recommend final payment. Contractor shall make the corrections identified in the Architect's refusal to recommend final payment. Thirty days after presentation to District of the application and accompanying documentation, with the Architect's recommendation and notice of acceptability of the work, the amount recommended by Architect shall be come due and payable by District to Contractor.

5. LIQUIDATED DAMAGES

5.1 LIQUIDATED DAMAGES - SUBSTANTIAL COMPLETION

If the Contractor fails to complete this contract and this Work within the time fixed therefore, allowance being made for contingencies as provided herein, Contractor becomes liable to the Public Agency for all its loss and damage there from; and because, from the nature of the case, it is and will be impracticable and extremely difficult to ascertain and fix the Public Agency's actual damage from any delay in performance hereof, it is agreed that Contractor will pay as liquidated damages to the Public Agency the reasonable sum specified in Section 1, the result of the parties' reasonable endeavor to estimate fair average compensation therefore, for each calendar day's delay in finishing said Work; and if the same be not paid, Public Agency may, in addition to its other remedies, deduct the same from any money due or to become due Contractor under this Contract. If the Public Agency for any cause authorizes or contributes to a delay, suspension of work or extension of time, its duration shall be added to the time allowed for completion, but it shall not be deemed a waiver nor be used to defeat any right of the Agency to damages for non-completion or delay hereunder. Pursuant to Government Code Section 4215, the Contractor shall not be assessed liquidated damages for delay in completion of the work, when such delay was caused by the failure of the Public Agency or the owner of a utility to provide for removal or relocation of existing utility facilities.
5.2 LIQUIDATED DAMAGES-THE REMAINING WORK

The Remaining Work, as such work is determined by the Public Agency or Public Agency’s Representative, shall be completed within the Contract Time or any proper extension thereof granted by Public Agency. If the Contractor shall neglect, fail or refuse to complete the Remaining Work within the Contract Time or any proper extension thereof granted by the Public Agency, then the Contractor does hereby agree, as part consideration for the awarding of this Contract, to pay to the Public Agency the amount specified in the Contract, not as a penalty but as liquidated damages for the Remaining Work for each such breach of Contract set forth herein for each and every consecutive calendar day that the Contractor shall be in default after expiration of the Contract Time.

6. INTEGRATED DOCUMENTS

The drawings and specifications and special provisions of the Public Agency’s Notice Inviting Bids, and Contractor’s accepted bid for this work are hereby incorporated into this Contract; and they are intended to cooperate, so that anything exhibited in the drawings and not mentioned in the specifications or special provisions, or vice versa, is to be executed as if exhibited, mentioned and set forth in both, to the true intent and meaning thereof when taken all together; and differences of opinion concerning these shall be finally determined by the Public Agency.

7. PAYMENT

(a) For strict and literal fulfillment of these promises and conditions, and full compensation for all this work, the Public Agency shall pay the Contractor the sum specified in Section 1, except that in unit price contracts the payment shall be for finished quantities at unit bid prices.

(b) On or about the first day of each calendar month, the Contractor shall submit to the Public Agency a verified application for payment, supported by a statement showing all materials actually installed during the preceding month, the labor expended thereon, and the cost thereof; whereupon, after checking, the Public Agency shall issue to Contractor a certificate for the amount determined to be due, minus five (5%) percent thereof pursuant to the Public Agency’s General Terms and Conditions, but not until defective work and materials have been removed, replaced and made good.

8. PAYMENTS WITHHELD

(a) The Public Agency or its agent may withhold any payment, or because of later discovered evidence nullify all or any certificate for payment, to such extent and period of time only as may be necessary to protect the Public Agency from loss because of:

(1) Defective work not remedied, or work not completed, or
(2) Claims filed or reasonable evidence indicating probable filing, or
(3) Failure to properly pay subcontractors or for material or labor, or
(4) Reasonable doubt that the work can be completed for the balance then unpaid, or
(5) Damage to another contractor, or
(6) Damage to the Public Agency, other than damage due to delays.
(b) The Public Agency shall use reasonable diligence to discover and report to the Contractor, as the work progresses, the materials and labor which are not satisfactory to it, so as to avoid unnecessary trouble or cost to the Contractor in making good any defective work or parts.

(c) Thirty-five (35) calendar days after Public Agency files its notice of completion of the entire work, it shall issue a certificate to the Contractor and pay the balance of the contract sum after deducting all amounts withheld under this contract, provided the Contractor shows that all claims for labor and materials have been paid, no claims have been presented to the Public Agency based on acts or omissions of the Contractor, and no liens or withhold notices have been filed against the work or site, and provided there are not reasonable indications of defective or missing work or of late-recorded notices of liens or claims against Contractor.

9. **INSURANCE**

Contractor’s Liability Insurance: Before the commencement of the Work, the Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least A status as rated in the most recent edition of Best’s Insurance Reports or as amended by the Supplementary General Conditions, if any, such insurance as will protect the Public Agency from claims set forth below, which may arise out of or result from the Contractor’s operations under the Contract and for which the Contractor may be legally liable, whether such operations are by the Contractor, by a Subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

(a) Claims for damages because of bodily injury, sickness, disease, or death of any person District would require indemnification and coverage for employee claim;

(b) Claims for damages insured by usual personal injury liability coverage, which are sustained by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor or by another person;

(c) Claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents;

(d) Claims for damages because of bodily injury, death of a person, or property damage arising out of the ownership, maintenance, or use of a motor vehicle, all mobile equipment, and vehicles moving under their own power and engaged in the Work;

(e) Claims involving contractual liability applicable to the Contractor’s obligations under the Contract Documents, including liability assumed by and the indemnity and defense obligations of the Contractor and the Subcontractors; and

(f) Claims involving Completed Operations, Independent Contractors’ coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating. (XCU)

(g) Claims involving sudden or accidental discharge of contaminants or pollutants.

Subcontractor Insurance Requirements: The Contractor shall require its Subcontractors to take out and maintain similar public liability insurance and property damage insurance as required under the above paragraph, titled “Contractor’s Liability Insurance, in amounts commensurate with the value of the subcontract. A “claims made” or modified “occurrence” policy shall not satisfy the requirements of
the above paragraph, titled “Contractor’s Liability Insurance, without prior written approval of the District.

**Additional Insured Endorsement Requirement:** The Contractor shall name, on any policy of insurance, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as Additional Insured. Subcontractors shall name the Contractor, the District, Architect, Inspector, the State of California, their officers, employees, agents and independent contractors as Additional Insured.

The Additional Insured Endorsement included on all such insurance policies shall state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the Additional Insured have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The insurance provided by the Contractor must be designated in the policy as primary to any insurance obtained by the Public Agency. The amount of the insurer’s liability shall not be reduced by the existence of such other insurance.

**Workers’ Compensation Insurance:** During the term of this Contract, the Contractor shall provide workers’ compensation insurance for all of the Contractor’s employees engaged in Work under this Contract on or at the Site of the Project and, in case any of the Contractor’s Work is subcontracted, the Contractor shall require the Subcontractor to provide workers’ compensation insurance for all the Subcontractor’s employees engaged in Work under the subcontract. Any class of employee or employees not covered by a Subcontractor’s insurance shall be covered by the Contractor’s insurance. In case any class of employees engaged in Work under this Contract on or at the Site of the Project is not protected under the Workers’ Compensation laws, the Contractor shall provide or cause a Subcontractor to provide adequate insurance coverage for the protection of those employees not otherwise protected. The Contractor shall file with the District certificates of insurance as required under Section 00700, Article 11.6, and in compliance with Labor Code § 3700.

**Specific Insurance Requirement:** Contractor shall take out and maintain and shall require all subcontractors, if any, whether primary or secondary, to take out and maintain:

(a) **Workers’ Compensation Insurance:** $1,000,000.00; Contractor is aware of and complies with Labor Code Section 3700 and the Worker’s Compensation Law.

(b) **Comprehensive General Liability Insurance** with a combined single limit per occurrence of not less than $1,000,000.00 and $2,000,000.00 project specific aggregate, or Commercial General Liability Insurance (including automobile insurance) which provides limits of not less than:

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<th>Item</th>
<th>Limit</th>
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</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Per occurrence (combined single limit) $1,000,000.00</td>
</tr>
<tr>
<td>(2)</td>
<td>Project Specific Aggregate (for this project only) $2,000,000.00</td>
</tr>
<tr>
<td>(3)</td>
<td>Products and Completed Operations $1,000,000.00</td>
</tr>
</tbody>
</table>

(c) **Insurance Covering Special Hazards**

The following Special hazards shall be covered by riders or riders to above mentioned public liability insurance or property damage insurance policy or policies of insurance, in amounts as follows:

<table>
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<tr>
<th>Item</th>
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<tr>
<td>(1)</td>
<td>Automotive and truck where operated in amounts $1,000,000.00</td>
</tr>
<tr>
<td>(2)</td>
<td>Material Hoist where used in amounts $1,000,000.00</td>
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(d) In addition, provide Excess Liability Insurance coverage in the amount of Two Million Dollars ($2,000,000.00).

**Builder’s Risk/ “All Risk” Insurance**/Course-of-Construction Insurance Requirements: The Contractor, during the progress of the Work and until final acceptance of the Work by District upon completion of the entire Contract, shall maintain Builder’s Risk, Course of Construction or similar first party property coverage issued on a replacement cost value basis consistent with the total replacement cost of all insurable Work and the Project included within the Contract Documents. Coverage is to insure against all risks of accidental direct physical loss, and must include, by the basic grant of coverage or by endorsement, the perils of vandalism, malicious mischief (both without any limitation regarding vacancy or occupancy), fire, sprinkler leakage, civil authority, sonic boom, earthquake, flood, collapse, wind, lightning, smoke and riot. The coverage must include debris removal, demolition, increased costs due to enforcement of building ordinance and law in the repair and replacement of damage and undamaged portions of the property, and reasonable costs for the Architect’s and engineering services and expenses required as a result of any insured loss upon the Work and Project which is the subject of the Contract Documents, including completed Work and Work in progress, to the full insurable value thereof. Such insurance shall include the District and the Architect as additional named insureds, and any other person with an insurable interest as designated by the District.

The Contractor shall submit to the District for its approval all items deemed to be uninsurable. The risk of the damage to the Work due to the perils covered by the “Builder’s Risk/All Risk” Insurance, as well as any other hazard which might result in damage to the Work, is that of the Contractor and the surety, and no claims for such loss or damage shall be recognized by the District nor will such loss or damage excuse the complete and satisfactory performance of the Contract by the Contractor.

10. **BONDS**

**Bond Requirements:** Prior to commencing any portion of the Work, the Contractor shall furnish separate payment and performance bonds for its portion of the Work which shall cover 100% faithful performance of and payment of all obligations arising under the Contract Documents and/or guaranteeing the payment in full of all claims for labor performed and materials supplied for the Work. All bonds shall be provided by a corporate surety authorized and admitted to transact business in California as sureties.

To the extent, if any, that the Contract Sum is increased in accordance with the Contract Documents, the Contractor shall, upon request of the Public Agency, cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the Public Agency. To the extent available, the bonds shall further provide that no change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Sum, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will release the surety. If the Contractor fails to furnish the required bonds, the Public Agency may terminate the Contract for cause.
On signing this contract, Contractor shall deliver to Public Agency for approval good and sufficient bonds with sureties, in amount(s), specified in the specifications or special provisions, guaranteeing faithful performance of this contract and payment for all labor and materials hereunder.

Surety Qualifications: Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure § 995.120 shall be accepted. Surety must be a California-admitted surety and listed by the U.S. Treasury with a bonding capacity in excess of the Project cost.

Alternate Surety Qualifications: If a California-admitted surety insurer issuing bonds does not meet these requirements, the insurer will be considered qualified if it is in conformance with § 995.660 of the California Code of Civil Procedure and proof of such is provided to the District.

11. FAILURE TO PERFORM

If the Contractor at any time refuses or neglects, without fault of the Public Agency or its agent(s), to supply sufficient materials or workers to complete this agreement and work as provided herein, for a period of ten days or more after written notice thereof by the Public Agency, the Public Agency may furnish same and deduct the reasonable expenses thereof from the contract price.

12. LAWS APPLY: General

Both parties recognize the applicability of various federal, state and local laws and regulations, especially Chapter 1 of Part 7 of the California Labor Code (beginning with Section 1720, and including Sections 1735, 1777.5, 1777.6, forbidding discrimination) and intend that this agreement complies therewith. The parties specifically stipulate that the relevant penalties and forfeitures provided in the Labor Code, especially in Sections 1775, 1776, and 1813, concerning prevailing wages and hours, shall apply to this agreement as though fully stipulated herein.

13. SUBCONTRACTORS

Public Contract Code Sections 4100-4113 are incorporated herein.

14. WAGE RATES

(a) Pursuant to Labor Code Section 1773, the Director of the Department of Industrial Relations has ascertained the general prevailing rates of wages per diem, and for holiday and overtime work, in the locality in which this work is to be performed, for each craft, specified in the call for bids for this work and are on file with the Public Agency, and are hereby incorporated herein.

(b) This schedule of wages is based on a working day of eight (8) hours unless otherwise specified; and the daily rate is the hourly rate multiplied by the number of hours constituting the working day. When less than that number of hours are worked, the daily wage rate is proportionately reduced, but the hourly rate remains as stated.

(c) The Contractor, and all subcontractors, must pay at least these rates to all persons on this work, including all travel, subsistence, and fringe benefit payments provided for by applicable collective bargaining agreements. All skilled labor not listed above must be paid at least the wage scale established by collective bargaining agreement for such labor in the locality where such work is being performed. If it becomes necessary for the Contractor or any subcontractor to employ any
person in a craft, classification or type of work (except executive, supervisory, administrative, clerical or other non-manual workers as such) for which no minimum wage rate is specified, the contractor shall immediately notify the Public Agency which shall promptly determine the prevailing wage rate therefore and furnish the Contractor with the minimum rate based thereon, which shall apply from the time of the initial employment of the person affected and during the continuance of such employment.

15. **HOURS OF LABOR**

Eight hours of labor in one calendar day constitutes a legal day's work, and no worker employed at any time on this work by the Contractor or by any subcontractor shall be required or permitted to work longer thereon except as provided in Labor Code Sections 1810-1815.

16. **APPRENTICES**

Properly indentured apprentices may be employed on this work in accordance with Labor Code Sections 1777.5 and 1777.6, forbidding discrimination.

17. **PREFERENCE FOR MATERIALS**

The Public Agency desires to promote the industries and economy of Contra Costa County, and the Contractor therefore promises to use the products, workers, laborers and mechanics of this County in every case where the price, fitness and quality are at least equal.

18. **ASSIGNMENT**

This agreement binds the heirs, successors, assigns, and representatives of the Contractor; but Contractor cannot assign it in whole or in part, nor any monies due or to become due under it, without the prior written consent of the Public Agency and the Contractor's surety or sureties, unless they have waived notice of assignment.

19. **NO WAIVER BY PUBLIC AGENCY**

Inspection of the work and/or materials, or approval of work and/or materials inspected, or statement by any officer, agent or employee of the Public Agency indicating the work or any part thereof complies with the requirements of this contract, or acceptance of the whole or any part of said work and/or materials, or payments therefore, or any combination of these acts, shall not relieve the Contractor of Contractor's obligation to fulfill this contract as prescribed; nor shall the Public Agency be thereby stopped from bringing any action for damages or enforcement arising from the failure to comply with any of the terms and conditions hereof.

20. **HOLD HARMLESS AND INDEMNITY**

(a) Contractor promises to and shall hold harmless and indemnify from the liabilities as defined in this section.
(b) The indemnities benefited and protected by this promise are the Public Agency and its elective and appointive boards, commissions, officers, agents and employees.

(c) The liabilities protected against are any liability or claim for damage of any kind allegedly suffered, incurred or threatened because of actions defined below, including personal injury, death, property damage, inverse condemnation, or any combination of these, regardless of whether or not such liability, claim or damage was unforeseeable at any time before the Public Agency approved the improvement plan or accepted the improvements as completed, and including the defense of any suit(s) or action(s) at law or equity concerning these.

(d) The actions causing liability are any act or omission (negligent or non-negligent) in connection with the matters covered by this contract and attributable to the contractor, subcontractor(s), or any officer(s), agent(s), or employee(s) of one or more of them.

(e) Non-conditions: The promise and agreement in this section is not conditioned or dependent on whether or not any Indemnities has prepared, supplied, or approved any plan(s), drawing(s), specifications(s) or special provision(s) in connection with this work, has insurance or other indemnification covering any of these matters, or that the alleged damage resulted partly from any negligent or willful misconduct of any Indemnities.

21. EXCAVATION

Contractor shall comply with the provisions of Labor Code Section 6705, if applicable, by submitting to Public Agency a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during trench excavation.

22. GOVERNMENT CODE SECTION 10532

Contractor shall be subject to the examination and audit of the Auditor General for a period of three years after final payment under the contract.

23. WARRANTY

(a) In addition to any other warranties or guaranties in the Contract Documents, the Contractor warrants, except as provided in paragraph (i) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the Work or Phase of Work, unless otherwise provided or extended in the Contract Documents. If the District takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the District takes possession.

(c) The Contractor shall remedy at the Contractor’s expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor’s expense any damage to District-owned or controlled real or personal property, when that damage is the result of—

(1) The Contractor’s failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.
(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor’s warranty with respect to work repaired or replaced will run for 1 year or as otherwise provided or extended from the date of repair or replacement.

(e) The District shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the District shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor’s expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall—

(1) Obtain all warranties that would be given in normal commercial practice;
(2) Require all warranties to be executed, in writing, for the benefit of the District, if directed by the District; and
(3) Enforce all warranties for the benefit of the District, if directed by the District.

(h) In the event the Contractor’s warranty under paragraph (b) of this clause has expired, the District may bring suit at its expense to enforce a subcontractor’s, manufacturer’s, or supplier’s warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the District nor for the repair of any damage that results from any defect in District-furnished material or design.

(j) This warranty shall not limit the District’s rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

24. CONSEQUENTIAL DAMAGES

The Contractor and Public Agency waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

(a) Damages incurred by the Public Agency for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

(b) Damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party’s termination. Nothing contained in this subparagraph shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

25. HAZARDOUS MATERIALS

(a) If reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos, lead or
polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Public Agency in writing.

(b) The Public Agency shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. The Public Agency shall furnish in writing to the Contractor the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written notification from the Public Agency and Contractor. The Contract Time shall be extended appropriately.

26. SAFETY

(a) Safety Programs. In addition to and as required by other Sections of the Contract Documents, the Contractor shall be solely responsible for initiating, maintaining and supervising all safety programs required by applicable law, ordinance, regulation or governmental orders in connection with the performance of the Contract, or otherwise required by the type or nature of the Work. The Contractor's safety program shall include all actions and programs necessary for compliance with California or federally statutorily mandated workplace safety programs, including without limitation, compliance with the California Drug Free Workplace Act of 1990 (California Government Code §§8350 et seq.). Without limiting or relieving the Contractor of its obligations hereunder, the Contractor shall require that its Subcontractors similarly initiate and maintain all appropriate or required safety programs. Prior to commencement of Work, the Contractor shall meet with the Campus Buildings and Grounds Manager, Project Manager, and Construction Manager to review Contractor's safety precautions and implementation of safety programs during the Work.

(b) Safety Precautions. In addition to and as required by other Sections of the Contract Documents, the Contractor shall be solely responsible for initiating and maintaining reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (i) employees on the Work and other persons who may be affected thereby; (ii) the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and (iii) other property or items at the site of the Work, or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction. The Contractor shall take adequate precautions and measures to protect existing roads, sidewalks, curbs, pavement, utilities, adjoining property and improvements thereon (including without limitation, protection from settlement or loss of lateral support) and to avoid damage thereto. Without adjustment of the Contract Price or the Contract Time, the Contractor shall repair, replace or restore any damage or destruction of the foregoing items as a result of performance or installation of the Work.
(c) **Safety Signs, Barricades.** In addition to and as required by other Sections of the Contract Documents, the Contractor shall erect and maintain, as required by existing conditions and conditions resulting from performance of the Contract, reasonable safeguards for safety and protection of property and persons, including, without limitation, posting danger signs and other warnings against hazards, promulgating safety regulations and notifying Districts and users of adjacent sites and utilities.

(d) **Safety Notices.** In addition to and as required by other Sections of the Contract Documents, the Contractor shall give or post all notices required by applicable law and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

27. **SIGNATURES AND ACKNOWLEDGEMENT**

**Public Agency**, By: _____________________________________________________  
David Wetmore, Director of Purchasing and Contracts

**Note to Contractor:** (1) Execute acknowledgement form below, and (2) if a corporation, affix Corporate Seal.

Contractor hereby also acknowledging awareness of and compliance with Labor Code S1861 concerning Worker's Compensation Law.

**Contractor:**

By: _____________________________________________________  
(CORPORATE SEAL)
(Designate Official Capacity – COMPANY NAME)

_____________________________________________________
Print NAME and TITLE

___________________  _____________________  
License Number   Federal ID Number

**NOTARY PUBLIC**

=================================================================================================

State of California )ss. ACKNOWLEDGEMENT (By Corporation, Partnership or Individual)
County of Contra Costa )

The person(s) signing above for Contractor, known to me in individual and business capacity as stated, personally appeared before me today and acknowledged that he/she/they executed it and that the
 corporation or partnership named above executed it.

Dated: ________________________________

_____________________________________

(NOTARIAL SEAL)

END OF SECTION 00600
SECTION 00650

NOTICE TO PROCEED

Date: ____________________________

TO: __________________________________________________________

ADDRESS: __________________________________________________________________

PROJECT: __________________________________________________________________

You are notified that the Contract Time under the above contract will commence to run on _____________. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Section 00600, Construction Agreement, the date of Substantial Completion is ________________, and the date for Final Completion is ________________________.

CONTRA COSTA COMMUNITY COLLEGE DISTRICT

By: ________________________________

Ray Pyle

Title: Chief Facilities Planner

END OF DOCUMENT
# General Conditions

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ARTICLE 1

GENERAL CONDITIONS

1.1 BASIC DEFINITIONS

1.1.1 Action of the Governing Board is a vote of a majority of the District’s governing board.

1.1.2 Approval for a Contract, Agreement, or Change Order means written authorization through action of the governing board unless specific delegation of approval authority is delegated to a District representative.

1.1.3 Approved. The term “approved,” when used to convey Architect’s action on Contractor’s submittals, applications, and requests, is limited to Architect’s duties and responsibilities as stated in the Conditions of the Contract.

1.1.4 Architect means the architect, engineer, or other design professional engaged by the District to design and perform general observation of the work of construction and interpret the drawings and specifications for the Project.

1.1.5 As shown, as indicated, as detailed refer to drawings accompanying this specification.

1.1.6 Bid/Bidders. The term Bid and Proposal have the same meaning, and the same is true for Bidders and Proposers.

1.1.7 Contract or Agreement. When the terms are used in these General Conditions shall be references to the Contract Documents as defined herein.

1.1.8 Contract Time. Contract Time means the number of consecutive calendar days specified in the contract immediately after the date to commence work issued by Owner in the Notice to Proceed and includes both the time allowed for completion of the work required to achieve Substantial Completion and the time allowed to complete the Remaining Work.

1.1.9 Contractor. Whenever the term “Contractor” is used in the Contract or elsewhere in the Contract Documents, it refers to a person or entity that has an agreement directly with the District to perform any of the work for the Project. The term Contractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Contractor or his authorized representative. The term Contractor does not include any contractors under separate and direct contract with the District. A Subcontractor is a person or entity that has a direct or indirect contract with the Contractor to perform any of the Work at the site.

1.1.10 Contractor’s Construction Schedule. The document prepared by the Contractor, which details the events of construction and establishes completion dates for the various stages of the Work and the entire project.

1.1.11 The Contract Documents. The Contract Documents consist of the Agreement between District and Contractor (hereinafter the Agreement or Contract), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to bid, instructions
to bidders, notice to bidders, and the requirements contained in the Bid Documents, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is a written amendment to the Contract signed by parties, a Change Order, a Construction Change Directive, or a written order for a minor change in the Work issued by the Architect. The Contract Documents collectively form the Contract. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Architect and Contractor, between the District and any Subcontractor or Sub-subcontractor, or between any persons or entities other than the District and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect’s duties.

1.1.12 Contractor, District, and Architect are those mentioned as such in the Agreement. They are treated throughout the Contract Documents as if they are of singular number and neuter gender. Any reference to “Owner” shall mean “District.”

1.1.13 Construction Manager. Whenever the term “Construction Manager” or “CM” is used in the contract or elsewhere in the Contract Documents, it refers to the District assigned Construction Manager, or the District Project Manager if no CM is assigned.

1.1.14 Days means calendar days, unless otherwise noted as working days.

1.1.15 Directed. Terms such as “directed,” “requested,” “authorized,” “selected,” “approved,” “required,” and “permitted” mean directed by the Architect or the District, requested by the Architect or District, and similar phrases.

1.1.16 District. Whenever the term “District” is used in the Contract Documents, it refers to the Contra Costa Community College District or those persons designated by the District to act in/on its behalf.

1.1.17 The Drawings are graphic and pictorial portions of the Contract Documents prepared for the Project and approved changes thereto, wherever located and whenever issued, showing the design, location, and scope of the Work, generally including plans, elevations, sections, details, schedules, and diagrams as drawn or approved by the Architect.

1.1.18 Emergency shall be defined as a sudden, unexpected occurrence, involving a clear and imminent danger, demanding immediate action to prevent or mitigate loss of, or damage to, life, health, property, or essential public services. Emergency includes such occurrences as fire, flood, earthquake, or other soil or geologic movements, as well as such occurrences as riot, accident, or sabotage.

1.1.19 Exposed. Whenever this term is used it shall be understood to mean any item or surface, exterior, or interior, which can be seen by a person outside the building, or seen by a person inside any usable space within the building during normal activity. Mechanical and electrical rooms, utility and service tunnels, air handling rooms, and penthouses or platforms shall be considered to have exposed surfaces, as shall the mechanical and electrical construction within them. The interior of closets and alcoves shall be considered exposed surfaces, and shall be finished to match the finish of the adjoining room or space, unless another finish is shown. The interiors of cabinets shall be considered
exposed, but a finish different from that of the exterior may be permitted or specified. Spaces which are not normally occupied or used by occupants or building staff, such as shafts, hoistways, ceiling plenums, attics and crawl spaces shall be considered “concealed” spaces, unless finishes are shown or specified for their surfaces.

1.1.20 **Final Completion.** The date when all Work for the total project has been completed in accordance with the terms of the Contract Documents and has been inspected following completion of Work identified in the Punchlist Inspection and accepted by the Architect and the District.

1.1.21 **Furnish.** Whenever this term is used it shall be understood to mean “purchase and deliver to the project site” ready for unloading, unpacking, assembly, installation, and similar operations.

1.1.22 **Governing Dictionary.** The definitions of words used in these Specifications, which are not defined, The General Conditions, or in referenced standards, are as given in “The American Heritage Dictionary of the English Language”.

1.1.23 **Indicated.** The term “indicated” refers to graphic representations, notes, or schedules on Drawings or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as “shown,” “noted,” “scheduled,” and “specified” are used to help the user locate the reference.

1.1.24 **Inspector of Record** is the individual retained by the District in accordance with titles 21 and 24 of the California Code of Regulations and who will be assigned to the Project. May also be referred to as the Project Inspector.

1.1.25 **Install.** Whenever this term is used it shall be understood to mean “receive, unload, inventory, store and be responsible for at the project site, transport from point of receipt to final destination, protect, unpack, erect, install in place, anchor, connect, apply, and place in operation or finish, cleaning, complete for intended use.”

1.1.26 **Installer.** An installer is the Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

1.1.27 **Locality in which the work is performed** means the county in which the Project is located.

1.1.28 **Option.** Whenever this term is used it shall be understood to mean a choice from among the specified products or procedures which shall be made by the Contractor. The choice is not “whether” the work is to be performed, but “which” product or “which” procedure is to be used. The product or procedure chosen by the Contractor shall be provided at no increase in the cost to the District with no lessening of the Contractor’s responsibility for its performance. All or any options selected or proposed are still subject to all requirements for submittals and for approval of same.
1.1.29 **Or Equal and Or Approved Equal.** The terms “or equal” and “or approved equal” shall mean “or equal as approved in writing by the Architect”.

1.1.30 **The Project** is the complete construction of the Work performed in accordance with the Contract Documents.

1.1.31 **The Project Manual.** The Project Manual is the volume assembled for the Work which may include, without limitation, the bidding requirements, sample forms, Conditions of the Contract, and Specifications.

1.1.32 **The Project Site.** Project site is the space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.1.33 **Provide** shall include “provide complete in place,” that is “furnish and install.” Complete and ready for the intended use.

1.1.34 **Punch List Inspection.** The inspection performed by the Construction Manager, Architect and the District upon written notification by the Contractor that the Work is substantially complete.

1.1.35 **Regulations.** The term “regulations” includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

1.1.36 **Remaining Work.** Remaining Work means the work required by the Contract, but not required for Substantial Completion, that the District or Architect determines has not been satisfactorily completed at the time of Substantial Completion, deferred commissioning requirements, deferred and seasonal testing, and all maintenance and operating instructions, schedules, reports, guaranties, warranties, bonds, certificates of inspection, marked-up As-Built documents, prevailing wage compliance reports and all other documents as required by the Contract Documents. Remaining Work may also be referred to as Punch List work.

1.1.37 **Safety Orders** are those issued by any cognizant city, county, state or federal agency.

1.1.38 **Site** refers to the grounds of the Project as defined in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work.

1.1.39 **The Specifications.** The Specifications are that portion of the Contract Documents consisting of the written requirements for material, equipment, construction systems, instructions, quality assurance standards, workmanship, and performance of related services.

1.1.40 **Specification Language.** These Specifications are written in the imperative mood, as defined in the Construction Specifications Institute’s Manual of Practice. Imperative language is directed to the Contractor. The indicative mood is employed on occasion when such sentence structure is necessary to convey the intended meaning in a more accurate or understandable form. The text is streamlined, with the colon (:) employed as a symbol for the words “shall be”, “shall have”, “shall conform with”, “shall comply with”, or “shall meet the requirements of”. The colon is also used to separate a paragraph title or heading from the text that follows.
1.1.41 Standards, Rules, and Regulations referred to are recognized printed standards and shall be considered as one and a part of these specifications within limits specified. Federal, state and local regulations are incorporated into the Contract Documents by reference.

1.1.42 Subcontractor, as used herein, includes those having direct or indirect contracts with Contractor and ones who furnished labor, material or services for a special design according to drawings and specifications of this Work, but does not include ones who merely furnish material not so worked.

1.1.43 Substantial Completion. The date on which the Work or designated portion thereof, as certified by the District Project Manager and Architect, is sufficiently complete, in accordance with the Contract Documents, so the District, may occupy or utilize the Work or designated portion thereof for the use for which it is intended.

1.1.44 Surety is the person, firm, or corporation that executes as surety the Contractor’s Performance Bond and Payment Bond.

1.1.45 Work of the Contractor or Subcontractor shall include all labor, materials and equipment necessary for the Contractor to fulfill all of its obligations pursuant to the Contract Documents. It shall include the initial obligation of any Contractor or Subcontractor who performs any portion of the Work, to visit the Site of the proposed Work (a continuing obligation after the commencement of the Work), to fully acquaint and familiarize itself with the conditions as they exist and the character of the operations to be carried out under the Contract Documents, and make such investigation as it may see fit so that it shall fully understand the facilities, physical conditions, and restrictions attending the Work under the Contract Documents. Each such Contractor or Subcontractor shall also thoroughly examine and become familiar with the Drawings, Specifications, and associated bid documents before preparing and submitting any bid.

1.1.46 Workers includes laborers, workers, and mechanics.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 Correlation and Intent

1.2.1.1 Documents Complementary and Inclusive. The Contract Documents are complementary; what is required by one shall be as binding as if required by all. The Contract Documents will be construed in accordance with the laws of the State of California and applicable building codes and statutes of the City and/or County where the Project is located. The intent of the Contract Documents is to describe and provide for a functionally complete and operational Project (or part thereof) to be constructed in accordance with the Contract Documents. All Work, materials, and equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as necessary to properly execute and complete the Work to conform to the requirements of the Contract Documents and provide for a functionally complete and operational Project shall be provided by Contractor with no change in the Contract Sum or Contract Time. A typical or representative detail on the Drawings shall constitute the standard for workmanship and material throughout corresponding parts of the Work. Where necessary, and where reasonably inferable from the Drawings, Contractor shall adapt such representative detail for application to such corresponding parts of the Work.
with no change in the Contract Sum or Contract Time. The details of such adaptation shall be submitted to the City for approval. Repetitive features shown in outline on the Drawings shall be in exact accordance with corresponding features completely shown. All Contract Documents form the Contractor’s contract with the District. Any item of Work mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be provided by Contractor as if shown or mentioned in both. Ambiguities or inconsistencies arising as a result of separation of sections or portions of the drawings or specifications by or for subcontractor bidding shall not relieve the Contractor for providing the complete Work at the Contract Price and within the Contract Time.

1.2.1.2 Coverage of the Drawings and Specifications. The Drawings and Specifications generally describe the Work to be performed by Contractor. Generally, the Specifications describe Work which cannot be readily indicated on the Drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work. It is not intended to mention every item of Work in the Specifications, which can be adequately shown on the Drawings, or to show on the Drawings all items of Work described or required by the Specifications even if they are of such nature that they could have been shown. All materials or labor for Work, which is shown on either the Drawings or the Specifications (or is reasonably inferable therefrom as being necessary to complete the Work), shall be provided by the Contractor to provide a complete project. It is intended that the Work be of sound, quality construction, and the Contractor shall be responsible for the inclusion of adequate amounts to cover installation of all items indicated, described, or implied in the portion of the Work to be performed by them.

1.2.1.3 Conflicts. In the event there is a discrepancy between the various Contract Documents, the more stringent, higher quality, and greater quantity of Work shall apply.

1.2.1.4 Conformance with Laws. Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, even if through mistake or otherwise any such provision is not inserted, or is not correctly inserted. Before commencing any portion of the Work, Contractor shall check and review the Drawings and Specifications for such portion for conformance and compliance with all laws, ordinances, codes, rules and regulations of all governmental authorities and public and municipal utilities affecting the construction and operation of the physical plant of the Project, all quasi-governmental and other regulations affecting the construction and operation of the physical plant of the Project, and other special requirements, if any, designated in the Contract Documents. Such checking shall include Title 21 and Title 24 of the California Code of Regulations, California Building Code, local utility, local water connection, local grading and all other applicable agencies. In the event Contractor observes any violation of any law, ordinance, code, rule or regulation, or inconsistency with the Contract Documents, Contractor shall, within five (5) days, notify Architect and District in writing of same and shall ensure that any such violation or inconsistency shall be corrected in the manner provided hereunder prior to the construction of that portion of the Project. The Contractor shall bear all expenses of correcting Work done contrary to said laws, ordinances, rules, and regulations if the Contractor performed same (1)
without first consulting the Architect for further instructions regarding said Work or (2) disregarded the Architect’s instructions regarding said work.

1.2.1.5 Ambiguity and Inconsistency. Before commencing any portion of the Work, Contractor shall carefully examine all Drawings and Specifications and other information given to Contractor as to materials and methods of construction and other Project requirements. Contractor shall, within five (5) days, notify Architect and District in writing of any perceived or alleged error, inconsistency, conflict, ambiguity, or lack of detail or explanation in the Drawings and Specifications in the manner provided herein. If the Contractor or its Subcontractors, material or equipment suppliers, or any of their officers, agents, and employees performs, permits, or causes the performance of any Work under the Contract Documents, which it knows or should have known to be in error, inconsistent, or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all costs arising therefrom including, without limitation, the cost of correction thereof without increase or adjustment to the Contract Price or the time for performance. If Contractor performs, permits, or causes the performance of any Work under the Contract Documents prepared by or on behalf of Contractor which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction, without increase to or adjustment in the Contract Price or the Time for performance. Ambiguities or inconsistencies arising as a result of separation of sections or portions of the drawings or specifications by or for subcontractor bidding shall not relieve the Contractor for providing the complete Work without increase to or adjustment in the Contract Price or the Time for performance.

1.2.2 Addenda and Deferred Approvals

1.2.2.1 Addenda are the changes in specifications, drawings, and contract documents, which have been authorized in writing by the District or Architect prior to receipt of bids, and which alter, explain, or clarify the contract documents. Addenda shall govern over all other Contract Documents. Subsequent addenda issued shall govern over prior addenda unless otherwise specified in the addenda.

1.2.2.2 Deferred Approvals. Contract Documents which require deferred approval items are meant to be for illustration purposes only. Contractor is responsible for all deferred approval requirements set forth in the Contract Documents. Contractor is responsible to comply with all laws, building codes, and regulations necessary to obtain all necessary approvals, including those required from the Division of the State Architect (“DSA”) and the State Fire Marshall. Contractor shall not be granted an extension of time for failure to obtain necessary approvals due to failure to comply with laws, building codes, and other regulations (including Title 24 of the California Code of Regulations). Contractor shall schedule all deferred approval items in its progress schedule pursuant to Article 3. If Contractor fails to include deferred-approval items in its schedule which results in a critical path delay, then Contractor shall be subject to the assessment of liquidated damages.

1.2.2.3 Deferred Approval Requirements. Deferred approvals shall be submitted and processed pursuant to the requirements of Division 1 of the Specifications. All deferred approvals shall be prepared by Contractor or Contractor’s agent early enough so as to not delay the Project. Contractor is aware that Title 21
California Code of Regulations Section 17(g) and Title 24 California Code of Regulations Section 4-317 have specific requirements for deferred approval as to governing agencies and as to the Architect and Engineer for the Project. As a result, any delay associated with the time for approval by applicable agencies or by the Architect or Architect’s consultants shall be Contractor’s.

1.2.3 Specification Interpretation

1.2.3.1 Titles. The Specifications are separated into titled sections for convenience only and not to dictate or determine the trade or craft involved.

1.2.3.2 As Shown, Etc. Where “as shown,” “as indicated,” “as detailed,” or words of similar import are used, reference is made to the Drawings accompanying the Specifications unless otherwise stated. Where “as directed,” “as required,” “as permitted,” “as authorized,” “as accepted,” “as selected,” or words of similar import are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.

1.2.3.3 General Conditions. The General Conditions and supplementary general conditions are a part of each and every section of the Specifications.

1.2.3.4 Abbreviations. In the interest of brevity, the Specifications are written in an abbreviated form and may not include complete sentences. Omission of words or phrases such as “Contractor shall,” “shall be,” etc., are intentional. Nevertheless, the requirements of the Specifications are mandatory. Omitted words or phrases shall be supplied by inference in the same manner as they are when a “note” occurs on the Drawings. In the interest of brevity, the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an,” but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.2.3.5 Plural. Words in the singular shall include the plural whenever applicable or the context so indicates.

1.2.3.6 Metric. The Specifications may indicate metric units of measurement as a supplement to U.S. customary units. When indicated thus: 1” (25 mm), the U. S. customary unit is specific, and the metric unit is nonspecific. When not shown with parentheses, the unit is specific. The metric units correspond to the “International System of Units” (SI) and generally follow ASTM E 380, “Standard for Metric Practice.”

1.2.3.7 Standard Specifications. Any reference to standard specifications of any society, institute, association, or governmental authority is a reference to the organization’s standard specifications, which are in effect at the date of the Contractor’s proposal unless directed otherwise. If applicable specifications are revised prior to completion of any part of the Work, the Contractor may, if acceptable to Architect, perform such Work in accordance with the revised specifications. The standard specifications, except as modified in the Specifications for the Project, shall have full force and effect as though printed in the Specifications. Architect will furnish, upon request, information as to how copies of the standard specifications referred to may be obtained.
1.2.4 Rules of Document Interpretation

1.2.4.1 In the event of conflict within the drawings, the following rules shall apply:

(a) General Notes, when identified as such, shall be incorporated into other portions of Drawings.

(b) Schedules, when identified as such, are complementary with other notes and other portions of Drawings including those identified as General Notes.

(c) Larger scale drawings shall take precedence over smaller scale drawings.

(d) At no time shall the Contractor base construction on scaled drawings.

1.2.4.2 Specifications shall govern as to materials, workmanship, and installation procedures.

1.2.4.3 If Contractor observes that drawings and specifications are in conflict, Contractor shall, within five (5) days, notify the Architect in writing for the purposes of obtaining an interpretation of the Contact Documents.

1.2.4.4 In the case of conflict or inconsistencies, the order of precedence shall be as follows:

(a) General Conditions take precedence over Drawings and Specifications.

(b) Special Conditions take precedence over General Conditions.

(c) The Agreement shall take precedent over the Special Conditions.

(d) In the case of disagreement or conflict between or within standards, specifications, and drawings, the more stringent, higher quality, and greater quantity of Work shall apply.

1.3 OWNERSHIP AND USE OF ARCHITECT’S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

The Drawings, Specifications, and other contract documents for the Project are the property of the District and/or Architect pursuant to Education Code § 17316. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect. All copies except the Contractor’s record set, shall be returned or properly accounted for upon completion of the Work. The Drawings, Specifications, and other documents prepared by the Architect, and copies thereof furnished to the Contractor are not to be used by the Contractor or any Subcontractor, Sub-subcontractor, or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work. The District and/or Architect hereby grants the Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers a limited license to use applicable portions of the Drawings, Specifications, and other documents prepared for the Project in the execution of their Work under the Contract Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the District’s property interest or other reserved right.
ARTICLE 2

DISTRICT

2.1 INFORMATION AND SERVICES REQUIRED OF THE DISTRICT

2.1.1 Site Survey.

If applicable, the District will furnish, at its expense, a legal description of the Site and a land survey showing the boundaries of the Site. Contractor shall be responsible for all surveys regarding location of construction, grading and site work.

2.1.2 Soils.

When required by the scope of the Project, the District will furnish, at its expense, the services of geotechnical engineers or consultants when reasonably required and deemed necessary by the Architect or as required by local or state codes. Such services, with written reports and appropriate written professional recommendations, may include test boring, test pits, soil bearing values, percolation tests, air and water pollution tests, and ground corrosion and resistivity tests, including necessary operations for determining subsoil, air, and water conditions.

2.1.3 Contractor Reliance.

If appropriate to the Work, a soils investigation report has been obtained from test holes at the Site, and such report is available for the Contractor’s use in preparing its bid and Work under this Contract. The soils report is provided for review. Any information obtained from such report or any other information given on drawings as to subsurface soil condition or to elevations of existing grades or elevations of underlying rock is approximate only. If, during the course of Work under this Contract, Contractor encounters subsurface conditions which differ materially from those indicated in the soils investigation report, then Contractor shall notify the District within five (5) calendar days of discovery of the condition, and changes to the contract price may be made in accordance with Article 7 entitled “Changes in the Work.” Contractor agrees that no claim against District will be made by Contractor for damages and hereby waives any rights to damages in the event the Contractor fails to notify District within the five-day period mentioned above.

WARNING: DISTRICT DOES NOT WARRANT THE SOILS AT THE PROJECT SITE. SOILS INVESTIGATION REPORT IS PROVIDED FOR CONTRACTORS INFORMATION ONLY. CONTRACTOR HAS CONDUCTED AN INDEPENDENT INVESTIGATION OF THE PROJECT SITE AND THE SOILS CONDITIONS OF THE SITE. DISTRICT DOES NOT WARRANT THE SOILS CONDITIONS OF THE SITE AND CONTRACTOR IS FULLY RESPONSIBLE TO ASCERTAIN SITE CONDITIONS FOR THE PURPOSES OF DETERMINING CONSTRUCTION MEANS AND METHODS PRIOR TO COMMENCING CONSTRUCTION. THE SOILS INVESTIGATION REPORT IS NOT A CONTRACT DOCUMENT.

2.1.4 Utilities.

2.1.4.1 Regional Notification Center. Contractor, except in an emergency, shall contact the appropriate regional notification center at least two working days prior to
commencing any excavation if the excavation will be conducted in an area or in a private easement which is known, or reasonably should be known, to contain subsurface installations other than the underground facilities owned or operated by the District, and obtain an inquiry identification number from that notification center. No excavation shall be commenced and carried out by the Contractor unless such an inquiry identification number has been assigned to the Contractor or any subcontractor of the Contractor and the District has been given the identification number by the Contractor. Any damages arising from failure to make appropriate regional notification shall be at the sole risk of Contractor. Any delays caused by failure to make appropriate regional notification shall be at the sole risk of Contractor and shall not be considered for extension of time pursuant to Paragraph 8.4.

2.1.4.2 Utilities – Removal and Restoration

The District has endeavored to determine the existence of utilities at the Site of the Work from the records of the District of known utilities in the vicinity of the Work. The positions of these utilities as derived from such records are shown in the Contract Documents.

No excavations were made to verify the locations shown for underground utilities. The service connections to these utilities may not be shown on the drawings. It shall be the responsibility of the Contractor to determine the exact location of all service connections. The Contractor shall make its own investigations, including exploratory excavations, to determine the locations and type of service connections, prior to commencing work which could result in damage to such utilities. The Contractor shall immediately notify the District’s representative as to any utility discovered by Contractor in a different position than shown in the Contract Documents or which is not shown on the Contract Documents.

Contractor shall coordinate its Work with all utilities, including, but not limited to electricity, water, gas and telephone and meet with said utilities prior to the start of any work.

2.1.4.3 Other Utilities.

In case it should be necessary to remove, relocate, or temporarily maintain a utility because of interference with the Work, the work on the utility shall be performed and paid for as follows:

When it is necessary to remove, relocate or temporarily maintain a service connection, the cost of which is not required to be borne by the owner thereof, the Contractor shall bear all expenses incidental to the work on the service connection. The work on the service connection shall be done in a manner satisfactory to the owner thereof; it being understood that the owner of the service connection has the option of doing such work with his own forces or permitting the work to be done by the Contractor.

When it is necessary to remove, relocate, or temporarily maintain a utility which is in the position shown on the drawings, the cost of which is not required to be borne by the owner thereof, the Contractor shall bear all expenses incidental to the work on the utility. The work on the utility shall be done in a manner satisfactory to the owner thereof; it being understood that the owner of the utility has the option of doing such work with his own forces or permitting the work to be done by the Contractor.

When it is necessary to remove, relocate, or temporarily maintain a utility which is not shown on the drawings or is in a position different from that shown on the drawings and were it in the position...
shown on the drawings would not need to be removed, relocated, or temporarily maintained, and the cost of which is not required to be borne by the owner thereof, the District will make arrangements with the owner of the utility for such work to be done at no cost to the Contractor, or will require the Contractor to do such work in accordance with Article 7 or will make changes in the alignment and grade of the Work to obviate the necessity to remove, relocate, or temporarily maintain the utility. Changes in alignment and grade will be ordered in accordance with Article 7 herein.

No representations are made that the obligations to move or temporarily maintain any utility and to pay the cost thereof is or is not required to be borne by the owner of such utility, and it shall be the responsibility of the Contractor to investigate to find out whether said cost is required to be borne by the owner of the utility.

The right is reserved to governmental agencies and to owners of utilities to enter at any time upon any street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work and for the purpose of maintaining and making repairs to their property.

2.1.5 Existing Utility Lines; Removal, Relocation.

2.1.5.1 Main or Trunkline Facilities

If the Contractor while performing the contract discovers utility facilities not identified by the District in the Contract Documents, Contractor shall, within five (5) days, notify the District and utility in writing.

The District has the responsibility to identify, with reasonable accuracy, main or trunkline facilities on the drawings and specifications. In the event that main or trunkline utility facilities are not identified with reasonable accuracy in the drawings and specifications, District shall assume the responsibility for their timely removal, relocation, or protection.

The owner of the public utility shall have the sole discretion to perform repairs or relocation work or permit the Contractor to do such repairs or relocation work at a reasonable price.

The Contractor shall exercise reasonable care and shall be compensated by the District for the actual verified field costs of locating, and removing, relocating, protecting or temporarily maintaining such main or trunkline utility facilities not indicated with reasonable accuracy in the drawings and specifications, and for equipment in use on the project necessarily idled during such work. This work shall be performed in accordance with Article 7 of these General Conditions.

Alternatively, District may make changes in the alignment and grade of the work to obviate the need to remove, relocate, or temporarily maintain the utility, in accordance with Article 7 or District may make arrangements with the owner of the utility for such work to be done at no cost to the Contractor.

The Contractor shall not be assessed a forfeiture for delay in completion of the Project when such delay is caused by the failure of the District or the owner of the utility to provide for the removal, relocation, protection or temporary maintenance of all such main or trunkline facilities not indicated with reasonable accuracy.
Nothing herein shall preclude the District from pursuing any appropriate remedy against the utility for delays which are the responsibility of the utility.

Nothing herein shall be construed to relieve the utility from any obligation as required either by law or by contract to pay the cost of removal or relocation of existing utility facilities.

2.1.5.2 Assessment. These subparagraphs shall not be construed to preclude assessment against the Contractor for any other delays in completion of the Work. Nothing in these subparagraphs shall be deemed to require the District to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Site can be inferred from the presence of other visible facilities, such as buildings, or meter junction boxes on or adjacent to the Site.

2.1.5.3 Notification. If the Contractor, while performing Work under this Contract, discovers utility facilities not identified by the District in the Contract Documents, Contractor shall, within five (5) days, notify the District and the utility in writing. If Contractor fails to notify the District within five (5) days after discovery of any utility facilities not identified by District in the Contract Documents, Contractor waives all rights to be compensated for any extra Work or damages resulting from such discovered utilities.

2.1.6 Easements.

District shall secure and pay for easements for permanent structures or permanent changes in existing facilities, if any, unless otherwise specified in the Contract Documents.

2.2 DISTRICT’S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, including, but not limited to:

1. Failure to supply adequate workers on the entire Project or any part thereof;
2. Failure to supply a sufficient quantity of materials;
3. Failure to perform any provision of this Contract;
4. Failure to comply with safety requirements, or due to Contractor is creation of an unsafe condition;
5. In the case of bona fide emergency;
6. Failure to order materials in a timely manner;
7. Failure to prepare deferred-approval items or shop drawings in a timely manner;
8. Failure to comply with Contractor’s schedule which would result in a delay to the critical path;

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails (within a five-day period after receipt of written notice or a shorter time period expressly stated in the written notice from the District in an emergency situation) to commence and continue correction of such default with diligence and promptness, the District may correct such deficiencies without prejudice to other remedies the District may have, including those set forth in
Article 14 after providing five-day written notice to Contractor and Surety. If during this five (5) day period, Surety personally delivers notice to District that it intends to perform such work, District shall allow Surety seven (7) days to perform. In an emergency situation, the District may correct such deficiencies without prejudice to other remedies the District may have, including those set forth in Article 14 after providing 48 hours’ notice to the Contractor. In either case, the Contractor will be invoiced the cost of correcting such deficiencies, including compensation for additional services and expenses made necessary by such default, or neglect. The invoice amount shall be deducted from the next payment due the Contractor. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the District.

ARTICLE 3

THE CONTRACTOR

3.1 SUPERVISION AND CONSTRUCTION PROCEDURES

3.1.1 Contractor.

The Contractor shall continually supervise and direct the Work using the Contractor’s best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, procedures; and shall coordinate all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. The Contractor shall not perform the Work without utilizing the Contract Documents or, where required, approved shop drawings, product data, or samples for any such portion of the work. If any of the Work is performed by contractors retained directly by the District, Contractor shall be responsible for the coordination and sequencing of the work of those other contractors so as to avoid any impact on the project schedule pursuant to the requirements of Article 6 and Article 8. Specific duties of the Contractor shall include those set out in Section 43 of Title 21 of the California Code of Regulations and Section 4-343 of Title 24 of the California Code of Regulations. These duties include, but are not limited to the following:

(a) Responsibilities. It is the duty of the Contractor to complete the Work covered by his or her contract in accordance with the approved drawings and specifications. The Contractor in no way is relieved of any responsibility by the activities of the Architect, Engineer, Inspector or DSA in the performance of their duties.

(b) Performance of the work. The Contractor shall carefully study the approved drawings and specifications and shall plan its schedule of operations well ahead of time. If at any time it is discovered that work is being done which is not in accordance with the approved drawings and specifications, the contractor shall correct the work immediately.

All inconsistencies or times which appear to be in error in the drawings and specifications shall promptly be called to the attention of the Architect or, Engineer, for interpretation or correction. Local conditions which may affect the structure shall be brought to the Architect’s attention at once. In no case, shall the instruction of the Architect be construed
to cause work to be done which is not in conformity with the approved drawings, specifications, change orders, construction change directives, and as required by law.

The Contractor shall not carry on Work except with the knowledge of the Inspector of Record.

(c) Verified Reports. The Contractor shall make and submit to the District from time to time, verified reports as required in Section 36 of Title 21 and Section 4-366 of Title 24.

Contractor shall fully comply with any and all reporting requirements of Education Code Sections 81147, et seq., in the manner prescribed by Title 24, as applicable.

3.1.2 Contractor Responsibility.

The Contractor shall be responsible to the District for acts and omissions of the Contractor’s employees, Subcontractors, material and equipment suppliers, and their agents, employees, invitees, and other persons performing portions of the Work under direct or indirect contract with the Contractor or any of its Subcontractors.

3.1.3 Obligations not Changed by Architect’s Actions.

The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract or by tests, inspections, or approvals required or performed by persons other than the Contractor.

3.1.4 Acceptance/Approval of Work.

The Contractor shall be responsible to determine when any completed portions of the Work already performed under this Contract or provided pursuant to Article 6 are suitable to receive subsequent Work thereon.

3.1.5 Performance of Work With Own Force.

Contractor shall perform at least 15% of the Work, exclusive of supervisory and clerical work without the services of any subcontractor. Contractor shall supervise and direct the work competently and efficiently, devoting such attention thereto and applying such skills as may be necessary to perform the Work in accordance with the Contract Documents.

3.2 SUPERVISION

3.2.1 Full Time Supervision.

Unless personally present on the Project site where the Work is being performed, the Contractor shall keep on the Work at all times during its progress a competent construction Superintendent satisfactory to the District. The Superintendent shall be present on a full-time basis, shall be dedicated exclusively to the Project and shall not share superintendence duties with another project or job. The Superintendent shall not be replaced except with written consent of the District.
The Superintendent shall represent the Contractor in its absence and shall be fully authorized to receive and fulfill any instruction from the Architect, the Inspector, the District or any other District representative. All Requests for Information shall be originated by the Superintendent and responses thereto shall be given to the Superintendent. No Work shall begin on any day by any Subcontractor or other person on the Project site until the Superintendent has arrived, or shall any Work continue during the day after the Superintendent has departed from the Project site. The Superintendent shall have authority to bind Contractor through the Superintendent’s acts. The Superintendent shall represent the Contractor, and communications given to the Superintendent shall be binding on the Contractor. Before commencing the Work, Contractor shall give written notice to District and Architect of the name and a Statement of Qualifications of such superintendent for District approval. Superintendent shall not be changed except with written consent of District, unless a superintendent proves to be unsatisfactory to Contractor and ceases to be in its employ, in which case, Contractor shall notify District and Architect in writing. Contractor shall provide a replacement superintendent approved by the District prior to performing additional work.

3.2.2 Staff.

Notwithstanding other requirements of the contract documents, the Contractor and each Subcontractor shall: (1) furnish a competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintendence of its portion of the Work; (2) organize the procurement of all materials and equipment so that the materials and equipment will be available at the time they are needed for the Work; and (3) keep an adequate force of skilled and fit workers on the job to complete the Work in accordance with all requirements of the Contract Documents.

3.2.3 Right to Remove.

District shall have the right, but not the obligation, to require the removal from the Project of any superintendent, staff member, agent, or employee of any Contractor, Subcontractor, material or equipment supplier.

3.3 LABOR AND MATERIALS

3.3.1 Contractor to Provide.

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water, heat, air conditioning, utilities, transportation, and other facilities, services and permits necessary for proper execution and completion of the Work whether temporary or permanent and whether or not incorporated in the Work.

3.3.2 Quality.

Unless otherwise specified, all materials and equipment to be permanently installed in the Project shall be new and shall be of the highest quality or as specifically stated in the Contract Documents. The Contractor shall, if requested, furnish satisfactory evidence as to kind and quality of all materials and equipment within ten (10) days of a written request by the District, including furnishing the District with bona fide copies of invoices for materials or services provided on the Project.
shall be performed by workers skilled in their respective trades, and shall be of the same or higher quality as with the standards of other school construction.

3.3.3 Replacement.

Any work, materials, or equipment, which do not conform to these requirements or the standards set forth in the Contract Documents, may be disapproved by the District, in which case, they shall be removed and replaced by the Contractor at no additional cost or extension of time to the District.

3.3.4 Discipline.

The Contractor shall enforce strict discipline and good order among the Contractor’s and Subcontractor’s employees, and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. As used in this subsection, “unfit” includes any person who the District concludes is improperly skilled for the task assigned to that person, who fails to comply with the requirements of this article, or who creates safety hazards which jeopardize other persons and/or property.

3.3.5 Noise, Drugs, Tobacco, and Alcohol.

Contractor shall take all steps necessary to insure that employees of Contractor or any of its subcontractors’ employees do not use, consume, or work under the influence of any alcohol, tobacco or illegal drugs while on the project. Contractor shall further prevent any of its employees or its subcontractor employees from playing any recorded music devices or radios or wearing any radio headphone devices for entertainment while working on the project. Likewise, Contractor shall prevent its employees or subcontractor’s employees from bringing any animal onto the project. Contractors shall not violate any written school policies.

3.3.6 Delivery of Material.

Contractor shall place orders for materials or equipment so that the Work may be completed in accordance with the Construction schedule for the Work as set forth in Article 8 of this Agreement. Contractor shall, upon demand from the Architect, furnish to the Architect documentary evidence including, but not limited to purchase orders, invoices, bills of materials, work orders and bills of lading, showing that orders have been placed.

3.3.7 Liens and Other Security Interests of Subcontractors and Material Suppliers.

No material, supplies, or equipment for the Work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver premises, together with all improvements and appurtenances constructed or placed thereon by it, to District free from any claims, security interests, liens, or charges. Contractor further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any Work covered by this Contract shall have any right to place a lien upon the premises or any improvement or appurtenance thereof, except that Contractor may install metering devices or other equipment of a utility company or
political subdivision, title to which is commonly retained by the utility company or political subdivision. In event of installation of any such metering device or equipment, Contractor shall advise District as to its owner within five (5) days of such installation in writing, prior to making the installation.

3.3.8 Title to Materials.

The title to new materials or equipment for the Work of this Contract, and attendant liability for its protection and safety, shall remain with Contractor until incorporated in the Work of this Contract and accepted by the District and Architect; no part of said materials shall be removed from its place of storage, and Contractor shall keep an accurate inventory of all said materials and equipment in a manner satisfactory to the District or its authorized representative.

3.3.9 Assemblies.

For all material and equipment specified or indicated in the Drawings, the Contractor shall provide all labor, materials, equipment, and services necessary for complete assemblies and complete working systems. Incidental items not indicated on the Drawings, nor mentioned in the Specifications, that can legitimately and reasonably be inferred to belong to the Work described, or be necessary in good practice to provide a complete assembly or system, shall be furnished as though itemized in the Contract Documents in every detail. In all instances, material and equipment shall be installed in strict accordance with each manufacturer’s most recent published recommendations and specifications.

3.4 WARRANTY

3.4.1 The Contractor warrants to the District that material and equipment furnished under the Contract will be of the highest quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. Contractor’s warranty and guaranty to District includes, but is not limited to the following representations:

3.4.1.1 In addition to any other warranties and guaranties provided elsewhere, Contractor shall, and hereby does, warrant all Work after the date of Notice of Completion of Work by District and shall repair or replace any or all such work, together with any other work, which may be displaced in so doing that may prove defective in workmanship or materials within a one (1) year period from date of completion as defined in Public Contract Code Section 7107(c) without expense whatsoever to District, ordinary wear and tear, unusual abuse or neglect excepted. District will give notice of observed defects with reasonable promptness. Contractor shall notify District upon completion of repairs.

3.4.1.2 In the event of failure of Contractor to comply with above mentioned conditions within one week after being notified in writing, District is hereby authorized to proceed to have defects repaired and made good at expense of Contractor who hereby agrees to pay costs and charges therefore immediately on demand.

3.4.1.3 If, in the opinion of the District, defective Work creates a dangerous condition or requires immediate correction or attention to prevent further loss to the
District, the District will attempt to give the notice required by this Article. If the Contractor cannot be contacted or does not comply with the District’s requirements for correction within a reasonable time as determined by the District, the District may, notwithstanding the provisions of this article, proceed to make such correction or attention which shall be charged against Contractor. Such action by the District will not relieve the Contractor of the guarantee provided in this Article or elsewhere in this Contract.

3.4.1.4 This Article does not in any way limit the guarantee on any items for which a longer warranty or guaranty is specified or on any items for which a manufacturer gives a guarantee for a longer period. Contractor shall furnish District all appropriate guaranty or warranty certificates upon completion of the project.

3.4.2 Format - All Warranties/Guaranties and shall include:

3.4.2.1 Contractor, subcontractor, and equipment supplier shall provide Warranties and Guaranties on their original company letterhead with original signature.

3.4.2.2 Contractor shall provide original Warranties and Guaranties. Photo copies, fax and e-mail copies are not acceptable.

3.4.3 Preparation

3.4.3.1 Contractor shall obtain warranties and guaranties, executed in duplicate by each applicable and/or responsible subcontractor(s), supplier(s), and manufacturer(s), within fifteen (15) days after Notice of Substantial Completion of the applicable Work or Phase of Work. Except for items put into use with District’s permission, Contractor shall leave date of beginning of time of warranty or guaranty blank until the date of completion is determined by District.

3.4.3.2 Contractor’s Response to Construction Warranty and Guaranty Service Requirements: Following oral or written notification by the District, respond to construction warranty and guaranty service requirements within 24 hours, or earlier in case of emergency.

3.4.4 Warranty and/or Guaranty Tags.

At the time of installation of mechanical equipment or other major system elements, tag each warranted or guaranteed item with a durable, oil and water resistant tag approved by the District. Attached each tag with a copper wire and spray with a silicone waterproof coating. The date of Substantial Completion and the Contractor Authorized signature must remain blank until the date the District makes a determination of Substantial Completion. Show the following information on the tag:
WARRANTY/GUARANTY INFORMATION – [insert project number and name on actual tag]

a. Type of product/material______________________________________________________.
b. Model number______________________________________________________________.
c. Serial number______________________________________________________________.
d. Contract number____________________________________________________________.
e. Warranty/Guaranty period ______ (months) from___________ to__________________.
f. Inspector's signature__________________________________________________________.

g. Construction Contractor______________________________________________________.
Address_______________________________________________________________.
Telephone number______________________________________________________________.

h. Warranty or Guaranty contact__________________________________________________.
Address_______________________________________________________________.
Telephone number______________________________________________________________.

j. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE
DURING THE WARRANTY PERIOD.

3.5 TAXES

Contractor will pay all applicable Federal, State, and local taxes on all materials, labor, or
services furnished by it, and all taxes arising out of its operations under the Contract Documents.
District is exempt from Federal Excise Tax, and a Certificate of Exemption shall be provided upon
request.

3.6 PERMITS, FEES AND NOTICES

3.6.1 Payment.

The Contractor shall secure and pay for all permits and governmental fees, licenses, and
inspections necessary for proper execution and completion of the Work which are necessary after
execution of the Contract and are legally required by any authority having jurisdiction over the Project,
except those required by the Division of the State Architect (DSA). District shall be responsible for all
testing and inspection as required by the DSA on-site or within the distance limitations set forth in
Paragraph 13.5.2.

3.6.2 Compliance.

The Contractor shall comply with and give notices required by any law, ordinance, rule,
regulation, and lawful order of public authorities bearing on performance of the Work.
3.6.3 Responsibility.

The Contractor shall perform all Work in conformance with every applicable law, statute, ordinance, building code, rule or regulation. The Contractor shall assume full responsibility for such Work and shall bear the attributable cost of correction or project delay.

3.7 Not used.

3.8 CONTRACTOR’S CONSTRUCTION SCHEDULES

3.8.1 Requirements.

(a) Within ten (10) calendar days after being awarded the contract, Contractor shall submit a schedule for District’s approval using Microsoft Project, or Oracle Primavera software. Contractor shall provide digital schedule files to District on CD for this schedule, and all subsequent progress schedules required by the District. The schedule shall not exceed time limits set forth in the Contract Documents and shall comply with all of the scheduling requirements as set forth in the Specifications. Failure to submit a schedule or submittal of a schedule which shows completion of the Work beyond the specified completion date shall be deemed a material breach by the Contractor. The schedule must indicate the beginning and completion of all phases of construction and shall use the “critical path method” (commonly called CPM) for the value reporting, planning and scheduling, of all Work required under the Contract Documents. The scheduling is necessary for the District’s adequate monitoring of the progress of the Work and shall be prepared in accordance with the time frame described in Article 8 of the General Conditions. The District may disapprove of any schedule or require modification to it if, in the opinion of the District, adherence to the progress schedule will not cause the Work to be completed in accordance with the Agreement.

(b) Contractor shall not submit a schedule showing early completion without indicating float time through the date set for Project completion by District. Contractor’s schedule shall account for all days past early completion as float which belongs to both District and Contractor. Usage of float shall not entitle Contractor to any delay claim or damages due to delay.

(c) Contractor shall not be granted an extension of time for failure to obtain necessary approvals for deferral approvals due to failure to comply with laws, building codes, and other regulations (including Title 24 of the California Code of Regulations). Contractor shall schedule all deferred approval items and shop drawings in its progress schedule. If Contractor fails to include deferred approval items and shop drawings in its schedule which results in a critical path delay, then Contractor shall be subject to the assessment of liquidated damages.

(d) In addition to providing a schedule update every thirty (30) days, the Contractor, if requested by the Architect or District, shall provide revised schedules within ten (10) days if, at any time, the Architect or District, consider the completion date to be in jeopardy because of “activities behind schedule.” The additional schedule shall include a new arrow or precedence diagram and schedule reports.
conforming to the requirements above, designed to show how the Contractor intends to accomplish the Work to meet the completion date. The form and method employed by the Contractor shall be the same as for the original construction schedule accepted by the District. The Contractor shall modify any portions of the schedule that become infeasible because of “activities behind schedule” or for any other valid reason. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule. If Contractor submits a revised schedule showing an earlier completion date for the Project, District’s acceptance of this revised schedule shall not entitle Contractor to any delay claim or damages due to any such revised schedule.

(e) Contractor shall include in the schedule all shop drawings, and deferred submittals. Include activities for the submittal, District/Architect’s review (minimum duration of 14 calendar days), procurement (or fabrication as applicable); and link the finish of the procurement/fabrication activity to the start of the related field activity at the Site.

3.8.2 Failure to Meet Requirements.

Failure of the Contractor to provide proper schedules as required by this Article and Article 9 is a material breach of the contract and grounds for termination pursuant to Article 14. The District, at its sole discretion, may choose, instead, to withhold, in whole or in part, any progress payments or retention amounts otherwise payable to the Contractor.

3.9 Not used.

3.10 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the Site for the District one current copy of the International Building Code, Titles 19, 21 and 24 of the California Code of Regulations and one record copy of the Drawings, Specifications, Addenda, Change Orders, and other Modifications, in good order and marked currently to record changes and selections made during construction. In addition, the Contractor shall maintain at the Site approved Shop Drawings, Product Data, Samples, and similar required submittals. These documents shall be available to the District, and shall be delivered to the District upon completion of the Work.

3.11 SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND SUBSTITUTIONS

3.11.1 Submittals defined.

3.11.1.1 Shop Drawings. The term “shop drawings” as used herein means drawings, diagrams, schedules, and other data, which are prepared by Contractor, Subcontractors, manufacturers, suppliers, or distributors illustrating some portion of the Work, and includes: illustrations; fabrication, erection, layout and setting drawings; manufacturer’s standard drawings; schedules; descriptive literature, instructions, catalogs, and brochures; performance and test data including charts; wiring and control diagrams; and all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment, or systems and their position conform to the requirements of the Contract Documents. The Contractor shall obtain and submit with shop drawings all seismic and other
calculations and all product data from equipment manufacturers. “Product data” as used herein are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work. 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. Shop drawings shall: establish the actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical systems and equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.

3.11.1.2 Samples. The term “samples” as used herein are physical examples furnished by Contractor to illustrate materials, equipment, or quality and includes natural materials, fabricated items, equipment, devices, appliances, or parts thereof as called for in the Specifications, and any other samples as may be required by the District/Architect to determine whether the kind, quality, construction, finish, color, and other characteristics of the materials, etc., proposed by the Contractor conform to the required characteristics of the various parts of the Work. All Work shall be in accordance with the approved samples.

3.11.1.3 Contractor’s Responsibilities. Contractor shall obtain and shall submit all required shop drawings, samples, etc., required by the Specifications with such promptness as to cause no delay in its own Work, or in that of any other contractor or subcontractor but in no event later than ten (10) days after the award of the Contract. No extensions of time will be granted to Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the Schedule. Each Subcontractor shall submit all shop drawings, samples, and manufacturer’s descriptive data for the review of the District, the Contractor, and the Architect through the Contractor. By submitting shop drawings, product data, samples, etc., the Contractor represents that it has determined and verified all materials, field measurements, catalog numbers, related field construction criteria, and other relevant data in connection with each such submission, and that it has checked, verified, and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents, including the construction schedule. The submission of the shop drawings, product data, samples, etc., shall not deviate from the requirements of the Contract Documents including detailing and design intent which is specifically outlined in Contract Documents except as specifically authorized by the District/Architect or through an accepted substitution pursuant to Paragraph 3.10.4. All deviations from the Contract Documents shall be narratively described in a transmittal accompanying the shop drawings. However, shop drawings shall not be used as a means of requesting a substitution, the procedure for which is defined in Paragraph 3.10.4, “Substitutions.” Review by District and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper shop drawings in accordance with the Contract Documents. Any submission, which in District/Architect’s opinion is incomplete, contains errors, or has been checked superficially will be returned un-reviewed by the District/Architect for resubmission by the Contractor. Contractor shall stamp, sign, and date each submittal indicating its representation that the submittal meets all of the requirements of the Contract Documents and evidence Contractor’s review through execution of the following stamp to be placed on each shop drawings:

“The contractor has reviewed and approved the field dimensions and the construction criteria, and has also made written notation regarding any information in the shop drawings that does not conform to the contract documents. This shop drawing has been coordinated with all other shop drawings received to date by contractor and this
duty of coordination has not been delegated to subcontractors, material suppliers, the Architect, or the engineers on this project.

___________________________
Signature of Contractor and date”

3.11.1.4  **Extent of Review.** In reviewing shop drawings, the District nor the Architect will not verify dimensions and field conditions. The Architect will review and approve shop drawings, product data, samples, etc., for aesthetics and for conformance with the design concept of the Work and the information in the Contract Documents. The District nor the Architect’s review shall neither be construed as a complete check which relieves the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract Documents unless the Contractor has, in writing, called the District’s/Architect’s attention to the deviations at the time of submission. The District’s or Architect’s review shall not relieve the Contractor or Subcontractors from responsibility for errors of any sort in shop drawings or schedules, for proper fitting of the Work, coordination of the differing subcontractor trades and shop drawings and Work which is not indicated on the shop drawings at the time of submission of shop drawings. Contractor and Subcontractors shall be solely responsible for any quantities which may be shown on the submittals or Contract Documents.

3.11.2  **Drawing Submission Procedure.**

3.11.2.1  **Transmittal Letter and Other Requirements.** All shop drawings must be properly identified with the name of the Project and dated, and each lot submitted must be accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as well as “clouding” on the submissions, all qualifications, departures, or deviations from the Contract Documents. Shop drawings, for each section of the Work shall be numbered consecutively and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor.

3.11.2.2  **Copies Required.** Unless otherwise approved by the District, each submittal shall include six (6) legible prints of each drawing or schedule, table, cut sheet, etc., including fabrication, erection, layout and setting drawings, and such other drawings as required under the various sections of the Specifications, until final acceptance thereof is obtained. Subcontractor shall submit copies, in an amount as requested by the Contractor, of: (1) manufacturers’ descriptive data for materials, equipment, and fixtures, including catalog sheets showing dimensions, performance, characteristics, and capacities; (2) wiring diagrams and controls; (3) schedules; (4) all seismic calculations and other calculations; and (5) other pertinent information as required by the District or Architect.

3.11.2.3  **Corrections.** The Contractor shall make all corrections required by District/Architect and shall resubmit, as required by District/Architect, corrected copies of shop drawings or new samples until approved. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections required by the District/Architect on previous submissions. Professional services required for more than one (1) re-review of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor pursuant to Paragraph 4.4.

3.11.2.4  **Approval Prior to Commencement of Work.** No portion of the Work requiring a shop drawing or sample submission or other submittal shall be commenced until the submission has
been reviewed by Contractor and Architect and approved by Architect unless specifically directed in writing by the District. All such portions of the Work shall be in accordance with approved shop drawings and samples.

3.11.3 Sample Submissions Procedure.

3.11.3.1 Samples Required. In case a considerable range of color, graining, texture, or other characteristics are anticipated in finished products, a sufficient number of samples of the specified materials shall be furnished by the Contractor to indicate the full range of characteristics which will be present in the finished products; and products delivered or erected without submittal and approval of a full range of samples shall be subject to rejection. Except for range samples, and unless otherwise called for in the various sections of the Specifications, samples shall be submitted in duplicate. All samples shall be marked, tagged, or otherwise properly identified with the name of the submitting party, the name of the Project, the purpose for which the samples are submitted and the date, and shall be accompanied by a letter of transmittal containing similar information, together with the Specification section number. Each tag or sticker shall have clear space for the review stamps of Contractor and Architect.

3.11.3.2 Labels and Instructions. All samples of materials shall be supplied with the manufacturer’s descriptive labels and application instructions.

3.11.3.3 Architect’s Review. The Architect will review and, if appropriate, approve submissions and will return them to the Contractor with the Architect’s stamp and signature applied thereto, indicating the timing for review and appropriate action in compliance with the Architect’s (or District’s) standard procedures.

3.11.3.4 Not used.

3.11.3.5 Not used.

3.11.3.6 District’s Property. All shop drawings, computer disks, annotated specifications, samples and other submittals shall become the District’s property upon receipt by the District or Architect.

3.11.4 Substitutions.

3.11.4.1 One Product Specified. Unless the Specifications state that no substitution is permitted, whenever the Contract Documents indicate any specific material, product, thing or service, or any specific name, make, trade name, or catalog number, with or without the words “or equal,” such specification shall be deemed to be used for the purpose of facilitating description of the material, product, thing or service desired and shall be deemed to be followed by the words “or equal” unless the Contract Documents specify “no substitution allowed”, “no equal”, “no equivalent”, or other language with similar meaning, in which case no substitutions will be allowed. Pursuant to Paragraph 3.11.4.3, the Contractor may, unless otherwise stated, within three (3) work days after the bid opening, submit a substitution request for any material, product, thing or service, which shall be materially equal or better in every respect to that so indicated or specified (“Specified Item”) and will completely accomplish the purpose of the Contract Documents.

(a) Products Specified Which are Commercially Unavailable. If the Contractor fails to make a request for substitutions for products, within three (3) work days after bid opening, and such products subsequently become commercially unavailable, the Contractor may request a substitution for such commercially unavailable item. The decision to grant
this request is solely at the District’s discretion. The written approval of the District, consistent with the procedure for Change Orders, shall be required for the use of a proposed substitute material. The District may condition its approval of the substitution upon the delivery to District of an extended warranty or guaranty or other assurances of adequate performance of the substitution as well as an equitable deduction in the contract sum should the substituted item cost less than the Specified Item. All risks of delay due the approval of a requested substitution by the District, DSA, or any other governmental agency having jurisdiction, shall be on the requesting party. All additional costs, all procurement and construction delays, and all costs for review by the Architect or its consultants shall be the responsibility of the Contractor and will be deducted from Contractor’s pay request.

3.11.4.2 Substitution Request Form. Requests for substitutions of materials, products, things or services in place of a Specified Item must be submitted to the District in writing on the District’s Substitution Request Form (“Request Form”) within three (3) work days after bid opening, except as provided for in Paragraph 3.11.4.1.

The Request Form must be accompanied by evidence as to whether the proposed substitution:

1. Is equal in quality/service/ability to the Specified Item;
2. Will entail no changes in detail, construction, and scheduling of related work;
3. Will be acceptable in consideration of the required design and artistic effect;
4. Will provide no cost disadvantage to the District;
5. Will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; and
6. Will required no change of the construction schedule.

3.11.4.3 In completing the Request Form, the bidder shall state, with respect to each requested substitution, that the bidder will agree to provide the Specified Item in the event that the District denies the bidder’s request for such requested substitution. In the event the District denies the bidder’s requested substitution for a Specified Item, the bidder shall provide the Specified Item without any additional cost or charge to the District, and waives all rights to submit a claim.

3.11.4.4 After bids are opened, the apparent lowest bidder shall provide, within three (3) days of opening such bids, any and all Drawing, Specifications, samples, performance data, calculations, and other information, as may be required to assist the Architect and the District in determining whether the proposed substitution is acceptable. The burden of establishing these facts shall be upon the bidder.

3.11.4.5 After the District’s receipt of such evidence by the bidder, the District will make its final decision as to whether the bidder’s request for substitution for any Specified Items will be granted. The decision as to whether a proposed request for substitution is equal to a Specified Item shall be at the sole discretion of the District. Any request for substitution that is granted by the District shall be documented and processed through a Change Order. The District may condition its approval of any substitution upon delivery to the District of an extended warranty or guaranty or other assurances of adequate performance of the substitution. Any and all risks of delay due to approval by the District, DSA or any other governmental agency having jurisdiction shall be on the bidder.

3.11.4.6 If the Architect and District accept a proposed substitution, the Contractor agrees to pay for all District expenses, including but not limited to Division of the State Architect fees,
engineering and design services, compensation to the Architect and affected engineers for their required time to process such substitution through the Division of the State Architect, if required, and to make all changes and adjustments in materials or the work of all trades directly or indirectly affected by the substituted item or items at no cost to the District.

3.12 INTEGRATION OF WORK

3.12.1 Scope.

The Contractor shall be responsible for cutting, fitting, or patching to complete the Work and to make all parts fit together properly. Contractor shall be responsible for ensuring that all trades are coordinated and scheduled so as to ensure the timely and proper execution of the work. When modifying existing work or installing new Work adjacent to existing work, Contractor shall match, as closely as conditions of Site and materials will allow, the finishes, textures, and colors of the original work, refinishing existing work at no additional cost to District. All cost caused by defective or ill-timed work shall be borne by Contractor. Contractor shall be solely responsible for protecting existing work on adjacent properties and shall obtain all required permits for shoring and excavations near property lines.

3.12.2 Structural Members.

New or existing structural members and elements, including reinforcing bars and seismic bracing, shall not be cut, bored, or drilled except by written authority of the Architect and DSA. Work done contrary to such authority is at the Contractor’s risk and subject to replacement at its own expense without reimbursement under the Contract. Schedule delays resulting from unauthorized work shall be the Contractor’s responsibility.

3.12.3 Subsequent Removal.

Permission to patch any areas or items of the Work shall not constitute a waiver of the District’s or the Architect’s right to require complete removal and replacement of the areas of items of the Work if, in the opinion of the Architect or the District, the patching does not satisfactorily restore quality and appearance of the Work or does not otherwise conform to the Contract Documents.

3.13 CLEANING UP

3.13.1 Contractor’s Responsibility.

Contractor at all times shall keep premises free from debris such as waste, dust, excess water, storm water runoffs, rubbish, and excess materials and equipment. Contractor shall not leave debris under, in, or about the premises, but shall promptly remove same from the premises and dispose of it in a lawful manner. Disposal receipts or dump tickets shall be furnished to the Architect within five (5) days of request. Upon completion of Work, Contractor shall clean interior and exterior of buildings, including fixtures, equipment, walls, floors, ceilings, roofs, window sills and ledges, horizontal projections, and any areas where debris has collected, so surfaces are free from foreign material or discoloration; Contractor shall clean and polish all glass, plumbing fixtures, equipment, finish hardware and similar finish surfaces. Upon completion of the Work, Contractor shall also remove temporary utilities, fencing, barricades, planking, sanitary facilities and similar temporary facilities from Site.
Contractor shall remove rubbish and debris resulting from the Work on a daily basis. Contractor shall maintain the structures and Site in a clean and orderly condition at all times until acceptance of the project by the District. Contractor shall keep its access driveways and adjacent streets, sidewalks, gutters and drains free of rubbish, debris and excess water by cleaning and removal each day.

3.13.1.1 In addition to the general cleaning, the following special cleaning shall be done at the completion of the work in accordance with the specifications including, but not limited to:

(a) Remove putty stains from glazing, then wash and polish glazing.
(b) Remove marks, stains, fingerprints and other soil or dirt from painted, stained or decorated work.
(c) Remove temporary protection and clean and polish floors and waxed surfaces.
(d) Clean and polish hardware and plumbing trim; remove stains, dust, dirt, plaster and paint.
(e) Remove spots, soil, plaster and paint from tile work, and wash tile.
(f) Clean all fixtures and equipment, remove excess lubrication, clean light fixtures and lamps, polish metal surfaces.
(g) Vacuum-clean carpeted surfaces.
(h) Remove debris from roofs, down spout and drainage system.

3.13.2 Failure to Cleanup.

If the Contractor fails to clean up as provided in the Contract Documents, the District may do so, and the cost thereof shall be the responsibility of the Contractor and deducted from the next progress payment.

3.14 ACCESS TO WORK

The Contractor shall provide the District, the Architect, Engineers and the Inspector of Record, access to the Work in preparation and progress wherever located. Contractor shall provide safe and proper facilities for such access so that District’s representatives may perform their functions.

CONTRACTOR IS AWARE THAT THIS CONTRACT MAY BE SPLIT INTO SEVERAL PHASES AS ADDRESSED IN ARTICLE 6.

3.15 ROYALTIES AND PATENTS

3.15.1 Payment and indemnity for Infringement.

Contractor shall hold and save the District and its officers, agents, and employees, the Architect, and the Architect’s consultants harmless from liability of any nature or kind, including cost and expense, for or on account of any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the District, unless otherwise specifically provided in the contract documents, and unless such liability arises from the sole negligence, or active negligence, or willful misconduct of the District, the Architect, or the Architect’s consultants.
3.15.2 Review.

The review by the Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be for its adequacy for the Work and shall not be an approval for the use by the Contractor in violation of any patent or other rights of any person or entity.

3.16 INDEMNIFICATION

3.16.1 Contractor.

Contractor shall defend, indemnify and hold harmless District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors from all liabilities, claims, actions, liens, judgments, demands, damages, losses, costs or expenses of any kind arising from death, personal injury, property damage or other cause based or asserted upon any act, omission, or breach connected with or arising from the progress of Work or performance of service under this Agreement or the Contract Documents. As part of this indemnity, Contractor shall protect and defend, at its own expense, District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors from any legal action including attorneys fees or other proceeding based upon such act, omission, or breach.

Furthermore, Contractor agrees to and does hereby defend, indemnify and hold harmless District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors from every claim or demand made, and every liability, loss, damage, expense or attorneys fees of any nature whatsoever, which may be incurred by reason of:

(a) Liability for (1) death or bodily injury to persons; (2) damage or injury to, loss (including theft), or loss of use of, any property; (3) any failure or alleged failure to comply with any provision of law or the Contract Documents; or (4) any other loss, damage or expense, sustained by any person, firm or corporation or in connection with the Work called for in this Agreement or the Contract Documents, except for liability resulting from the sole or active negligence, or the willful misconduct of the District.

(b) Any bodily injury to or death of persons or damage to property caused by any act, omission or breach of Contractor or any person, firm or corporation employed by Contractor, either directly or by independent contract, including all damages or injury to, loss (including theft), or loss of use of, any property, sustained by any person, firm or corporation, including District, arising out of or in any way connected with Work covered by this Agreement or the Contract Documents, whether said injury or damage occurs either on or off District property, but not for any loss, injury, death or damages caused by the sole or active negligence or willful misconduct of the District.

(c) Any dispute between Contractor and Contractor's subcontractors/supplies/sureties, including, but not limited to, any failure or alleged failure of the Contractor (or any person hired or employed directly or indirectly by the Contractor) to pay any Subcontractor or Materialman of any tier or any other person employed in connection with the Work and/or filing of any stop notice or mechanic’s lien claims.
Contractor, at Contractor’s own expense, cost, and risk, shall defend any and all claims, actions, suits, or other proceedings that may be brought or instituted against the District, its officers, agents or employees, on or founded upon any cause, damage, or injury identified herein Section 3.16.1 and shall pay or satisfy any judgment that may be rendered against the District, its officers, agents or employees in any action, suit or other proceedings as a result thereof.

Contractor shall ensure that its contract with each of its subcontractors contains provisions requiring the subcontractors to defend, indemnify and hold harmless the District, Architect, Inspector, the State of California to a minimum level as set forth in this Article and consistent with the language of 3.16.1.

The Contractor’s and Subcontractors’ obligation to defend, indemnify and hold harmless the District, Architect, Inspector, the State of California and their officers, employees, agents and independent contractors hereunder shall include, without limitation, any and all claims, damages, and costs for the following: (1) any damages or injury to or death of any person, and damage or injury to, loss (including theft), or loss of use of, any property; (2) breach of any warranty or guaranty, express or implied; (3) failure of the Contractor or Subcontractors to comply with any applicable governmental law, rule, regulation, or other requirement; and (4) products installed in or used in connection with the Work.

3.17  SUBMISSION OF DAILY REPORTS

3.17.1 General.

At the close of each working day, the Contractor shall submit a daily report to the District and the Inspector, on forms approved by the District, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day. An attempt shall be made to reconcile the report daily, and it shall be signed by a District representative and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved that day. Each party shall retain a signed copy of the report. Reports by subcontractors or others shall be submitted through the Contractor.

3.17.2 Labor.

The report required by Paragraph 3.17.1 shall show names of workers, classifications, hours worked.

3.17.3 Materials.

The report required by Paragraph 3.17.1 shall describe materials used.

3.17.4 Equipment.

The report required by Paragraph 3.17.1 shall show type of equipment, size, and hours of operation, including loading and transportation, if applicable.
3.18 EXECUTION OF THE WORK

3.18.1 Examination.

3.18.1.1 Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record all observations in writing.

3.18.1.2 Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

3.18.1.3 Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3.18.1.4 Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.18.2 Existing Site and/or Building Conditions.

The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning Work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work. Before construction, verify the location and points of connection of all utility services for the entire Project.

3.18.3 Existing Utilities.

The existence and location of underground and other utilities and construction indicated in the Contract Documents as existing are not guaranteed. Prior to beginning the Work investigate and verify the existence and location of all underground utilities and/or other improvements affecting the Work.

3.18.3.1 Before construction, verify the location and invert all elevations at points of connection of sanitary sewer, storm sewer, and water-service piping; and all underground electrical services.

3.18.3.2 Furnish location data for work related to Project that must be performed by public utilities serving Project site.

3.18.4 Preparation.

Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a written request for information (RFI) to the District.

Existing Utility Information: Furnish information to the District and Architect that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Contractor shall coordinate with authorities having jurisdiction.
Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, Contractor shall investigate and verify all dimensions of other construction by field measurements before fabrication. Contractor shall coordinate fabrication schedule with construction progress to avoid delaying the Work.

Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Contract Documents. Contractor shall be responsible for all coordination and measurements including means and methods of Construction.

3.18.5 Construction Layout.

Verification: Before proceeding to lay out the Work, Contractor shall verify layout information and Field condition in relation to the Contract documents. Notify District and Architect immediately of any discrepancies.

3.18.6 Installation.

General Contractor shall locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

3.18.6.1 Make vertical work plumb and make horizontal work level.

3.18.6.2 Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3.18.6.3 Conceal pipes, ducts, and wiring in furnished areas, unless otherwise indicated.

3.18.6.4 Maintain minimum headroom clearance of eight feet in spaces without a suspended ceiling.

3.18.6.5 Contractor shall comply with manufacturer’s written instructions and recommendations for installing products in applications indicated.

3.18.6.6 Contractor shall install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for performance until accepted by District.

3.18.6.7 Contractor shall conduct construction operations so no part of the Work is subjected to damage or loading in excess of that expected during normal conditions of occupancy.

3.18.6.8 Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

3.18.6.9 Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

3.18.6.10 Allow for building movement, including thermal expansion and contraction.
3.18.6.11 Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

3.18.6.12 Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

3.18.6.13 Hazardous Materials: Use only products, cleaners, and installation materials that are not classified as or considered hazardous.

3.18.7 District-Installed Products

3.18.7.1 Site Access: Provide access to Project site for District’s construction forces.

3.18.7.2 Coordination: Coordinate construction and operations of the Work with work performed by District construction forces.

3.18.7.3 Construction Schedule: Inform District of Contractor’s preferred construction schedule for District’s portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify District and Architect if changes to schedule are required due to differences in actual construction progress.

3.18.7.4 Pre-installation Conferences: Include District’s construction forces at pre-installation conferences covering portions of the Work that are to receive District’s work. Attend pre-installation conferences conducted by District’s construction forces if portions of the Work depend on District’s construction forces.

3.19 **DSA VERIFIED REPORTS AND CERTIFICATE OF COMPLIANCE**

3.19.1 Contractor Actions.

The Contractor acknowledges and agrees that a material obligation of the Contractor under the Contract Documents is the completion by the Contractor of all actions and activities which by the Contract Documents or by operation of applicable law, code, rule or regulation are the responsibility of the Contractor relating to DSA reporting requirements pursuant to Education Code §81141 (including amendments thereto) and issuance of DSA’s Certificate of Compliance for the Project pursuant to Education Code §81147 (including amendments thereto) upon completion of Project construction. The foregoing shall include without limitation, the timely preparation, completion and filing of Verified Reports during Project construction and the filing of the Final Verified Report with DSA within ten (10) days of the determination of Project Final Completion. The Contractor shall provide the Project Inspector, Architect, Construction Manager retained by the District for the Project and the District with copies of all Verified Reports completed by the Contractor and submitted to DSA; such copies shall be provided to the Project Inspector, Architect, the Construction Manager and the District concurrently with the Contractor’s submission thereof to DSA.

Notwithstanding any provision of the Contract Documents to the contrary, the completion and filing of the Final Verified Report with DSA by the Contractor is an express condition precedent to the District’s disbursement of Twelve Thousand Dollars ($12,000) of the Contract Sum due the Contractor under this Agreement (“the Final Verified Report Value”). The Final Verified Report Value is in addition to, and not in lieu of, retention withheld and retained by the District from Progress Payments disbursed to the Contractor during Project construction. The District’s disbursement of the Final Verified Report Value to the Contractor shall be made by the District within thirty (30) days of the presentation by the Contractor to the Project Inspector, Architect, Construction Manager and District of reasonably satisfactory written evidence that the Contractor has filed the Contractor’s Final Verified Report with DSA in accordance with the preceding and the submission of a billing statement by the Contractor to the District for payment of the Final Verified Report Value. If the Contractor fails to file the Final Verified Report with DSA within ten (10) days of the determination of Project Final Completion, notwithstanding the preparation or filing of such Final Verified Report by the Contractor thereafter, the District may in the sole and exclusive discretion of the District retain and withhold from disbursement to the Contractor all or any part of the Final Verified Report Value as damages for the failure of the Contractor to have timely discharged its obligations hereunder.

3.20 NOISE CONTROL

The Contractor shall be responsible for the installation and maintenance of noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction equipment noise is subject to the control of the Environmental Protection Agency’s Noise Control Program (Part 204 of Title 40, Code of Federal Regulations). If classes are in session at any point during the progress of the Project, and, in the District’s reasonable discretion, the noise from such Work disrupts or disturbs the students or faculty or the normal operation of the college, at the District’s request, the Contractor shall schedule the performance of all such Work around normal campus hours or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall Contractor have a right to receive additional compensation or an extension to the contract time as a result of any such rescheduling or the making of such arrangements. These controls shall be implemented during site preparation and construction.

ARTICLE 4

ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 Replacement of Architect.

In the case of the termination of the Architect, the District may appoint an architect or another construction professional or may perform such functions with its own licensed professional personnel. The status of the replacement Architect under the Contract Documents shall be the same as that of the former architect.
4.2 ARCHITECT’S ADMINISTRATION OF THE CONTRACT

4.2.1 Status.

Pursuant to Titles 24 and 21 of the California Code of Regulations and as required pursuant to the Field Act, Education Code 81130 et. seq. the Architect will provide administration of the Contract Documents and the Work, and will be a District representative during construction, as well as during the one (1) year period following the commencement of any warranties or guaranties. The Architect will have authority to act on behalf of the District only to the extent provided in the Contract Documents.

4.2.2 Site Visits.

The Architect will visit the Site at intervals necessary in the judgment of the Architect to become generally familiar with the progress and quality of the Work and to determine in general if the Work is being performed in accordance with the Contract Documents.

4.2.3 Limitations of Construction Responsibility.

The Architect shall not have control over, charge of, or be responsible for construction means, methods, techniques, schedules, sequences or procedures, fabrication, procurement, shipment, delivery, receipt, installation, or for safety precautions and programs in connection with the Work, since these are solely the Contractor’s responsibility under the Contract Documents. The Architect shall not be responsible for the Contractor’s, Subcontractors’, material or equipment suppliers’, or any other person’s schedules or failure to carry out the Work in accordance with the Contract Documents. The Architect shall not have control over or charge of acts or omissions of the Contractor, Subcontractors, their agents or employees, or any other persons or entities performing or supplying portions of the Work. The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract Documents, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

4.2.4 Communications Facilitating Contract Administration.

Except as otherwise provided in the Contract Documents the Contractor shall communicate through the District representative. The District representative shall be promptly informed, and shall receive copies of all written communications. Contractor shall not rely upon any communications from the District that is not from the District’s representative. Communications by and with the Architect’s consultants shall be through the Architect. Communications by and with Subcontractors and material or equipment suppliers shall be through the Contractor.

4.2.5 Payment Applications.

The Architect will review and make recommendations to the District regarding the amounts due the Contractor on the Certificates for Payment pursuant to Article 9 and subject to the Inspector’s approval and Architect’s observation.
4.2.6 Rejection of Work.

In addition to the rights, duties, and obligations of the Inspector under this Article, the Architect may recommend to the District that the District reject Work which does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable to achieve the intent of the Contract Documents, the Architect may recommend to the District that the District require additional inspection or testing of the Work in accordance with Paragraph 13.5, whether or not such Work is fabricated, installed, or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

4.2.7 Warranties and Guaranties Upon Completion.

The Architect, in conjunction with the District and Inspector will conduct field reviews of the Work to determine the date of completion, shall receive and forward to the District for the District’s review and records written warranties, guaranties, and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment when the Architect believes the Work has been completed in compliance with the requirements of the Contract Documents. The handling by the Architect of such warranties, guaranties, maintenance manuals, or similar documents shall not diminish or transfer to the Architect any responsibilities or liabilities required by the Contract Documents of the Contractor or other entities, parties, or persons performing or supplying the Work.

The Architect will conduct a field review of the Contractor’s comprehensive list of items to be completed or corrected (final punch list) and one (1) follow-up field review if required. The cost incurred by the District for further field reviews or the preparation of further punch lists by the Architect shall be invoiced to the Contractor and deducted from the final payment.

4.2.8 Interpretation.

The Architect will interpret and decide matters concerning performance and requirements of the Contract Documents.

4.2.9 Additional Instructions.

4.2.9.1 Typical Parts and Sections. Whenever typical parts or sections of the Work are completely detailed on the Drawings, and other parts or sections which are essentially the same construction are shown in outline only, the complete details shall apply to the Work which is shown in outline.

4.2.9.2 Dimensions. Dimensions of Work shall not be determined by scale or rule. Figured dimensions shall be followed at all times. If figured dimensions are lacking on Drawings, Architect shall supply them on request. The Architect’s decisions on matters relating to aesthetic effect will be final.
4.3 **INSPECTOR OF RECORD**

4.3.1 General.

One or more project inspectors employed by the District and approved by the Division of the State Architect will be assigned to the Work in accordance with the requirements of Title 24 of the California Code of Regulations. The Inspector(s) duties are as specifically defined in Title 24.

4.3.2 Inspector’s Duties.

All Work shall be under the observation of the Inspector. The Inspector shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Inspector such information as may be necessary to keep the Inspector fully informed regarding progress and manner of Work and character of materials. Such observations shall not, in any way, relieve the Contractor from responsibility for full compliance with all terms and conditions of the Contract, or be construed to lessen to any degree the Contractor’s responsibility for providing efficient and capable superintendence. The Inspector is not authorized to make changes in the drawings or specifications nor shall the Inspector’s approval of the Work and methods relieve the Contractor of responsibility for the correction of subsequently discovered defects, or from its obligation to comply with the Contract Documents.

4.3.3 Inspector’s Authority to Reject or Stop Work.

The Inspector shall have the authority to reject Work whenever provisions of the Contract Documents are not being complied with, and Contractor shall instruct its Subcontractors and employees accordingly. In addition, the Inspector may stop any Work that poses a probable risk of harm to persons or property. The Contractor shall instruct its employees, Subcontractors, material and equipment suppliers, etc., accordingly. The absence of any Stop Work order or rejection of any portion of the Work shall not relieve the Contractor from any of its obligations pursuant to the Contract Documents.

4.3.4 Inspector’s Facilities.

Within seven (7) days after notice to proceed, the Contractor shall provide the Inspector with the temporary facilities as required under Division 1 of the Specifications.

4.3.5 Testing Times.

The District will provide inspection and testing at its cost during the normal eight (8) hour day Monday through Friday (except holidays). Work by the Contractor outside of the normal eight (8) hour day shall constitute an authorization from the Contractor to the District to provide inspection and testing as required outside of the normal eight (8) hour day. Contractor shall reimburse District for any additional costs associated with inspection and testing (including re-inspection and re-testing) outside the normal eight-hour day and for any retests caused by the Contractor.

4.4 **RESPONSIBILITY FOR ADDITIONAL CHARGES INCURRED BY THE DISTRICT FOR PROFESSIONAL SERVICES**

If at any time prior to the completion of the requirements under the Contract Documents, the District is required to provide or secure additional professional services for any reason by any act of the
Contractor, the Contractor shall be invoiced by the District for any costs incurred for any such additional services, which costs shall be deducted from the next progress payment. Such invoicing shall be independent from any other District remedies and shall not be considered a waiver of any District rights or remedies. If payments then or thereafter due to the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the District. Additional services shall include, but shall not be limited to, the following:

(a) Services made necessary by the default of the Contractor.
(b) Services made necessary due to the defects or deficiencies in the Work of the Contractor.
(c) Services required by failure of the Contractor to perform according to any provision of the Contract Documents.
(d) Services in connection with evaluating substitutions of products, materials, equipment, Subcontractors’ proposed by the Contractor, and making subsequent revisions to drawings, specifications, and providing other documentation required (except for the situation where the specified item is no longer manufactured or available).
(e) Services for evaluating and processing claims submitted by the Contractor in connection with the Work outside the established Change Order process.
(f) Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified time of completion.
(g) Services in conjunction with the testing, adjusting, balancing and start-up of equipment other than the normal amount customarily associated for the type of Work involved.
(h) Services in conjunction with more than one (1) re-review of submittals of shop drawings, product data, samples, etc.

4.5 DISPUTES

4.5.1 Decision of Architect.

Disputes between District and Contractor involving money or time, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for action as provided in Paragraph 4.5.2. A decision by the Architect, as provided in Paragraph 4.5.5, shall be required as a condition precedent to proceeding with remedies set forth in Paragraph 4.5.6 as to all such matters arising prior to the date final payment is due, regardless of whether such matters relate to execution and progress of the Work, or the extent to which the Work has been completed. The decision by the Architect in response to a Claim shall not be a condition precedent to the remedies under Paragraph 4.5.2 through 4.5.5 in the event: (1) the position of Architect is vacant; (2) the Architect has not received evidence or has failed to render a decision within agreed time limit; (3) the Architect has failed to take action required under Paragraph 4.6.4 within thirty (30) days after the Claim is made, forty-five (45) days have passed after the Claim has been referred to the Architect; or (4) the Claim relates to a Stop Notice Claim not arising from any extra change order or Construction Change Directive for which approval has not been provided.
4.5.2 Architect’s Review.

The Architect will review Claims and take one or more of the following preliminary actions within ten (10) days of receipt of a Claim: (1) request additional supporting data from the Claimant; (2) submit a schedule to the parties indicating when the Architect expects to take action; (3) reject the Claim in whole or in part, stating reasons for rejection; (4) recommend approval of the Claim; or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

4.5.3 Documentation if Resolved.

If a Claim has been resolved, the Architect will prepare or obtain appropriate documentation.

4.5.4 Actions if Not Resolved.

If a Claim has not been resolved and all documentation requested pursuant to Paragraph 4.5.2 has been provided, the party making the Claim shall, within ten (10) days after the Architect’s preliminary response, take one or more of the following actions: (1) modify the initial Claim; (2) notify the Architect that the initial Claim stands; or (3) supplement with additional supporting data.

4.5.5 Architect’s Written Decision.

If a Claim has not been resolved after consideration of the foregoing and of other evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect’s decision will be made within twenty (20) days. Upon expiration of such time period, the Architect will render to the parties its written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. The Architect may, but is not obligated to, notify the surety and request the surety’s assistance in resolving the controversy.

4.5.6 Continuing Contract Performance.

Pending final resolution of a Claim, including, negotiation, mediation, arbitration, or litigation, the Contractor shall proceed diligently with performance of the Contract, and the District shall continue to make any undisputed payments in accordance with the Contract. If the dispute is not resolved, Contractor agrees it will neither rescind the contract nor stop the progress of the work, but Contractor’s sole remedy shall be to submit such controversy to determination by a court of competent jurisdiction in the county where the project is located, after the project has been completed, and not before. At the District’s sole option, the District may submit individual disputes for binding arbitration and Contractor agrees to the resolution determined for each individual dispute by Arbitrator, including resolution of time and delays. If binding arbitration is utilized for individual disputes, such resolution is full and final as to that particular Claim.

4.5.7 Claims for Concealed Trenches or Excavations Greater Than Four Feet Below the Surface.

When any excavation or trenching extends greater than four feet below the surface or if any condition involving hazardous substances are encountered:
(a) Immediately upon discovery, The Contractor shall promptly, and before the following conditions are disturbed, notify the District, by telephone and in writing, of the condition except:

1. If such condition is a hazardous waste condition, and Contractor’s bid includes removal or disposal of hazardous substances. Material that the Contractor believes may be a material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law. In such case, the notice bulletin procedures of Article 7 apply.

2. Subsurface or latent physical conditions at the Site differing from those indicated.

3. Unknown physical conditions at the Site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract.

(b) The District shall investigate the conditions, and if District finds that the conditions do materially so differ, do involve hazardous waste, and cause a decrease or increase in the Contractor’s cost of, or the time required for, performance of any part of the Work shall issue a change order or construction change directive under the procedures described in the Contract.

(c) In the event that a dispute arises between the District and the Contractor whether the conditions materially differ, involve hazardous waste, or cause a decrease or increase in the Contractor’s cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all Work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

4.5.8 Claims for Extension of Time.

If Contractor and District cannot agree upon an extension of time, whether compensable or not, then Contractor must have first completed the procedures set forth in Paragraph 8.4. Upon completion of the procedures set forth under Paragraph 8.4, Contractor must then comply with the requirements in this Article including those set forth under Paragraph 4.5.9.

4.5.9 Claims Procedures.

4.5.9.1 Procedure applicable to all Claims:

(a) Definition of Claim: A “Claim” means a separate demand by the Contractor for (1) time extension, (2) payment of money or damages arising from Work done by or on behalf of the Contractor pursuant to the Contract and payment of which is not otherwise expressly provided for or the Claimant is not otherwise entitled to, or (3) and amount the payment of which is disputed by the District.
(b) **Filing Claim is Not Basis To Discontinue Work:** The Contractor shall promptly comply with Work under the Contract or Work requested by the District even though a written Claim has been filed. The Contractor and the District shall make good faith efforts to resolve any and all Claims that may arise during the performance of the Work covered by this contract.

(c) **Claim Notification:** The Contractor shall within seven (7) calendar days after the Claim arises, submit a notification, in writing, with the District stating clearly the basis for the Claim. If the notification is not submitted within seven (7) days after the Claim arises, the Contractor shall be deemed to have waived all right to assert the Claim, and the Claim shall be denied. Claims submitted after the final payment date shall also be considered null and void by the District. All Claims shall be reviewed pursuant to Paragraph 4.5.1, 4.5.2, and 4.5.5. In order to qualify as a Claim, the written notice must state that it is a Claim submitted under this paragraph of these General Conditions.

(d) **Formal Claim Appeal Submission:** If the Contractor does not concur with the District’s decision regarding the Claim Notification, the Contractor will issue a formal Claim Appeal within fourteen (14) days of receipt of the District’s decision and all detailed information in support of the Claim Appeal within thirty (30) days. All appeals shall be submitted before final payment. If the Claim Appeal is not submitted within fourteen (14) calendar days and detailed information within thirty (30) days, the Contractor shall be deemed to have waived its right to assert the Claim and the Claim shall be denied. Contractor’s failure to submit any detailed information which is in the possession of Contractor shall render such information inadmissible by Contractor at trial or arbitration.

(e) **Appeal Claim Format:** The Contractor shall provide all written detailed documentation which supports the Claim, including but not limited to: arguments, justifications, cost, estimates, schedule analysis and detailed documentation. The format of the Claim Appeal shall be as follows:

1. **Cover letter.**

2. **Summary of factual basis of Claim and amount of Claim.**

3. **Summary of the basis of the Claim, including the specific clause and section under the Contract under which the Claim is made.**

4. **Documents relating to the Claim, including:**
   a. Specifications
   b. Drawings
   c. Clarifications (RFI’s)
   d. Other relevant information
   e. Analysis of claim merit.
   f. Analysis of claim cost.
   g. For Claims relating to time extensions, an analysis and supporting documentation evidencing any effect upon the critical path.
   h. Certification.
i. Chronology of events and related correspondence.

j. Daily reports and logs.

(f) Certification: The Contractor (and subcontractors, if applicable) shall submit with the Claim a certification under penalty of perjury:

(1) That the Contractor has reviewed the Claim and that such Claim is made in good faith;

(2) Supporting data are accurate and complete to the best of the Contractor’s knowledge and belief;

(3) The amount requested accurately reflects the amount of compensation for which the Contractor believes the District is liable.

(4) That the Contractor is familiar with Government Code Sections 12650 et seq. and Penal Code Section 72 and that false Claims can lead to substantial fines and/or imprisonment.

(g) Signature of Certification: If the Contractor is not an individual, the certification shall be executed by an officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor’s affairs.

(h) Mandatory Claim Appeal Procedure: The Contractor’s Claim Appeal shall be denied if it fails to provide the written basis of the Claim and certification as set forth herein.

(i) District May Request Additional Information: Within thirty (30) days of receipt of the Claim Appeal and the information under this Article, the District may request in writing any additional documentation supporting the Claim or documentation relating to defenses to the Claim which the District may assert.

4.5.9.2 Binding Arbitration of Individual Claim Issues. At the District’s sole option, the District may submit individual disputes, or Claims, to binding arbitration and Contractor agrees to the resolution determined for each individual dispute by Arbitrator, including resolution of time and delays. If binding arbitration is utilized, such resolution is a full and final resolution of the particular Claim or dispute. Under no circumstances may the Contractor stop work, rescind its contract or otherwise slow the progress of Work during resolution of individual Claims in binding Arbitration.

4.5.9.3 Resolution of Disputes in Court of Competent Jurisdiction. If Claims are not resolved under the procedure set forth and pursuant to Article 4.5.9.2, such Claim or controversy shall be submitted to a court in the county of competent jurisdiction after the Project has been completed, and not before.

4.5.9.4 Warranties, Guaranties and Obligations. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guaranties and obligations imposed upon Contractor by the General Conditions and amendments thereto; and all of the rights and remedies available to District and Architect thereunder, are in addition to, and are not to be construed in any way as a
limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations by special warranty or guaranty or by other provisions of the Contract Documents, and the provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 Subcontractual Relations

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the same obligations and responsibilities, assumed by Contractor pursuant to the Contract Documents. Each subcontract agreement shall preserve and protect the rights of the District and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Upon written request of the Subcontractor, the Contractor shall identify to the Subcontractor the terms and conditions of the proposed subcontract agreement, which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.1.2 Subcontractor Licenses.

All subcontractors shall be properly licensed by the California State Licensing Board.

5.1.3 Substitution of Subcontractor

Substitution of Subcontractors shall be permitted only as authorized under Public Contract Code §§ 4107 et. Seq. Any substitutions of Subcontractors shall not result in any increase in the Contract Price or result in the granting of any extension of time for the completion of the Project.

5.1.4 Contingent Assignment of Subcontracts and Other Contracts

Each subcontract and other contract or agreement for any portion of the Work is hereby assigned by the Contractor to the District provided that:

(a) Such assignment is effective only after termination of this contract with the Contractor by the District as provided herein and only for those subcontracts and other contracts and agreements that the District accepts by notifying the Subcontractor or Materialman (as may be applicable) in writing; and
(b) Such assignment is subject to the prior rights of the Surety(ies) obligated under the Payment Bond and Performance Bond.

The Contractor shall include adequate provisions for this contingent assignment of subcontracts and other contracts and agreements in each such document.

ARTICLE 6

CONSTRUCTION BY DISTRICT OR BY SEPARATE CONTRACTORS

6.1 DISTRICT’S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 Separate Contracts.

(a) District reserves the right to let other contracts in connection with this Work. Contractor shall afford other contractors reasonable opportunity for (1) introduction and storage of their materials; (2) access to the Work; and (3) execution of their work. Contractor shall properly connect and coordinate its work with that of other Contractors.

(b) If any part of Contractor’s Work depends on proper execution or results of any other contractor, the Contractor shall inspect and within seven (7) days or less, report to Architect, in writing, any defects in such work that render it unsuitable for proper execution of Contractor’s work. Contractor will be held accountable for damages to District for that work which it failed to inspect or should have inspected. Contractor’s failure to inspect and report shall constitute its acceptance of other contractors’ work as fit and proper for reception of its work, except as to defects which may develop in other contractors’ work after execution of Contractor’s work.

(c) To ensure proper execution of its subsequent Work, Contractor shall measure and inspect Work already in place and shall at once report to the Architect in writing any discrepancy between executed Work As-Built drawings and the Contract Documents.

(d) Contractor shall ascertain to its own satisfaction the scope of the Project and nature of any other contracts that have been or may be awarded by District in prosecution of the Project and the potential impact of such work on Contractor’s schedule.

(e) Nothing herein contained shall be interpreted as granting to Contractor the exclusive occupancy at the site of Project. Contractor shall not cause any unnecessary hindrance or delay to any other contractor working on the Project Site. If execution of any contract by the District is likely to cause interference with Contractor’s performance of its contract, District shall decide which contractor shall cease work temporarily and which contractor shall continue, or whether work can be coordinated so that contractors may proceed simultaneously.

(f) District shall not be responsible for any damages suffered or extra costs incurred by Contractor resulting directly or indirectly from award or performance or attempted performance of any other contract or contracts at the Project, or caused
by any decision or omission of District respecting the order of precedence in performance of contracts.

CONTRACTOR IS AWARE THAT THIS CONTRACT MAY BE SPLIT INTO SEVERAL PHASES. IF THE CONTRACT IS SPLIT INTO PHASES THEN CONTRACTOR HAS MADE ALLOWANCE FOR ANY DELAYS OR DAMAGES WHICH MAY ARISE FROM COORDINATION WITH CONTRACTORS FOR OTHER PHASES. IF ANY DELAYS SHOULD ARISE FROM ANOTHER CONTRACTOR WORKING ON A DIFFERENT PHASE, CONTRACTOR’S SOLE REMEDY FOR DAMAGES, INCLUDING DELAY DAMAGES, SHALL BE AGAINST THE CONTRACTOR WHO CAUSED SUCH DAMAGE AND NOT THE DISTRICT. CONTRACTOR SHALL PROVIDE ACCESS TO OTHER CONTRACTORS FOR OTHER PHASES AS NECESSARY TO PREVENT DELAYS AND DAMAGES TO OTHER CONTRACTORS WORKING ON OTHER PHASES OF CONSTRUCTION.

6.1.2 District’s Right to Carry Out the Work.

See Paragraph 2.2.

6.1.3 Designation as Contractor.

When separate contracts are awarded to contractors on the Project Site, the term “Contractor” in the Contract Documents in each case shall mean the Contractor who executes each separate District/Contractor Agreement.

6.1.4 Contractor Duties.

The Contractor shall have overall responsibility to reasonably coordinate and schedule Contractor’s activities with the activities of the District’s own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the District in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule and Contract Sum deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors, and the District until subsequently revised. Additionally, Contractor shall coordinate with Architect and District inspector to ensure timely and proper progress of work.

6.2 CONSTRUCTIVE OWNERSHIP OF PROJECT SITE AND MATERIAL

Upon commencement of Work, the Contractor becomes the constructive owner of the entire site, improvements, material and equipment on Project site. Contractor must ensure proper safety and storage of all materials and assumes responsibility as if Contractor was the owner of the Project site. All risk of loss or damage shall be borne by Contractor during the Work until the date of Completion. As construction owner, Contractor must carry adequate insurance in case of calamity and is not entitled to rely on the insurance requirements as set forth in this agreement as being adequate coverage in case of calamity.
6.3 **DISTRICT’S RIGHT TO CLEAN UP**

If a dispute arises among the Contractor, separate contractors, and the District as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.12, the District may clean up and allocate the cost among those it deems responsible.

**ARTICLE 7**

**CHANGES IN THE WORK**

7.1 **CHANGES**

7.1.1 **No Changes Without Authorization.**

There shall be no change whatsoever in the drawings, specifications, or in the Work without an executed Change Order, Construction Change Directive, or order by the Architect for a minor change in the Work as herein provided. District shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the District’s Governing Board has authorized the same and the cost thereof approved in writing by Change Order or executed Construction Change Directive. No extension of time for performance of the Work shall be allowed hereunder unless claim for such extension is made at the time changes in the Work are ordered, and such time duly adjusted in writing in the Change Order. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications. Notwithstanding anything to the contrary in this Article 7, all Change Orders shall be prepared and issued by the District and shall become effective when executed by the District’s Governing Board, the Architect, the Contractor, and the DSA.

Should any Change Order result in an increase in the Contract Sum, the cost of such Change Order shall be agreed to, in writing, in advance by Contractor and District and be subject to the monetary limitations set forth in Public Contract Code Section 20659. In the event that Contractor proceeds with any change in Work without first notifying District and obtaining the Architect’s and District’s consent to a Change Order, Contractor waives any claim of additional compensation for such additional work.

CONTRACTOR UNDERSTANDS, ACKNOWLEDGES, AND AGREES THAT THE REASON FOR THIS NOTICE REQUIREMENT IS SO THAT DISTRICT MAY HAVE AN OPPORTUNITY TO ANALYZE THE WORK AND DECIDE WHETHER THE DISTRICT SHALL PROCEED WITH THE CHANGE ORDER OR ALTER THE PROJECT SO THAT SUCH CHANGE IN WORK BECOMES UNNECESSARY.

7.1.2 **Architect Authority.**

The Architect will have authority to order minor changes in the Work not involving any adjustment in the Contract Sum, or an extension of the Contract Time, or when a change which is inconsistent with the intent of the Contract Documents. Such changes shall be effected by written Change Order and shall be binding on the District and the Contractor. The Contractor shall carry out such written orders promptly.
7.2 **CHANGE ORDERS (“CO”)**

A CO is a written instrument prepared by the Architect and signed by the District (as authorized by the District’s Governing Board), the Contractor, the Architect, stating their agreement upon all of the following:

(a) A description of a change in the Work;
(b) The amount of the adjustment in the Contract Sum, if any; and
(c) The extent of the adjustment in the Contract Time, if any.

7.3 **CONSTRUCTION CHANGE DIRECTIVE**

7.3.1 Definition.

A Construction Change Directive is a written order prepared by the Architect and signed by the District and the Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The District may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions within. If applicable, the Contract Sum and Contract Time will be adjusted accordingly. In the case of a Construction Change Directive being issued, Contractor must commence Work immediately or delays from failure to perform Construction Change Directive shall be the responsibility of Contractor. Any dispute as to the sum of Construction Change Directive or timing of payment, shall be resolved pursuant to Paragraph 4.5.

7.3.2 Use to Direct Change

A Construction Change Directive shall be used in the absence of agreement on the terms of a CO. A copy of a proposed form is provided at the end of this Article.

7.4 **REQUEST FOR INFORMATION (“RFI”)**

7.4.1 Definition.

An RFI is a written request prepared by the Contractor requesting the District to provide additional information necessary to clarify or amplify an item which the Contractor believes is not clearly shown or called for in the drawings or specifications, or to address problems which have arisen under field conditions.

7.4.2 Scope.

The RFI shall reference all the applicable Contract Documents including specification section, detail, page numbers, drawing numbers, and sheet numbers, etc. The Contractor shall make suggestions and interpretations of the issue raised by the RFI. An RFI cannot modify the Contract Sum, Contract Time, or the Contract Documents.
7.4.3  Response Time.

The Architect must respond to a RFI within a reasonable time after receiving such request. If the Architect’s response results in a change in the Work, then such change shall be effected by a written CO or Construction Change Directive, if appropriate. If the Architect cannot respond to the RFI within a reasonable time, the Architect shall notify the Contractor, with a copy to the Inspector and the District, of the amount of time that will be required to respond.

7.4.4  Costs Incurred.

The Contractor shall be responsible for any costs incurred for professional services, which shall be deducted from the next progress payment, if an RFI requests an interpretation or decision of a matter where the information sought is equally available to the party making such request. District, at its sole discretion, shall invoice Contractor for all such professional services arising from this Article.

7.5  REQUEST FOR PROPOSAL (“RFP”)

7.5.1  Definition.

An RFP is a written request prepared by the Architect requesting the Contractor to submit to the District and the Architect an estimate of the effect of a proposed change on the Contract Sum and the Contract Time.

7.5.2  Scope.

An RFP shall contain adequate information, including any necessary drawings and specifications, to enable Contractor to provide the cost breakdowns required by Paragraph 7.7. The Contractor shall not be entitled to any Additional Compensation for preparing a response to an RFP, whether ultimately accepted or not.

7.6  CHANGE ORDER REQUEST (“COR”)

7.6.1  Definition.

A COR is a written request prepared by the Contractor requesting that the District and the Architect issue a CO based upon a proposed change called for in an RFP or a claim pursuant to Paragraph 4.5.

7.6.2  Changes in Sum.

A COR shall include breakdowns per Paragraph 7.7 to validate any change in Contract Sum due to proposed change or claim.

7.6.3  Changes in Time.

A COR shall also include any additional time required to complete the Project. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Project Schedule as defined in Paragraph 3.8 of the General Contract. If contractor
fails to request a time extension in a COR, then the Contractor is thereafter precluded from requesting or claiming a delay.

7.7 **COST OF CHANGE ORDERS**

7.7.1 Scope.

Within ten (10) days after a request is made for a change that impacts the Contract Sum as defined in Paragraph 9.1, the critical path, or the Contract Time as defined in Paragraph 8.4.2, the Contractor shall provide the District and the Architect, with a written estimate of the effect of the proposed CO upon the Contract Sum and the actual cost of construction, which shall include a complete itemized cost breakdown of all labor and material showing actual quantities, hours, unit prices, and wage rates required for the change, and the effect upon the Contract Time of such CO. Changes may be made by District by an appropriate written CO, or, at the District's option, such changes shall be implemented immediately upon the Contractor’s receipt of an appropriate written Construction Change Directive.

District may, as provided by law and without affecting the validity of this Agreement, order changes, modification, deletions and extra work by issuance of written Construction Change Directives from time to time during the progress of the Project, contract sum being adjusted accordingly. All such work shall be executed under conditions of the original Agreement except that any extension of time caused thereby shall be adjusted at time of ordering such change. District has discretion to order changes on a “time and material” basis with adjustments to time made after Contractor has justified through documentation the impact on the critical path of the Project.

7.7.2 Determination of Cost.

The amount of the increase or decrease in the Contract Price from a CO, if any, shall be determined in one or more of the following ways as applicable to a specific situation:

(a) Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation. If an agreement cannot be reached within fifteen (15) days after submission and negotiation of Contractor’s proposal, Contractor may submit pursuant to Paragraph 7.7.3. Submission of sums which have no basis in fact are at the sole risk of Contractor and may be a violation of the False Claims Act set forth under Government Code Section 12650 et. seq.);

(b) By unit prices contained in Contractor’s original bid and incorporated in the Project documents or fixed by subsequent agreement between District and Contractor;

(c) Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee. However, in the case of disagreement, Contractor must utilize the procedure under section 7.7.3; or

(d) By cost of material and labor and percentage of overhead and profit. If the value is determined by this method the following requirements shall apply:
1. **Basis for Establishing Costs.**

   a. Labor will be the actual cost for wages prevailing locally for each craft or type of workers at the time the extra Work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. The use of a labor classification which would increase the extra Work cost will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

   b. Materials shall be at invoice or lowest current price at which such materials are locally available and delivered to the Site in the quantities involved, plus sales tax, freight, and delivery.

   The District reserves the right to approve materials and sources of supply or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the District.

   c. Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of $250 or less.

   Regardless of ownership, the rates to be used in determining equipment rental costs shall not exceed listed rates prevailing locally at equipment rental agencies or distributors at the time the Work is performed.

   The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

   Necessary loading and transportation costs for equipment used on the extra Work shall be included. If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the District than holding it at the Work Site, it shall be returned unless the Contractor elects to keep it at the Work Site at no expense to the District.

   All equipment shall be acceptable to the Inspector, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer’s ratings and modifications shall be used to classify equipment, and equipment shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

   d. Other Items. The District may authorize other items which may be required on the extra work. Such items include labor, services, material, and equipment which are different in their nature from those required by the Work, and which are of a type not ordinarily available from the Contractor or any of the Subcontractors. Invoices covering all such items in detail shall be submitted with the request for payment.
e. Invoices. Vendors’ invoices for material, equipment rental, and other expenditures shall be submitted with the COR. If the request for payment is not substantiated by invoices or other documentation, the District may establish the cost of the item involved at the lowest price which was current at the time of the Daily Report.

f. Overhead. Overhead, including direct and indirect costs, shall be submitted with the COR and include: home office overhead, off-site supervision, CO preparation/negotiation/research, time delays, project interference and disruption, additional guaranty and warranty durations, on-site supervision, additional temporary protection, additional temporary utilities, additional material handling costs, and additional safety equipment costs.

7.7.3 Format for Proposed Cost Change.

The following format shall be used as applicable by the District and the Contractor to communicate proposed additions and deductions to the Contract. A copy of a proposed Construction Change Directive form is provided at the end of this Article.

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<th>CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Material (attach itemized quantity and unit cost plus sales tax)</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(b) Labor (attach itemized hours and rates)</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(c) Equipment (attach invoices)</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(d) Subtotal</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>(e) If Subcontractor performed Work, add Subcontractor’s overhead and profit to portions performed by Sub-contractor, not to exceed fifteen percent (15%) of item (d).</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>
(f) Liability and Property Damage Insurance, Worker’s, Compensation Insurance, Social Security, and Unemployment Taxes, not to exceed as follows: FICA @ 6.2% - with a wage ceiling of $84,900; Medicare @ 1.45% - no wage ceiling; FUTA @ .8% - with a wage ceiling of $7,000; ETT and SUI @ 2.3% - with a wage ceiling of $7,000; Workers’ Compensation @ 5.94%; Liability and Property Damage @ 2.5%. **Total not-to-exceed is 19.19%**. *(Note: Modifications to these percentages will be evaluated and possibly modified only on a case-by-case basis and only after proper proof of alternate percentages are documented and approved in advance. In addition, as wage ceilings are met, those corresponding percentages must drop from the “burden” calculations).*

(g) Subtotal

(h) General Contractor’s Overhead and Profit: Not to exceed fifteen percent (15%) of Item (g) if Contractor performed the work. No more than five percent (5%) of Item (g) if Subcontractor performed the work. If work was performed by Contractor and Subcontractors, portions performed by Contractor shall not exceed fifteen percent (15%) if Item (g), and portions performed by Subcontractor shall not exceed five percent (5%) of Item (g)

(i) Subtotal

(j) Bond not to exceed one percent (1%) of Item (g)

(k) TOTAL

(l) Time

The undersigned Contractor approves the foregoing Construction Change Directive as to the changes, if any, and the contract price specified for each item and as to the extension of time allowed, if any, for completion of the entire work on account of said Construction Change Directive, and agrees to furnish all labor, materials and service and perform all work necessary to complete any additional work
specified therein, for the consideration stated herein. It is understood that said Construction Change Directive shall be effective when approved by the Governing Board of the District.

It is expressly understood that the value of such extra Work or changes, as determined by any of the aforementioned methods, expressly includes any and all of the Contractor’s costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages or time extensions not included are deemed waived.

The Contractor expressly acknowledges and agrees that any change in the Work performed shall not be deemed to constitute a delay or other basis for claiming additional compensation based on theories including, but not limited to, acceleration, suspension or disruption to the Project.

7.7.4 Net Deductive Change Orders

All net deductive Change Order(s) must be prepared pursuant to Paragraph 7.7.3. Contractor will be allowed a maximum of 5% total profit and overhead. If subcontractor work is involved, subcontractors shall be entitled to a maximum of 5% profit and overhead on the deducted work. Any deviation from this Article shall not be allowed.

7.7.5 Discounts, Rebates, and Refunds.

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor’s cost in determining the actual cost of construction for purposes of any change, addition, or omissions in the Work as provided herein.

7.7.6 Accounting Records.

With respect to portions of the Work performed by COs and Construction Change Directives on a time-and-materials, unit-cost, or similar basis, the Contractor shall keep and maintain cost-accounting records satisfactory to the District, which shall be available to the District on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

7.7.7 Notice Required.

If the Contractor desires to make a claim for an increase in the Contract Price, or any extension in the Contract Time for completion, it shall notify the District pursuant to Paragraph 4.5 and this Article. No claim shall be considered unless made in accordance with this subparagraph. Contractor shall proceed to execute the Work even though the adjustment may not have been agreed upon. Any change in the Contract Price or extension of the Contract Time resulting from such claim shall be authorized by a CO.

7.7.8 Applicability to Subcontractors.

Any requirements under this Article 7 shall be equally applicable to COs or Construction Change Directives issued to Subcontractors by the Contractor to the same extent required by the Contractor.
7.7.9 Alteration to Change Order Language.

Contractor shall not alter Change Orders or reserve time in Construction Change Directives. Contractor shall execute finalized Change Orders and proceed under Paragraph 7.7.7 and Paragraph 4.5 with proper notice. If Contractor intends to reserve time, without an approved CPM schedule prepared pursuant to Paragraph 3.8 then Contractor may be prosecuted pursuant to the False Claim Act.

ARTICLE 8

TIME

8.1 DEFINITIONS

8.1.1 Contract Time.

Unless otherwise provided, Contract Time is the period of time, in calendar days, including authorized adjustments, allotted in the Contract Documents for Completion of the Work.

8.1.2 Notice to Proceed.

District may give a notice to proceed within three (3) months of the award of the bid by District. Once Contractor has received the notice to proceed, Contractor shall complete the Work in the period of time referenced in the Contract Documents.

In the event that District desires to postpone the giving of the notice to proceed beyond this two-month period, it is expressly understood that with reasonable notice to the Contractor, the giving of the date to proceed may be postponed by District. It is further expressly understood by Contractor, that Contractor shall not be entitled to any Claim of additional compensation as a result of the postponement of the giving of the notice to proceed.

If the Contractor believes that a postponement will cause a hardship to Contractor, Contractor may terminate the contract with written notice to District within 10 days after receipt by Contractor of District’s notice of postponement. It is further understood by Contractor that in the event that Contractor terminates the Contract as a result of postponement by the District, the District shall only be obligated to pay Contractor for the Work that Contractor had performed at the time of notification of postponement. Should Contractor terminate the contract as a result of a notice of postponement, District shall have the authority to award the contract to the next lowest responsible bidder.

8.1.3 Computation of Time.

The term “day” as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

The Contractor will only be allowed a time extension for unusually severe weather if it results in precipitation or other conditions which in the amount, frequency, or duration is in excess of the norm at the location and time of year in question as established by National Oceanic and Atmospheric Administration (NOAA) weather data. No less than three work days allocated equally across the Contract
Time will be identified as non-working weather days in the contractor’s schedule for the entire contract period of performance. The weather days shall be shown on the schedule and if not used will become float for the Project’s use. A day-for-day extension will only be allowed for those days in excess of the norm. The Contractor is expected to work seven (7) days per week (if necessary, irrespective of inclement weather), to maintain access, and to protect the Work under construction from the effects of inclement weather.

If the weather is unusually severe and is in excess of the NOAA data norm and prevents the Contractor from beginning work at the usual daily starting time, or prevents the Contractor from proceeding with seventy-five (75%) of the normal labor and equipment force towards completion of the day’s current controlling item on the accepted construction schedule for a period of at least five hours, and the crew is dismissed as a result thereof, the Architect will designate such time as unavoidable delay and grant one (1) work-day extension.

8.2 HOURS OFWORK.

8.2.1 Sufficient Forces.

Contractors and Subcontractors shall continuously furnish sufficient forces to ensure the prosecution of the Work in accordance with the Construction Schedule.

8.2.2 Performance During Working Hours.

Work shall be performed during regular working hours as permitted by the District except that in the event of an emergency, or when required to complete the Work in accordance with job progress, work may be performed outside of regular working hours with the advance written consent of the District and approval of any required governmental agencies.

8.2.3 Costs for After Hours Inspections.

If the Contract Documents require Work to be done outside the Inspector’s regular working hours, the costs of any after hour inspections, shall be borne by the District.

If the District allows the Contractor to do Work outside regular working hours for the Contractor’s convenience, or if required to maintain schedule, the costs of any inspections required outside regular working hours shall be invoiced to the Contractor by the District and deducted from the next Progress Payment.

If the Contractor elects to perform Work outside the Inspector’s regular working hours, costs of any inspections required outside regular working hours shall be invoiced to the Contractor by the District and deducted from the next Progress Payment.

8.3 PROGRESS AND COMPLETION.

8.3.1 Time of the Essence.

Time limits stated in the Contract Documents are of the essence to the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.
8.4 EXTENSIONS OF TIME – LIQUIDATED DAMAGES

8.4.1 Liquidated Damages.

Contractor and District hereby agree that the exact amount of damages for failure to complete the Work within the time specified is extremely difficult or impossible to determine. If the Work is not completed within the time specified in the Contract Documents, it is understood that the District will suffer damage. It being impractical and unfeasible to determine the amount of actual damage, it is agreed the Contractor shall pay to District as fixed and liquidated damages, and not as a penalty, the amount specified in the Construction Agreement for each calendar day of delay in completion. Any liquidated damages recovered by the District shall not, however, limit the District’s right to separately recover any actual out-of-pocket damages it suffers due to Contractor’s delay. Contractor and his surety shall be liable for the amount thereof pursuant to Government Code section 53069.85.

8.4.2 Excusable Delay.

Contractor shall not be charged for liquidated damages because of any delays in completion of Work which are not the fault or negligence of Contractor or its subcontractors, including acts of God, as defined in Public Contract Code Section 7107, acts of enemy, epidemics and quarantine restrictions. Contractor shall within five (5) calendar days of beginning of any such delay notify District in writing of causes of delay; thereupon District shall ascertain the facts and extent of delay and grant extension of time for completing Work when, in its judgment, the findings of fact justify such an extension. Extensions of time shall apply only to that portion of Work affected by delay, and shall not apply to other portions of Work not so affected. An extension of time may only be granted after proper compliance with Paragraph 3.8 requiring preparation and submission of a properly prepared CPM schedule.

No extended overhead, general conditions costs, impact costs, out-of-sequence costs or any other type of compensation, by any name or characterization, shall be paid to the Contractor for any delay to any activity not designated as a critical path item on the latest approved Project schedule.

The Contractor shall notify the District and Architect in writing of any anticipated delay and its cause, in order that the District and Architect may take immediate steps to prevent, if possible, the occurrence or continuance of delay, and may determine whether the delay is to be considered avoidable or unavoidable, how long it continues, and to what extent the prosecution and completion of the Work might be delayed thereby.

In the event the Contractor requests an extension of Contract time for unavoidable delay, such request shall be submitted in accordance with the provisions in the Contract Documents governing changes in work. When requesting time, i.e., extensions, for proposed Change Orders, they must be submitted with the proposed Change Order with full justification and documentation. If the Contractor fails to submit justification with the proposed Change Order it waives its right to a time extension at a later date. Such justification must be based on the District accepted construction schedule as updated at the time of occurrence of the delay or execution of Work related to any changes to the scope of work. The justification must include, but is not limited to, the following information:
(a) The duration of the activity relating to the changes in the Work and the resources (manpower, equipment, material, etc.) required to perform these activities within the stated duration.

(b) Logical ties to the District accepted construction schedule for the proposed changes and/or delay showing the activity/activities in the schedule whose start or completion dates are affected by the change and/or delay. (A fragment of any delay of over ten (10) days must be provided.)

The Contractor and District understand and expressly agree that insofar as Public Contract Code Section 7102 may apply to changes in the Work or delays under this contract, the actual delays and damages, if any, and time extensions are intended to, and shall provide, the exclusive and full method of compensation for changes in the Work and construction delays.

8.4.3 Notice by Contractor Required.

The Contractor shall within five (5) calendar days of beginning of any such delay notify the District in writing of causes of delay with justification and supporting documentation. District will then ascertain the facts and extent of the delay and grant an extension of time for completing the Work when, in its judgment, the findings of fact justify such an extension. Extensions of time shall apply only to that portion of the Work affected by the delay and shall not apply to other portions of the Work not so affected. The sole remedy of Contractor for extensions of time under Paragraph 8.4.2 shall be an extension of the Contract Time at no cost to the District.

Claims relating to time extensions shall be made in accordance with applicable provisions of Article 7.

8.4.4 No Additional Compensation for Delays within Contractor’s Control

CONTRACTOR IS AWARE THAT GOVERNMENTAL AGENCIES, SUCH AS THE DEPARTMENT OF GENERAL SERVICES, GAS COMPANIES, ELECTRICAL UTILITY COMPANIES, WATER DISTRICTS AND OTHER AGENCIES MAY HAVE TO APPROVE CONTRACTOR PREPARED DRAWINGS OR APPROVE A PROPOSED INSTALLATION. CONTRACTOR HAS INCLUDED DELAYS AND DAMAGES WHICH MAY BE CAUSED BY SUCH AGENCIES IN CONTRACTOR’S BID. THUS, CONTRACTOR IS NOT ENTITLED TO MAKE CLAIM UPON THE DISTRICT FOR DAMAGES OR DELAYS ARISING FROM THE DELAYS CAUSED BY SUCH AGENCIES. FURTHERMORE, THE CONTRACTOR HAS SCHEDULED FOR SUCH DELAYS AND IS NOT ENTITLED TO AN EXTENSION OF TIME FOR DELAYS CAUSED BY GOVERNMENTAL AGENCIES WHICH CONTRACTOR MUST OBTAIN APPROVALS FROM AND, THUS, CONTRACTOR IS NOT ENTITLED TO AN EXTENSION OF TIME.

CONTRACTOR SHALL ONLY BE ENTITLED TO COMPENSATION FOR DELAY WHEN THE FOLLOWING CONDITIONS ARE MET: (1) THE DISTRICT IS RESPONSIBLE FOR THE DELAY; (2) THE DELAY IS UNREASONABLE UNDER THE CIRCUMSTANCES INVOLVED; AND (3) THE DELAY WAS NOT WITHIN THE CONTEMPLATION OF DISTRICT AND CONTRACTOR.
ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the District to the Contractor for performance of the Work under the Contract Documents.

9.2 COST BREAKDOWN

9.2.1 Required Information.

On forms or software programs (e.g., Microsoft Project, Primavera or Excel) approved by the District, the Contractor shall furnish the following:

(a) Within ten (10) days of the award of the Contract, a detailed breakdown of the Contract Sum (hereinafter “Schedule of Values” or “SOV”) for each Project or Site;

(b) Within ten (10) days of the award of the Contract, a schedule of estimated monthly payment requests due the Contractor showing the values and construction time of the various portions of the Work to be performed by it and by its Subcontractors or material and equipment suppliers containing such supporting evidence as to its correctness as the District may require;

(c) Within ten (10) days of the award of the Contract, the name, address, telephone number, telecopier number, California State Contractors License number, classification and monetary value of all Subcontracts for parties furnishing labor, material, or equipment for completion of the Project.

9.2.2 District Approval Required.

The District shall review all submissions received pursuant to Paragraph 9.2.1 in a timely manner. All submissions must be approved by the District before becoming the basis of any payment. Contractor may request to District representation, prior to submission, to submit information required by paragraph 9.2.1 in a spreadsheet (Microsoft Excel) format. Approval of an alternate format is entirely at District’s discretion.

9.3 PROGRESS PAYMENTS

9.3.1 Payments to Contractor.

Within thirty (30) days after approval of the Request for Payment, Contractor shall be paid a sum equal to ninety-five percent (95%) of the value of the Work performed (as certified by Architect and Inspector and verified by Contractor) up to the last day of the previous month, less the aggregate of previous payments. The value of the Work completed shall be Contractor’s best estimate. No inaccuracy or error in said estimate shall operate to release the Contractor, or any surety upon any bond, from damages arising from such Work, or from the District’s enforcement of each and every
provision of this Contract, and the District shall have the right subsequently to correct any error made in any estimate for payment.

The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for work performed, so long as any lawful or proper direction given by the District concerning the Work, or any portion thereof, remains incomplete.

The SOV items of Work shall include a prorated portion of Contractor’s home office and field office overhead, profit, insurance, (except to the extent expressly identified in a Proposal Item) and/or other financing, as well as General Conditions costs, (e.g., routine time related Site cleanup and maintenance., temporary power and lighting, security, temporary trailer rental, temporary fence rentals, and the like). The SOV shall also not include separate line items to prepare submittals, or other Work items not at the Project Site, unless expressly identified in these Contract Documents as specific exceptions.

Costs for each item of Work at the Project site shall be indicated on a single line that breaks out labor, materials, and equipment for that item of Work, with all items noted in the paragraph above prorated into each line. Unless otherwise allowed, the SOV shall reflect that the District shall only pay for installed items of Work at the Project site. All other costs shall be prorated through all activities and all Phases of the Project so that the sum of all Schedule of Values line items equals the total Contract Sum.

Notwithstanding anything to the contrary stated above, the Contractor may include in its Request for Payment the value of any fabricated structural steel, mail order materials, G.F.R.C. panels and other such custom-made materials prepared specifically for the Project and unique to the Project so long as all of the following requirements are satisfied:

(a) No payment shall be made for materials stored off-site without the written approval of the District to be given or withheld in the District’s sole discretion;

(b) Title to such materials shall be vested in the District as evidenced by documentation satisfactory in form and substance to the District, including, without limitation, recorded financing statements, UCC filings and UCC searches;

(c) With each Contractor Request for Payment, the Contractor shall submit to the District a written list identifying each location where materials are stored off-site (which must be a bonded warehouse) and the value of the materials at each location. The Contractor shall procure insurance satisfactory to the District (in its reasonable discretion) for materials stored off-site in an amount not less than the total value thereof;

(d) The consent of any Surety shall be obtained to the extent required prior to payment for any materials stored off-site;

(e) Representatives of the District shall have the right to make inspections of the storage areas at any time; and

(f) Such materials shall be (1) protected from diversion, destruction, theft and damage to the reasonable satisfaction of the District; (2) specifically marked for use on the Project; and (3) segregated from other materials at the storage facility.
9.3.2 Purchase of Materials and Equipment.

The Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from District to assure that there will be no delays.

9.3.3 No Waiver.

No payment by District hereunder shall be interpreted so as to imply that District has inspected, approved, or accepted any part of the Work. Notwithstanding any payment, the District may enforce each and every provision of this Contract. The District may correct any error subsequent to any payment.

9.3.4 Issuance of Certificate of Payment.

The Architect shall, within seven (7) days after receipt of the Contractor’s Application for Payment, either approve such payment or notify the Contractor in writing of the Architect’s reasons for withholding approval in whole or in part as provided in Paragraph 9.6. The review of the Contractor’s Application for Payment by the Architect is based on the Architect’s observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated and that, to the best of the Architect’s knowledge, information, and belief, the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to (1) an evaluation of the Work for conformance with the Contract Documents, (2) results of subsequent tests and inspections, (3) minor deviations from the Contract Documents correctable prior to completion, and (4) specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified.

9.4 APPLICATIONS FOR PROGRESS PAYMENTS

9.4.1 Procedure.

9.4.1.1 Application for Progress. On or before the fifth (5th) day of each calendar month during the progress of the Work, Contractor shall submit to the Architect an itemized Application for Progress Payment for operations completed in accordance with the Schedule of Values. Such application shall be notarized, if required, and supported by the following or such portion thereof as Architect requires:

(a) The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

(b) The amount being requested under the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;

(c) The balance that will be due to each of such entities after said payment is made;
(d) A certification that the As-Built Drawings and Annotated Specifications are current;
(e) Itemized breakdown of work done for the purpose of requesting partial payment;
(f) An updated construction schedule in conformance with Paragraph 3.8;
(g) The additions to and subtractions from the Contract Sum and Contract Time;
(h) A summary of the retentions held;
(i) Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the District may require from time to time;
(j) The percentage of completion of the Contractor’s Work by line item; and
(k) An updated Schedule of Values from the preceding Application for Payment.

9.4.2 Prerequisites for Progress Payments.

9.4.2.1 First Payment Request. The following items, if applicable, must be completed before the first payment request will be accepted for processing:
(a) Installation of the Project sign;
(b) Receipt by Architect of submittals;
(c) Installation of field office;
(d) Installation of temporary facilities and fencing;
(e) Submission of documents listed in the Paragraph 9.2 relating to Cost Breakdown;
(f) Contractor’s Construction Schedule (Schedule to be CPM based in conformance with Paragraph 3.8);
(g) Schedule of unit prices;
(h) Submittal Schedule;
(i) Copies of necessary permits;
(j) Copies of authorizations and licenses from governing authorities;
(k) Initial progress report;
(l) Surveyor qualifications;
(m) Written acceptance of District’s survey of rough grading;
(n) List of all subcontractors, with names, license numbers, telephone numbers, and scope of work;
(o) All bonds and insurance endorsements; and
(p) Resumes of General Contractor’s Project Manager and superintendent.
9.4.2.2 All Payment Requests. No payment requests will be processed unless Contractor has submitted copies of the Certified Payroll records for the Work which correlates to the payment request and a proper CPM schedule pursuant to Paragraph 3.8 is submitted.

9.4.2.3 Any payments made to Contractor where criteria set forth in Paragraph 9.4.2.1 or 9.4.2.2 have not been met shall not constitute a waiver of said criteria by District. Instead, such payment shall be construed as a good faith effort by District to resolve differences so Contractor may pay its Subcontractors and suppliers and that Contractor agrees that failure to submit such items may constitute a breach of contract by Contractor and may subject Contractor to termination.

9.5 WARRANTY OF TITLE

The Contractor warrants title to all work. The Contractor further warrants that all work is free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the Work. Failure to keep work free of liens, claims, security interests or encumbrances is grounds to make a claim against Contractor’s payment and performance bond to immediately remedy and defend.

If a lien or stop notice of any nature should at any time be filed against the Work or any District property, by any entity which has supplied material or services at the request of the Contractor, Contractor and Contractor’s surety shall promptly, on demand by District and at Contractor’s and surety’s own expense, take any and all action necessary to cause any such lien or stop notice to be released or discharged immediately therefrom.

If the Contractor fails to furnish to the District within ten (10) calendar days after demand by the District, satisfactory evidence that a lien or stop notice has been so released, discharged, or secured, then District may discharge such indebtedness and deduct the amount required therefor, together with any and all losses, costs, damages, and attorney’s fees and expense incurred or suffered by District from any sum payable to Contractor under the Contract.

9.6 DECISIONS TO WITHHOLD PAYMENT

9.6.1 Reasons to Withhold Payment.

The District may withhold payment in whole, or in part, to the extent reasonably necessary to protect the District if, in the District’s opinion, the representations to the District required by Paragraph 9.4 cannot be made. The District may withhold payment, in whole, or in part, to such extent as may be necessary to protect the District from loss because of, but not limited to:

(a) Defective Work not remedied;
(b) Stop Notices served upon the District;
(c) Liquidated damages assessed against the Contractor;
(d) The cost of completion of the Contract if there exists reasonable doubt that the Work can be completed for the unpaid balance of any Contract Sum or by the completion date;
(e) Damage to the District or other contractor;
(f) Unsatisfactory prosecution of the Work by the Contractor;
(g) Failure to store and properly secure materials;
(h) Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, acceptable monthly progress schedules, shop drawings, submittal schedules, schedule of values, product data and samples, proposed product lists, executed Construction Change Directives, and verified reports;
(i) Failure of the Contractor to maintain As-Built drawings;
(j) Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment;
(k) Unauthorized deviations from the Contract Documents;
(l) Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and completion dates.
(m) Failure to properly pay prevailing wages as defined in Labor Code section 1720, et seq.;
(n) Failure to properly maintain or clean up the Site;
(o) Payments to indemnify, defend, or hold harmless the District;
(p) Any payments due to the District including but not limited to payments for failed tests, or utilities changes or permits;
(q) Failure to submit an acceptable schedule in accordance with Paragraph 3.8; or
(r) Failure to pay Subcontractor or suppliers as required by Paragraph 9.8.1.

9.6.2 Reallocation of Withheld Amounts.

District may, in its discretion, apply any withheld amount to payment of outstanding claims or obligations as defined in Paragraphs 9.6.1 and 9.5. In so doing, District shall make such payments on behalf of Contractor. If any payment is so made by District, then such amount shall be considered as a payment made under Contract by District to Contractor and District shall not be liable to Contractor for such payments made in good faith. Such payments may be made without prior judicial determination of claim or obligation. District will render Contractor an accounting of such funds disbursed on behalf of Contractor.

If Contractor defaults or neglects to carry out the Work in accordance with the contract documents or fails to perform any provision thereof, District may, after ten (10) calendar days written notice to the Contractor and without prejudice to any other remedy make good such deficiencies. The District shall adjust the total Contract price by reducing the amount thereof by the cost of making good such deficiencies. If District deems it inexpedient to correct Work which is damaged, defective, or not done in accordance with Contract provisions, an equitable reduction in the Contract price (of at least 150% of the estimated reasonable value of the nonconforming work) shall be made therefor.
9.6.3 Payment After Cure.

When the grounds for declining approval are removed, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

9.7 NONCONFORMING WORK

Contractor shall promptly remove from premises all Work identified by District as failing to conform to the Contract whether incorporated or not. Contractor shall promptly replace and re-execute its own Work to comply with the Contract without additional expense to District and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

If Contractor does not remove such Work which has been identified by District as failing to conform to the Contract Documents within a reasonable time, fixed by written notice, District may remove it and may store the material at Contractor’s expense. If Contractor does not pay expenses of such removal within ten (10) calendar days’ time thereafter, District may, upon ten (10) calendar days’ written notice, sell such materials at auction or at private sale and shall account for net proceeds thereof, after deducting all costs and expenses that should have been borne by Contractor.

9.8 SUBCONTRACTOR PAYMENTS

9.8.1 Payments to Subcontractors.

No later than ten (10) days after receipt, or pursuant to Business and Professions Code Section 7108.5 and Public Contract Code section 7107, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor’s portion of the Work, the amount to which said Subcontractor is entitled. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.8.2 No Obligation of District for Subcontractor Payment.

The District shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

9.8.3 Payment Not Constituting Approval or Acceptance.

An approved Request for Payment, a progress payment, or partial or entire use or occupancy of the Project by the District shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.8.4 Joint Checks.

District shall have the right, if necessary for the protection of the District, to issue joint checks made payable to the Contractor and Subcontractors and material or equipment suppliers. The joint check payees shall be responsible for the allocation and disbursement of funds included as part of any
such joint payment. In no event shall any joint check payment be construed to create any contract between the District and a Subcontractor of any tier, any obligation from the District to such Subcontractor, or rights in such Subcontractor against the District.

9.9 PROJECT AS-BUILT DOCUMENTS

This section includes administrative and procedural requirements for Project As-Built Documents, including but not limited to the following where applicable:

9.9.1 As-Built Drawings
9.9.2 As-Built Specifications
9.9.3 As-Built Product Data
9.9.4 As-Built MEP & Structural coordination documents
9.9.5 Project As-Built Documents include, but are not limited to, the following:
  9.9.5.1 Marked-up copies of Drawings
  9.9.5.2 Marked up copy of the Project Specifications
  9.9.5.3 Marked-up copies of Shop Drawings
  9.9.5.4 Newly prepared Drawings and Specifications
  9.9.5.5 Marked-up Product Data submittals
  9.9.5.6 Field records, such as photographs, for variable and concealed conditions
  9.9.5.7 Record information for Work that is only schematically shown
  9.9.5.8 Maintenance forms for equipment

Contractor shall dedicate one complete full size set of the Contract Drawings and one complete Project Manual for use in recording as-built conditions.

Contractor shall submit to District in hard copy one original and two copies of all Project As-Built Documents. In addition, one electronic copy in electronic media format shall be submitted to District. District reserves the right to require resubmittal in accordance with these General Conditions if the documents are inaccurate or incomplete, or otherwise fail to meet the requirements of these Contract Documents.

9.9.6 Project As-Built

Mark-up Procedure: During the construction period, maintain a complete, current set of full size blackline prints of Contract Drawings and Shop Drawings for Project As-Built Documents purposes. Label each document (on first sheet or format page) "As-Built" in 2-inch high printed letters. Keep all As-Built documents current.

A reference by number to a Change Order, CCD, RFI, RFQ, RFP, Field Order or other such document is not acceptable as sufficient record information on any record document. Do not conceal any Work until required record information has been recorded.
Contractor shall mark As-Built drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to:

9.9.6.1 Dimensional changes to the Contract Drawings (horizontal and/or vertical)
9.9.6.2 Revisions or any modification to details shown on the Contract Drawings
9.9.6.3 Depths of various elements of foundations in relation to main floor level or survey datum.
9.9.6.4 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
9.9.6.5 Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
9.9.6.6 Locations of underground work, points of connection with existing utilities, changes in direction, valves, manholes, catch basins, capped stub outs, invert elevations and similar items
9.9.6.7 Final, actual numbering of each electrical circuit
9.9.6.8 Revisions to routing of piping and conduits
9.9.6.9 Revisions to electrical circuitry
9.9.6.10 Actual equipment locations
9.9.6.11 Duct size and routing
9.9.6.12 Changes made by Change Order, CCD, ASI, or any other directive
9.9.6.13 Details not on original Contract Drawings

Contractor shall mark completely and accurately As-Built Drawing prints of Contract Drawings or Shop Drawings, whichever is the most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.

Contractor shall mark As-Built Drawing sets with red, erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.

Contractor shall be responsible for Mark-up: Where feasible, the individual or entity who obtained As-Built Drawing data, whether the individual or entity is the installer, Subcontractor or similar entity, is required to prepare the mark-up on As-Built Drawings. Contractor shall prepare As-Built Drawings: Immediately prior to inspection for Certification of Substantial Completion of the Work, review completed marked-up As-Built Drawings with District, Project Inspector, Construction Manager, and Architect to ensure accuracy of information. Once accuracy of information is confirmed, prepare and submit a full set of As-Built Contract Drawings and Shop Drawings.
Incorporate changes and additional information previously marked on print sets. Delete, redraw, and/or add details and notations where applicable. Identify and date each Drawing; include the printed designation "PROJECT AS-BUILT DRAWING" and the date prepared in a prominent location on each Drawing.

Distribution: Whether or not changes and additional information were recorded, organize and bind original marked-up set of prints that were maintained during the construction period into manageable sets. Bind the set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets and submit to District.

9.9.7 Project As-Built Specification

Contractor shall, during the construction period, maintain one copy of the Project Specifications, including all addenda and all other modifications issued for Project As-Built Documents purposes.

Contractor shall mark the Project As-Built specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and/or modifications issued. Note related Project As-Built Drawing information, where applicable. Give particular attention to substitutions, selection of product options, Change Order and Construction Change Directive Work, and information on concealed installation that would be difficult to identify, measure, and record later.

9.9.8 Project As-Built Product Data

Contractor shall, during the construction period, maintain one copy of each Project As-Built Product Data submittal for "Project As-Built Document" purposes.

Contractor shall arrange Project As-Built Product Data by Specification Section number, and provide names, addresses, fax numbers, emails addresses, and telephone number of Subcontractors and suppliers. Information to be provided includes:

9.9.8.1 Trade Names
9.9.8.2 Model or type numbers
9.9.8.3 Assembly diagrams
9.9.8.4 Operating instructions
9.9.8.5 Cleaning instructions
9.9.8.6 Maintenance instructions
9.9.8.7 Recommended spare parts
9.9.8.8 Product data

9.9.9 Miscellaneous Project As-Built Submittals

Refer to other Specification Sections for miscellaneous record keeping requirements and submittals. Immediately prior to Substantial Completion of the Work complete miscellaneous records and place in good order, properly identified, ready for use and reference. Submit to the District for District's records, in Adobe PDF format.
9.9.10   Electronic Media Format

Electronic Media Format: Electronic media format for all Project As-Built Documents shall be Adobe PDF, with chapter markers and/or bookmarks inserted in place of the equivalent hard copy section tabs. Electronic copy shall include all tables, charts, drawings, codes and all other matters reflected in hard copies. Electronic media files shall be delivered on a unique CD-ROM or flash drive.

9.10   COMPLETION OF THE WORK

9.10.1   Contract Closeout Submittals include, but are not limited to:

9.10.1.1   Electronic Media of All Project As-Built Documents described in Article 9.9.10 above.
9.10.1.2   Record Samples
9.10.1.3   Field records for variable and concealed conditions
9.10.1.4   Operating and maintenance manuals and data
9.10.1.5   Warranties, guaranties, and bonds
9.10.1.6   Warranty Tags
9.10.1.7   Spare Parts Data
9.10.1.8   Service and maintenance contracts
9.10.1.9   Certified and approved fire inspection documents, when required

9.10.2   Initial Punch List and Inspection

When Contractor considers Work to be Substantially Complete, submit written notice to District’s Representative requesting an Initial Inspection and listing items remaining to be completed or corrected listed by room number and item number (hereinafter “Initial Punch List”). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the list without waiting for District review of the Initial Punch List and inspection of the Work. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The Contractor shall not submit a notice requesting an Initial Inspection unless the Work is Substantially Complete.

9.10.2.1   Before calling for final inspection, Contractor shall determine that the following Work has been performed:

a.   The Work has been completed.
b.   All life safety items are completed and in working order.
c.   Mechanical and electrical Work complete, fixtures in place, connected and ready for tryout and test.
d.   Electrical circuits scheduled in panels and disconnect switches labeled.
e. Painting and special finishes complete.

f. Doors complete with hardware, cleaned of protective film relieved of sticking or binding and in working order.

g. Tops and bottoms of doors sealed.

h. Floors waxed and polished as specified.

i. Broken glass replaced and glass cleaned.

j. Grounds cleared of Contractor’s equipment, raked clean of debris, and trash removed from Site.

k. Work cleaned, free of stains, scratches, and other foreign matter, replacement of damaged and broken material.

l. Finished and decorative work shall have marks, dirt and superfluous labels removed.

m. Final cleanup.

9.10.2.2 Furnish a letter to District stating that a responsible representative of District [give name and position] has been instructed in working characteristics of mechanical and electrical equipment.

Should District’s Representatives determine that Work is not Substantially Complete, the Architect or Construction Manager will promptly notify Contractor in writing, listing Work that must be completed prior to Substantial Completion. Any inspection list that is submitted to the District that does not result in a District determination of Substantial Completion will not be considered an accepted Initial Punch List. If the Work or Phase of Work is determined to not be Substantially Complete, Contractor shall complete all Work as directed prior to requesting an additional Initial Inspection by the District to determine Substantial Completion per this Specification Section.

Upon receipt of the Contractor’s Initial Punch List, and not before, the Architect, Construction Manager, and Inspector will make an Initial Inspection to determine whether the Work, or Phase of Work, is Substantially Complete.

9.10.2.3 All fire and life safety items, manufactured units, equipment and systems that require startup must have been started, run, tested, and operational for periods prescribed by the Contract Documents before a request for Initial Inspection is accepted by the District.

9.10.2.4 If additional Initial Inspections are required to review Initial Punch List items due to incompleteness of the Work by Contractor, Contractor will reimburse District for all costs associated with these inspections if additional services fees by District consultants are required. The costs of such District additional service fees will be deducted from the Contract Sum by Change Order.

9.10.3 Substantial Completion

When District determines that the Work is Substantially Complete, District will issue a Certificate of Substantial Completion, accompanied by Final Punch List of items to be completed or corrected as verified and/or appended by Architect and District.

When the Work is Substantially Complete, the District will file a Notice of Completion.
9.10.3.1 Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work unless otherwise provided in the Notice of Completion.

9.10.3.2 The Notice of Completion shall be submitted to the Contractor for their written acceptance of responsibilities assigned to them in such Notice prior to District filing the Notice of Completion for purposes of initiating the release of Retention for the Work or Phase of Work.

9.10.3.3 The District shall withhold from Contractor payment the value of remaining Work, Work to be corrected, incomplete Work, and an amount identified for Punch List Work, and as otherwise identified in Public Contract Code.

The Contractor shall complete the items listed in the Final Punch List within ten (10) working days of the Certificate of Substantial Completion. The Contractor shall execute the Work such that the District can occupy the Work within seven (7) calendar days of the date of the Certificate of Substantial Completion.

9.10.4 Final Inspection

When Contractor considers the items listed in the Final Punch List to be complete the Contractor shall submit written notice to District’s Representative requesting a Final Inspection.

Operations and Maintenance Manuals and Warranty and Guaranty documents. At least ten (10) days prior to final inspection, three (3) copies of complete operations and maintenance manuals, repair parts lists, service instructions for all electrical and mechanical equipment, and equipment warranties shall be submitted. All installation, operating, and maintenance information and drawings shall be bound in 8½” x 11” binders. Provide a table of contents in front and all items shall be indexed with tabs. Each manual shall also contain a list of subcontractors, with their addresses and the names of persons to contact in cases of emergency. Identifying labels shall provide names of manufactures, their addresses, ratings, and capacities of equipment and machinery. Additional requirements for Operations and Maintenance manuals may be found in other Specifications and Sections of the Contract Documents.

Upon receipt of the Contractor’s request for Final Inspection, and not before, the Contractor, Architect, and Construction Manager, shall meet to go over the Contract Documents to identify the administrative requirements for contract close-out.

9.10.4.1 The Construction Manager will prepare a list of requirements remaining for administrative close-out and shall provide the list to the Contractor. This list may be general in nature, and shall not serve to relieve the Contractor from any of the administrative requirements of the Contract.

9.10.4.2 The Contractor shall complete all items on the administrative close-out list within twenty-one (21) days

Subsequent to the meeting to identify administrative close-out requirements, Architect, Construction Manager, Campus Representatives, and Inspector will inspect the Work to determine whether the Work identified on the Final Punch List is complete.
If additional Final Inspections are required to review the Final Punch List items due to incompleteness of the Work by Contractor, Contractor will reimburse District for all costs associated with these inspections if additional services fees by District consultants are required. The costs of such District additional service fees will be deducted from the Contract Sum by Change Order.

When the Architect determines that all final punch list items have been completed, a final Project Inspection Report will be issued. Any outstanding administrative close-out requirements will be identified and a value for withholding from Progress Payment or Final Payment will be assigned.

The Project Inspector (IOR), the Construction Manager, and the Contractor shall, at all times, be together during all inspections. The Contractor shall give 24-hour notice to the District for such inspections.

9.10.5 Final Completion

Final Completion occurs when all Work meets all requirements of the Contract Documents. When Contractor considers all Work complete and all close-out requirements have been performed, submitted, and accepted, submit written certification to District that:

9.10.5.1 Contractor has inspected Work for compliance with Contract Documents, and all requirements for Final Acceptance have been met.

9.10.5.2 Except for Contractor maintenance and Deferred or Seasonal Testing, after Final Acceptance, all Work has been completed in accordance with Contract Documents and deficiencies listed with any Certificate of Substantial Completion have been corrected. Equipment and systems have been tested in the presence of Architect, Project Inspector (IOR), Construction Manager, and District Representatives and are operative.

Should District determine that the Work is incomplete or defective or that administrative requirements have not been completed:

9.10.5.3 District’s Representative promptly will so notify Contractor, in writing, listing the incomplete or defective items.

9.10.5.4 Contractor shall promptly remedy all incomplete and/or defective Work and notify the District when it is ready for re-inspection. District’s Representatives will then re-inspect the Work. If deficiencies previously noted are found not to be corrected, Contractor shall pay all District costs for the re-inspection.

9.10.5.5 When District determines that all Work and requirements are complete under the Contract Documents, District or Construction Manager will request Contractor to make a request for Final Payment.
9.11  **PARTIAL OCCUPANCY OR USE**

9.11.1  District’s Rights.

The District may occupy or use any completed or partially completed portion of the Work at any stage. The District and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract Documents. If District and Contractor cannot agree as to responsibilities such disagreement shall be resolved pursuant to Paragraph 4.5.1. When the Contractor considers a portion complete, the Contractor shall prepare and submit a Punch List to the District as provided under Paragraph 9.9.1.

9.11.2  Inspection Prior to Occupancy or Use.

Immediately prior to such partial occupancy or use, the District, the Contractor, and the Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.11.3  No Waiver.

Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of the Work not complying with the requirements of the Contract Documents.

9.12  **COMPLETION AND FINAL PAYMENT**

9.12.1  Final Inspection.

Contractor shall comply with all Punch List and Inspection procedures under Paragraph 9.10. Upon receipt and approval of such final Application for Payment as required in Article 9.10.5.5 and elsewhere, the Architect shall issue a final Certificate of Payment stating that to the best of its knowledge, information, and belief, and on the basis of its observations, inspections, and all other data accumulated or received by the Architect in connection with the Work, such Work has been completed in accordance with the Contract Documents. The District shall thereupon inspect such Work and either accept the Work as complete or notify the Architect and the Contractor in writing of reasons why the Work is not complete. Upon acceptance of the Work of the Contractor as fully complete (which, absent unusual circumstances, will occur when the Punch List items have been satisfactorily completed), the District shall record a Notice of Completion with the County Recorder, and the Contractor shall, upon receipt of payment from the District, pay the amounts due Subcontractors.

9.12.2  Retainage.

The retainage, less any amounts disputed by the District or which the District has the right to withhold Pursuant to Paragraph 9.6, shall be paid after approval of the District by the Architect’s Certificate of Payment, after the satisfaction of the conditions set forth in Article 9, and after thirty-five (35) days after the acceptance of the Work and recording of the Notice of Completion by District. No interest shall be paid on any retainage, or on any amounts withheld due to a failure of the Contractor to
perform, in accordance with the terms and conditions of the Contract Documents, except as provided to the contrary in any Escrow Agreement between the District and the Contractor pursuant to Public Contract Code § 22300.

9.12.3 Procedures for Application for Final Payment.

9.12.3.1 Prerequisites for Final Payment. The following conditions must be fulfilled prior to Final Payment:

(a) A full and final waiver or release of all Stop Notices in connection with the Work shall be submitted by Contractor, including a release of Stop Notice in recordable form, together with (to the extent permitted by law) a copy of the full and final release of all Stop Notice rights.

(b) The Contractor shall have made all corrections to the Work which are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of District required under the Contract Documents.

(c) Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work.

(d) Contractor must have completed all requirements set forth in Paragraph 9.9.1.2.

(e) Architect shall have issued a Final Certificate of Payment.

(f) The Contractor shall have delivered to the District all manuals and materials required by the Contract Documents.

(g) The Contractor shall have completed final clean up as required by Paragraph 3.12.

9.13 SUBSTITUTION OF SECURITIES

The District will permit the substitution of securities in accordance with the provisions of Public Contract Code section 22300.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 Contractor Responsibility.

The Contractor is constructive owner of Project site. The Contractor shall be responsible for all damages to persons or property that occur as a result of its fault or negligence in connection with the prosecution of this Contract and shall take all necessary measures and be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance
by the District. All work shall be solely at the Contractor’s risk, with the exception of damage to the work caused by “acts of God” as defined in Public Contract Code Section 7105(b)(2).

Contractor shall take, and require subcontractor to take, all necessary precautions for safety of workers on the Work and shall comply with all applicable federal, state, local and other safety laws, standards, orders, rules, regulations, and building codes to prevent accidents or injury to persons on, about, or adjacent to premises where Work is being performed and to provide a safe and healthful place of employment. In addition to meeting all requirements of OSHA, Cal-OSHA, state, and local codes, Contractor shall furnish, erect and properly maintain at all times, as directed by District or Architect or required by conditions and progress of work, all necessary safety devices, safeguards, construction canopies, signs, audible devices for protection of the blind, safety rails, belts and nets, barriers, lights, and watchmen for protection of workers and the public, and shall post danger signs warning against hazards created by such features in the course of construction. Contractor shall designate a responsible member of its organization on the Work, whose duty shall be to post information regarding protection and obligations of workers and other notices required under occupational safety and health laws, to comply with reporting and other occupational safety requirements, and to protect the life, safety and health of workers. The name and position of person so designated shall be reported to District by Contractor. Contractor shall correct any violations of safety laws, rules, orders, standards, or regulations. Upon the issuance of a citation or notice of violation by the Division of Occupational Safety and Health, such violation shall be corrected promptly.

The Contractor and Subcontractors shall continuously protect the Work, the District’s property, and the property of others, from damage, injury, or loss arising in connection with operations under the Contract Documents. The Contractor and Subcontractors, at their own expense, shall make good any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the District.

10.1.2 Subcontractor Responsibility.

Contractor shall require that Subcontractors participate in, and enforce, the safety and loss prevention programs established by the Contractor for the Project, which will cover all Work performed by the Contractor and its Subcontractors. Each Subcontractor shall designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall attend meetings with the representatives of the various Subcontractors employed to ensure that all employees understand and comply with the programs.

10.1.3 Cooperation.

All Subcontractors and material or equipment suppliers, shall cooperate fully with Contractor, the District, and all insurance carriers and loss prevention engineers.

10.1.4 Accident Reports.

Subcontractors shall immediately, within two (2) days, report in writing to the Contractor all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or off the Site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall
be reported within four (4) days by telephone or messenger. Contractor shall thereafter immediately, within two (2) days, report the facts in writing to the District and the Architect giving full details of the accident.

10.1.5 First-Aid Supplies at Site.

The Contractor will provide and maintain at the Site first-aid supplies which complies with the current Occupational Safety and Health Regulations.

10.1.6 Material Safety Data Sheets and Compliance with Proposition 65.

(a) Contractor is required to have material safety data sheets available in a readily accessible place at the job site for any material requiring a material safety data sheet per the Federal “hazard communication” standard, or employees’ “right-to-know law.” The Contractor is also required to properly label any substance brought into the job site, and require that any person working with the material, or within the general area of the material, is informed of the hazards of the substance and follows proper handling and protection procedures.

Contractor is required to comply with the provisions of California Health and Safety Code section 25249, et seq., which requires the posting and giving of notice to persons who may be exposed to any chemical known to the State of California to cause cancer. The Contractor agrees to familiarize itself with the provisions of this section, and to comply fully with its requirements.

10.1.7 Non-Utilization of Asbestos Material.

NO ASBESTOS OR ASBESTOS-CONTAINING PRODUCTS SHALL BE USED IN THIS CONSTRUCTION OR IN ANY TOOLS, DEVICES, CLOTHING, OR EQUIPMENT USED TO EFFECT THIS CONSTRUCTION.

Asbestos and/or asbestos-containing products shall be defined as all items containing, but not limited to, chrysotile, amosite, anthophyllite, tremolite, and antinolite.

Any or all material containing greater than one-tenth of one percent (>0.1%) asbestos shall be defined as asbestos-containing material.

All Work or materials found to contain asbestos or Work or material installed with asbestos-containing equipment will be immediately rejected and this Work will be removed at no additional cost to the District.

Decontamination and removal of Work found to contain asbestos or Work installed with asbestos-containing equipment shall be done only under supervision of a qualified consultant, knowledgeable in the field of asbestos abatement and accredited by the Environmental Protection Agency.

The asbestos removal contractor shall be an EPA accredited contractor qualified in the removal of asbestos and shall be chosen and approved by the asbestos consultant, who shall have sole discretion and final determination in this matter.
The asbestos consultant shall be chosen and approved by the District, who shall have sole discretion and final determination in this matter.

The Work will not be accepted until asbestos contamination is reduced to levels deemed acceptable by the asbestos consultant.

Interface of Work under this Contract with work containing asbestos shall be executed by the Contractor at his risk and at his discretion, with full knowledge of the currently accepted standards, hazards, risks, and liabilities associated with asbestos work and asbestos-containing products. By execution of this Contract, the Contractor acknowledges the above and agrees to hold harmless District and its assigns for all asbestos liability which may be associated with this work and agrees to instruct his employees with respect to the above-mentioned standards, hazards, risks, and liabilities.

10.2  SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor.

The Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:

(a) Employees on the Work and other persons who may be affected thereby;
(b) The Work, material, and equipment to be incorporated therein, whether in storage on or off the Site, under the care, custody, or control of the Contractor or the Contractor’s Subcontractors or Sub-subcontractors; and
(c) Other property at the Site or adjacent thereto such as trees, shrubs, lawns, walks, pavement, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

Contractor is constructive owner of Project site as more fully discussed in Paragraph 6.2.

10.2.2 Contractor Notices.

The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons or property or their protection from damage, injury, or loss.

10.2.3 Safety Barriers and Safeguards.

The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

10.2.4 Use or Storage of Hazardous Material.

When use or storage of explosives, other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. The Contractor shall notify the
District any time that explosives or hazardous materials are expected to be stored on Site. Location of storage shall be coordinated with the District and local fire authorities.

10.2.5 Protection of Work.

The Contractor and Subcontractors shall continuously protect the Work, the District’s property, and the property of others, from damage, injury, or loss arising in connection with operations under the Contract Documents. The Contractor and Subcontractors, at their own expense, shall make good any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the District.

The Contractor, at Contractor’s expense, will remove all mud, water, or other elements as may be required for the proper protection and prosecution of its Work.

Contractor shall take adequate precautions to protect existing roads, sidewalks, curbs, pavements, utilities, adjoining property and structures (including, without limitation, protection from settlement or loss of lateral support), and to avoid damage thereto, and repair any damage thereto caused by construction operations. All permits, licenses, or inspection fees required for such repair work shall be obtained and paid for by Contractor.

10.2.6 Requirements for Existing Sites.

Contractor shall (unless waived by the District in writing):

(a) When performing construction on existing sites, become informed and take into specific account the maturity of the students on the Site; and perform Work which may interfere with campus routine before or after campus hours, enclose working area with a substantial barricade, and arrange Work to cause a minimum amount of inconvenience and danger to students and faculty in their regular campus activities. The Contractor shall comply with specifications and directives of the District regarding the timing of certain construction activities in order to avoid unnecessary interference with the campus’ functions.

(b) Provide substantial barricades around any shrubs or trees indicated to be preserved.

(c) Deliver materials to building area over route designated by Architect.

(d) Take preventive measures to eliminate objectionable dust, noise, or other disturbances.

(e) Confine apparatus, the storage of materials, and the operations of workers to limits indicated by law, ordinances, permits or directions of Architect; and not interfere with the Work or unreasonably encumber premises or overload any structure with materials; and enforce all instructions of District and Architect regarding signs, advertising, fires, and smoking and require that all workers comply with all regulations while on the Project site.

(f) Take care to prevent disturbing or covering any survey markers, monuments, or other devices marking property boundaries or corners. If such
markers are disturbed by accident, they shall be replaced by an approved land surveyor or civil engineer and all maps and records required therefrom shall be filed with county and local authorities, at no cost to the District. All filing and plan check fees shall be paid by Contractor.

(g) Provide District on request with Contractor’s written safety program and safety plan for each site.

10.2.7 Shoring and Structural Loading.

The Contractor shall not impose structural loading upon any part of the Work under construction or upon existing construction on or adjacent to the Site in excess of safe limits, or loading such as to result in damage to the structural, architectural, mechanical, electrical, or other components of the Work. The design of all temporary construction equipment and appliances used in construction of the Work and not a permanent part thereof, including, without limitation, hoisting equipment, cribbing, shoring, and temporary bracing of structural steel, is the sole responsibility of the Contractor. All such items shall conform with the requirements of governing codes and all laws, ordinances, rules, regulations, and orders of all authorities having jurisdiction. The Contractor shall take special precautions, such as shoring of masonry walls and temporary tie bracing of structural steel work, to prevent possible wind damage during construction of the Work. The installation of such bracing or shoring shall not damage the Work in place or the Work installed by others. Any damage which does occur shall be promptly repaired by the Contractor at no cost to the District.

10.2.8 Conformance Within Established Limits.

The Contractor and Subcontractors shall confine their construction equipment, the storage of materials, and the operations of workers to the limits indicated by laws, ordinances, permits, and the limits established by the District or the Contractor, and shall not unreasonably encumber the premises with construction equipment or materials.

10.2.9 Subcontractor Enforcement of Rules.

Subcontractors shall enforce the District’s and the Contractor’s instructions, laws, and regulations regarding signs, advertisements, fires, smoking, the presence of liquor, and the presence of firearms by any person at the Site.

10.2.10 Site Access.

The Contractor and the Subcontractors shall use only those ingress and egress routes designated by the District, observe the boundaries of the Site designated by the District, park only in those areas designated by the District, which areas may be on or off the Site, and comply with any parking control program established by the District, such as furnishing license plate information and placing identifying stickers on vehicles.
10.3 **EMERGENCIES**

10.3.1 Emergency Action.

In an emergency affecting the safety of persons or property, the Contractor shall take any action necessary, at the Contractor’s discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 7.

10.3.2 Accident Reports.

The Contractor shall promptly report in writing to the District all accidents arising out of or in connection with the Work, which caused death, personal injury, or property damage, giving full details and statements of any witnesses in conformance with Article 10.1.4. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported in accordance with Paragraph 10.1.4, immediately by telephone or messenger to the District.

10.4 **HAZARDOUS MATERIALS**

10.4.1 Discovery of Hazardous Materials.

In the event the Contract or encounters or suspects the presence on the job site of material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or any other material defined as being hazardous by § 25249.5 of the California Health and Safety Code, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the District and the Architect in writing, whether or not such material was generated by the Contractor or the District. The Work in the affected area shall not thereafter be resumed, except by written agreement of the District and the Contractor, if in fact the material is asbestos, polychlorinated biphenyl (PCB), or other hazardous material, and has not been rendered harmless. The Work in the affected area shall be resumed only in the absence of asbestos, polychlorinated biphenyl (PCB), or other hazardous material, or when it has been rendered harmless by written agreement of the District and the Contractor.

If hazardous materials are encountered, they shall be handled in accordance with applicable local, state and federal regulation which may include: (1) CCR Title 8, Division 4, Chapter 4, Sections 5163 through 5167 and 5192 (Hazardous Waste Operations and Emergency Response); (2) CCR Title 22, Division 4.5, Chapters 10 through 13 and 18 (Environmental Health Standards for Management of Hazardous Waste); and (3) CCR Title 23, Division 3, Chapter 15 (Discharges of Hazardous Waste to Land).

Should the discovery of contaminants cause delay to Contractor’s operation, extension of Contract Time will be granted by District in accordance with these General Conditions. Contractor may not be entitled to damages or additional payment due to such delays. District may, if it believes appropriate in its sole discretion, grant an extension of Contract Time.

The Contractor shall take all measures to avoid and/or mitigate delays due to Hazardous Materials/Waste finds such as; avoiding the area of the find and proceeding with other work on the project; developing “work around” plans; and documenting his best efforts to avoid and/or mitigate delays.
10.4.2 Hazardous Material Work Limitations.

In the event that the presence of hazardous materials is suspected or discovered on the Site (except in cases where asbestos and other hazardous material work in the Contractor’s responsibility), the District shall retain an independent testing laboratory to determine the nature of the material encountered and whether corrective measures or remedial action is required. The Contractor shall not be required pursuant to Article 7 to perform without consent any Work in the affected area of the Site relating to asbestos, polychlorinated biphenyl (PCB), or other hazardous material, until any known or suspected hazardous material has been removed, or rendered harmless, or determined to be harmless by District, as certified by an independent testing laboratory and approved by the appropriate government agency.

10.4.3 Indemnification by Contractor for Hazardous Material Caused by Contractor.

In the event the hazardous materials on the Project Site is caused by the Contractor, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the District for any additional costs incurred as a result of Contractor’s generation of hazardous material on the Project Site. In addition, the Contractor shall defend, indemnify and hold harmless District and its agents, officers, and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with, arising out of, or relating to, the presence of hazardous material on the Project Site.

10.4.4 Terms of Hazardous Material Provision.

The terms of this Hazardous Material provision shall survive the completion of the Work and/or any termination of this Contract.

ARTICLE 11

INSURANCE AND BONDS

11.1 Not used
11.2 Not used
11.3 Not used
11.4 Not used
11.5 OTHER INSURANCE

The Contractor shall provide all other insurance required to be maintained under applicable laws, ordinances, rules, and regulations.
11.6 **PROOF OF INSURANCE**

The Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract until all required insurance and certificates have been obtained and delivered in duplicate to the District for approval subject to the following requirements:

(a) Certificates and insurance policies shall include the following clause:

“This policy shall not be non-renewed, canceled, or reduced in required limits of liability or amounts of insurance until notice has been mailed to the District. Date of cancellation or reduction may not be less than thirty (30) days after the date of mailing notice.”

(b) Certificates of insurance shall state in particular those insured, the extent of insurance, location and operation to which the insurance applies, the expiration date, and cancellation and reduction notices.

(c) Certificates of insurance shall clearly state that the District and the Architect are named as additional insureds under the policy described and that such insurance policy shall be primary to any insurance or self-insurance maintained by District.

(d) The Contractor and its Subcontractors shall produce a certified copy of any insurance policy required under this Section upon written request of the District.

11.7 **COMPLIANCE**

In the event of the failure of any contractor to furnish and maintain any insurance required by this Article 11, or in Section 00600, Construction Agreement, the Contractor shall be in default under the Contract. Compliance by Contractor with the requirement to carry insurance and furnish certificates or policies evidencing the same shall not relieve the Contractor from liability assumed under any provision of the Contract Documents, including, without limitation, the obligation to defend and indemnify the District and the Architect.

11.8 **WAIVER OF SUBROGATION**

Contractor waives (to the extent permitted by law) any right to recover against the District for damages to the Work, any part thereof, or any and all claims arising by reason of any of the foregoing, but only to the extent that such damages and/or claims are covered by property insurance and only to the extent of such coverage (which shall exclude deductible amounts) by insurance actually carried by the District.

The provisions of this section are intended to restrict each party to recovery against insurance carriers only to the extent of such coverage and waive fully and for the benefit of each, any rights and/or claims which might give rise to a right of subrogation in any insurance carrier. The District and the Contractor shall each obtain in all policies of insurance carried by either of them, a waiver by the insurance companies thereunder of all rights of recovery by way of subrogation for any damages or claims covered by the insurance.
ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 Uncovering Work for Required Inspections.

If a portion of the Work is covered without Inspector or Architect approval or not in compliance with the Contract Documents, it must, if required in writing by the Inspector or the Architect, be uncovered for the Inspector’s or the Architect’s observation and be replaced at the Contractor’s expense without change in the Contract Sum or Time.

12.1.2 Costs for Inspections not Required.

If a portion of the Work has been covered which the Inspector or the Architect has not specifically requested to observe prior to its being covered, the Inspector or the Architect may request to see such Work, and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncover and replacement shall, by appropriate Change Order, be charged to the District. If such Work is not in accordance with Contract Documents, the Contractor shall pay such costs unless the condition was caused by the District or a separate contractor, in which event the District shall be responsible for payment of such costs to the Contractor.

12.2 CORRECTION OF WORK

12.2.1 Correction of Rejected Work.

The Contractor shall promptly correct the Work rejected by the Inspector or the District upon recommendation of the Architect as failing to conform to the requirements of the Contract Documents, whether observed before or after Completion and whether or not fabricated, installed, or completed. The Contractor shall bear costs of correcting the rejected Work, including additional testing, inspections, and compensation for the Inspector’s or the Architect’s services and expenses made necessary thereby.

12.2.2 One-Year Warranty or Guaranty Corrections.

If, within one (1) years after the date of Completion of the Work or a designated portion thereof, or after the date for commencement of warranties and guaranties established under this Contract, or by the terms of an applicable special warranty or guaranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the District to do so unless the District has previously given the Contractor a written acceptance of such condition. This period of one (1) years shall be extended with respect to portions of the Work first performed after Completion by the period of time between Completion and the actual performance of the Work. This obligation under this Paragraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The District shall give such notice promptly after discovery of the condition.
12.2.3 District’s Rights if Contractor Fails to Correct.

If the Contractor fails to correct nonconforming Work within a reasonable time, the District may correct it, pursuant to Article 9.

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW AND REGULATIONS

The Contract shall be governed by the law of the place where the Project is located.

13.1.1 Specific reference in the Specifications to codes and regulations or requirements of regulatory agencies shall mean the latest printed edition of each adopted by the regulatory agency in effect at the time of the opening of Proposals, except as may be otherwise specifically stated in the Contract Documents.

13.1.2 No change order shall be considered for any change in any applicable federal, state or local code or regulation if similar language existed in an alternate applicable regulation in force at the time of opening of Bids.

13.1.3 Contractor shall not allow design or construction of any conditions wherein the finished Work will not comply with current applicable codes. No change order shall be considered by District for the Work correction of any Work not complying with code.

13.1.4 This section shall cover the general requirements for regulatory requirements pertaining to the Work and is supplementary to all other regulatory requirements mentioned or referenced elsewhere in the Contract Documents.

13.1.5 Code, laws, ordinances, rules and regulations referred to shall have full force and effect as though printed in full in these Specifications. Code, laws, ordinances, rules and regulations are not furnished to Contractor because Contractor is assumed to be and shall be familiar with these requirements, including readily available access to these requirements. The listing of applicable codes, laws, and regulations for hazardous waste abatement Work in the Contract Documents is supplied to Contractor as a courtesy and shall not limit Contractor’s responsibility for complying with all applicable laws, regulations or ordinances having application to the Work. Where conflict among the requirements or with these Specifications occurs, the most stringent requirements shall be used with no change in Contract Sum or Contract Time.

13.1.6 Contractor shall conform to all applicable federal, state, and local codes, laws, ordinances, rules and regulations, whether or not referenced in the Contract Documents.
13.1.7 Precedence:

13.1.7.1 Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence.

13.1.7.2 Where Contract Documents require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, Contract Documents shall take precedence so long as such increase is legal.

13.1.7.3 Where no requirements are identified on Contract Documents, comply with all requirements of applicable codes, ordinances and standards of governing authorities have jurisdiction.

13.1.7.4 If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to District for a decision before proceeding.

13.2 SUCCESSORS AND ASSIGNS

The District and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

In the absence of specific notice requirements in the Contract Documents, written notice shall be deemed to have been duly served if delivered in person to the individual, member of the firm or entity, or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and Obligations Cumulative.

Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.4.2 No Waiver.

No action or failure to act by the Inspector, the District, or the Architect shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act...
constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Compliance.

Tests, inspections, and approvals of portions of the Work required by the Contract Documents will comply with Title 24, and with all other laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction.

13.5.2 Independent Testing Laboratory.

The District will select and pay an independent testing laboratory to conduct all tests and inspections required by regulatory agencies. Selection of the materials required to be tested shall be made by the laboratory, and not by the Contractor. All costs for all other tests shall be included in the Bid Price and shall be paid for by the Contractor. Any costs or expenses of inspection or testing required by regulatory agencies, incurred outside of a fifty (50) mile radius from the Project Site or not located in a contiguous county to the Site, whichever distance is greater, shall be paid for by the District, invoiced by the District to the Contractor, and deducted from the next Progress Payment.

13.5.3 Contractor Responsibilities

13.5.3.1 Make samples available to the Independent Testing Laboratory. Samples shall be selected by laboratory personnel. Allow proper time for selecting samples, and making tests or considerations.

13.5.3.2 Cooperate with laboratory personnel, and provide access to work and to manufacturer’s facilities.

13.5.3.3 Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples as selected by laboratory personnel at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

13.5.3.4 Schedule all tests and inspections with the testing and inspections firm and to notify Construction Manager and Project Inspector a minimum of 3 working days prior to expected time for operations requiring inspection and testing services. Do not allow work to be covered prior to inspection and testing.

13.5.3.5 Cooperate fully with the testing laboratory’s personnel and with special inspectors in inspection any part of the construction and in taking any samples of materials required to be tested. Provide access to the work. The Contractor’s personnel shall furnish and cut or prepare all samples in the presence of either the testing laboratory personnel or the special inspectors and secure the witness’s initial on each sample prepared.

13.5.3.6 Notify the testing laboratory to pick up the initialed samples the same day the samples were prepared. Alert the testing laboratory 3 working days in advance as to the times and location of the required sampling, tests and inspections so
as to not delay the work of the project, and make sure that the required sampling, tests inspections are promptly completed.

13.5.4 Contractor Paid Test/Inspection Reports not required by regulatory agencies:

13.5.4.1 Reports will comply with Section 4-335(d), Part 1, Title 24, CCR.

13.5.4.2 Include every test and inspection made regardless of whether such tests and inspections indicate that the material and procedures are satisfactory or unsatisfactory.

13.5.4.3 Include records of special sampling operations as required.

13.5.4.4 Indicate that materials were sampled and tested in accordance with requirements of CCR regulations and Construction Documents.

13.5.4.5 Indicate specified design strength of materials such as masonry, concrete and steel.

13.5.4.6 State whether or not materials and procedures comply with requirements of the Construction Documents.

13.5.4.7 Submit copies of reports to District, Architect, Project Inspector, Structural Engineer, Civil Engineer, Soils Engineer and Contractor within 14 days of tests. Submit copies of reports of non-complying materials and procedures immediately.

13.5.5 Advance Notice to Inspector.

The Contractor shall notify the Inspector a sufficient time in advance of its readiness for required observation or inspection so that the Inspector may arrange for same, but no less than 2 work days. The Contractor shall notify the Inspector a sufficient time in advance, but no less than 2 work days, of the manufacture of material to be supplied under the Contract Documents which must, by terms of the Contract Documents, be tested in order that the Inspector may arrange for the testing of the material at the source of supply.

13.5.6 Testing Off-Site.

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

13.5.7 Additional Testing or Inspection.

If the Inspector, the Architect, the District, or public authority having jurisdiction determines that portions of the Work require additional testing, inspection, or approval not included under Paragraph 13.5.1, the Inspector will, upon written authorization from the District, make arrangements for such additional testing, inspection, or approval. The District shall bear such costs except as provided in Paragraph 13.5.4.

13.5.8 Costs for Retesting.

If such procedures for testing, inspection, or approval under Paragraphs 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents,
the Contractor shall bear all costs arising from such failure, including those of re-testing, re-inspection, or re-approval, including, but not limited to, compensation for the Architect’s services and expenses. Any such costs shall be paid by the District, invoiced to the Contractor, and deducted from the next Progress Payment.

13.5.9 Retesting Covered Work.

Re-examination of previously tested and inspected work may be ordered by the District, Architect, or by the Project Inspector. The Contractor shall uncover such work if retesting is ordered. If work is found in accordance with Contract Documents, the District will pay costs of uncovering, removing, retesting and replacing. If work is found not in accordance with Contract Documents, the District will deduct the cost of retesting from the Contract Sum by Change Order and the Contractor will bear the costs of uncovering, removing and replacing work.

13.5.10 Costs for Premature Test.

In the event the Contractor requests any test or inspection for the Project and is not completely ready for the inspection, the Contractor shall be invoiced by the District for all costs and expenses resulting from that testing or inspection, including, but not limited to, the Inspector’s and Architect’s fees and expenses, and the amount of the invoice of shall be deducted from the next Progress Payment.

13.6 TRENCH EXCAVATION

13.6.1 Trenches Greater Than Five Feet.

Pursuant to Labor Code § 6705, if the Contract Price exceeds $25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, submit to the District or a registered civil or structural engineer employed by the District or Architect, a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches. Said detailed plan shall be prepared by a California licensed civil or structural engineer employed by the Contractor.

13.6.2 Excavation Safety.

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted in writing by the District or by the person to whom authority to accept has been delegated by the District.

13.6.3 No Tort Liability of District.

Pursuant to Labor Code § 6705, nothing in this Article shall impose tort liability upon the District or any of its employees.
13.6.4 No Excavation Without Permits.

The Contractor shall not commence any excavation Work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

13.7 WAGE RATES, TRAVEL, AND SUBSISTENCE

13.7.1 Wage Rates.

Pursuant to the provisions of Article 2 (commencing at § 1720), Chapter 1, Part 7, Division 2, of the Labor Code, the District has obtained the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public works project is to be performed for each craft, classification, or type of worker needed for this Project from the Director of the Department of Industrial Relations (“Director”). These rates are on file at the administrative office of the DISTRICT and are also available from the Director of the Department of Industrial Relations. Copies will be made available to any interested party on request. The Contractor shall post a copy of such wage rates at appropriate, conspicuous, weatherproof points at the Site.

Any worker employed to perform work on the Project, but such work is not covered by any classification listed in the published general prevailing wage rate determinations or per diem wages determined by the Director of the Department of Industrial Relations, shall be paid not less than the minimum rate of wages specified therein for the classification which most nearly corresponds to the employment of such person in such classification.

13.7.2 Holiday and Overtime Pay.

Holiday and overtime work, when permitted by law, shall be paid for at the rate set forth in the prevailing wage rate determinations issued by the Director of the Department of Industrial Relations or at least one and one-half (1½) times the specified basic rate of per diem wages, plus employer payments, unless otherwise specified in the contract documents or authorized by law.

13.7.3 Wage Rates Not Affected by Subcontracts.

The Contractor shall pay and shall cause to be paid each worker engaged in the execution of the Work on the Project not less than the general prevailing rate of per diem wages determined by the Director, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor and such workers.

13.7.4 Per Diem Wages.

The Contractor shall pay and shall cause to be paid to each worker needed to execute the Work on the Project per diem wages including, but not limited to, employer payments for health and welfare, pensions, vacation, travel time and subsistence pay as provided for in Labor Code §1773.1.

13.7.5 Forfeiture and Payments.

Pursuant to Labor Code §1775 and the District’s Labor Compliance Program, the Contractor shall forfeit to the District, not more than Fifty Dollars ($50.00) for each calendar day, or portion thereof, for
each worker paid less than the prevailing wages rates as determined by the Director of the Department of Industrial Relations, for the work or craft in which the worker is employed for any Work done under the Agreement by the Contractor or by any Subcontractor under it. The amount of the penalty shall be determined by the Labor Commissioner and shall be based on consideration of: (1) whether the Contractor or Subcontractor’s failure to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily correct upon being brought to the attention of the Contractor or Subcontractor; and (2) whether the Contractor or Subcontractor has a prior record of failing to meet its prevailing wage obligations. Further details regarding the enforcement of paying prevailing wage rates, reporting violations, withholding contract payments, forfeitures and hearing to review withholding of contract payments are set forth in the District’s Labor Compliance Program.

13.8 RECORDS OF WAGES PAID

13.8.1 Payroll Records.

   (a) Pursuant to §1776 of the Labor Code, each Contractor and Subcontractor shall keep an accurate payroll record showing the name, address, social security number, work classification and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker or other employee employed in connection with the Project.

   (b) All payroll records shall be certified and submitted to the District with each application for payment, but shall not be submitted less than once per month. All payroll records shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

   (1) A certified copy of an employee’s payroll record shall be made available for inspection or furnished to the employee or their authorized representative on request.

   (2) A certified copy of all payroll records shall be made available for inspection or furnished upon request to a representative of District, the Division of Labor Standards Enforcement or the Division of Apprenticeship Standards of the Department of Industrial Relations.

   (3) A certified copy of all payroll records shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement. If the requested payroll records have not been provided pursuant to Paragraph (2) above, the requesting party shall, prior to being provided the records, reimburse the costs, according to law for the preparation by the Contractor, Subcontractor(s), and the entity through which the request was made. The public shall not be given access to such records at the principal office of the Contractor.

   (c) The certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement or shall contain the same information as the forms provided by the Division of Labor Standards Enforcement.
(d) The Contractor or Subcontractor(s) shall file a certified copy of all payroll records with the entity that requested such records within 10 calendar days after receipt of a written request.

(e) Any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the District, the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement shall be marked or obliterated to prevent disclosure of an individual’s name, address and social security number. The name and address of the Contractor awarded the Contract or the Subcontractor(s) performing the Contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (Section 175a of Title 29 of the United States Code) shall be marked or obliterated only to prevent disclosure of an individual’s name and social security number.

(f) The Contractor shall inform the District of the location of all payroll records, including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.

(g) The Contractor or Subcontractor(s) shall have 10 calendar days in which to comply subsequent to receipt of a written notice requesting payroll records. In the event that the Contractor or Subcontractor(s) fails to comply within the 10-day period, the Contractor or Subcontractor(s) shall, as a penalty to the District, forfeit Twenty-Five Dollars ($25.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Apprenticeship Standards or the Division of Labor Standards Enforcement, these penalties shall be withheld from progress payments then due.

Responsibility for compliance with this Article and the District’s Labor Compliance Program shall rest upon the Contractor.

13.8.2 Withholding of Contract Payments & Penalties.

The District may withhold or delay contract payments to the Contractor and/or any Subcontractor if:

(a) The required prevailing rate of per diem wages determined by the Director of the Department of Industrial Relations is not paid to all workers employed on the Project; or

(b) The Contractor or Subcontractor(s) fail to submit all required certified payroll records with each application for payment, but not less than once per month; or

(c) The Contractor or Subcontractor(s) submit incomplete or inadequate payroll records; or

(d) The Contractor or Subcontractor(s) fail to comply with the Labor Code requirements concerning apprentices; or
(e) The Contractor or Subcontractor(s) fail to comply with the District’s Labor Compliance Program; or

(f) The Contractor or Subcontractor(s) fail to comply with any applicable state laws governing labor on public works projects.

Any withholding of contract payments and penalties are set forth in the District’s Labor Compliance Program.

13.9 **APPRENTICES**

13.9.1 Apprentice Wages and Definitions.

All apprentices employed by the Contractor to perform services under the Contract shall be paid the standard wage paid to apprentices under the regulations of the craft or trade for which he or she is employed, and as determined by the Director of the Department of Industrial Relations, and shall be employed only at the Work of the craft or trade to which he or she is registered. Only apprentices, as defined in §3077 of the Labor Code, who are in training under apprenticeship standards that have been approved by the Chief of the Division of Apprenticeship Standards and who are parties to written apprenticeship agreements under Chapter 4 (commencing with §3070) of Division 3, are eligible to be employed under this Contract. The employment and training of each apprentice shall be in accordance with the apprenticeship standards and apprentice agreements under which he or she is training, or in accordance with the rules and regulations of the California Apprenticeship Council.

13.9.2 Employment of Apprentices.

Contractor agrees to comply with the requirements of Labor Code §1777.5. The Contractor awarded the Project, or any Subcontractor under him or her, when performing any of the Work under the Contract or subcontract, employs workers in any apprenticeable craft or trade, the Contractor and Subcontractor shall employ apprentices in the ratio set forth in Labor Code §1777.5. The Contractor or any Subcontractor must apply to any apprenticeship program in the craft or trade that can provide apprentices to the Project site for a certificate approving the Contractor or Subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, the decision of the apprenticeship program to approve or deny a certificate shall be subject to review by the Administrator of Apprenticeship. The apprenticeship program or programs, upon approving the Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or Subcontractor. The Contractor or Subcontractor covered by an apprenticeship program’s standards shall not be required to submit any additional application in order to include additional public works contracts under that program. “Apprenticeable craft or trade” as used in this Article means a craft or trade determined as an apprenticeable occupation in accordance with the rules and regulations prescribed by the California Apprenticeship Council. The ratio of work performed by apprentices to journeyman employed in a particular craft or trade on the Project shall be in accordance with Labor Code §1777.5.

13.9.3 Submission of Contract Information.

Prior to commencing work on the Project, the Contractor and Subcontractors shall submit contract award information to the applicable apprenticeship program(s) that can supply apprentices to the Project and make the request for the dispatch of apprentices in accordance with the Labor Code.
The information submitted shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices proposed to be employed, and the approximate dates the apprentices would be employed. A copy of this information shall also be submitted to the District. Within 60 days after concluding work on the Project, the Contractor and Subcontractors shall submit to the District, if requested, and to the apprenticeship program a verified statement of the journeyman and apprentice hours performed on the Project.

13.9.4 Apprentice Fund.

The Contractor or any Subcontractor under him or her, who, in performing any of the Work under the Contract, employs journeymen or apprentices in any apprenticeable craft or trade shall contribute to the California Apprenticeship Council the same amount that the Director determines is the prevailing amount of apprenticeship training contributions in the area of the Project. The Contractor and Subcontractors may take as a credit for payments to the California Apprenticeship Council any amounts paid by the Contractor or Subcontractor to an approved apprenticeship program that can supply apprentices to the Project. The Contractor and Subcontractors may add the amount of the contributions in computing his or her bid for the Contract.

13.9.5 Prime Contractor Compliance.

The responsibility of compliance with Article 13 and §1777.5 of the Labor Code for all apprenticeable occupations is with the Prime Contractor. Any Contractor or Subcontractor that knowingly violates the provisions of this Article or Labor Code §1777.5 shall be subject to the penalties set forth in Labor Code §1777.7 and the District’s Labor Compliance Program.

13.10 ASSIGNMENT OF ANTITRUST CLAIMS

13.10.1 Application.

Pursuant to Government Code § 4551, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the District all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act, (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 [commencing with § 16700] of Part 2 of Division 7 of the Business and Professions Code), arising from the purchase of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders final payment to the Contractor, without further acknowledgment by the parties. If the District receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Chapter 11 (commencing with § 4550) of Division 5 of Title 1 of the Government Code, the assignor shall be entitled to receive reimbursement for actual legal costs incurred and may, upon demand, recover from the District any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the District as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

13.10.2 Assignment of Claim.

Upon demand in writing by the assignor, the District shall, within one (1) year from such demand, reassign the cause of action assigned pursuant to this Article if the assignor has been or may
have been injured by the violation of law for which the cause of action arose and the District has not been injured thereby or the District declines to file a court action for the cause of action.

13.11  STATE AUDIT

Pursuant to and in accordance with the provisions of Government Code § 10532, or any amendments thereto, all books, records, and files of the District, the Contractor, or any Subcontractor connected with the performance of this Contract involving the expenditure of state funds in excess of Ten Thousand Dollars ($10,000.00), including, but not limited to, the administration thereof, shall be subject to the examination and audit of the Office of the Auditor General of the State of California for a period of three (3) years after final payment is made under this Contract. Contractor shall preserve and cause to be preserved such books, records, and files for the audit period.

13.12  Not Used

13.13  INDUSTRY STANDARDS

13.13.1 Applicability of Standards.

Unless the Contract Documents specify more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

13.13.2 Publication Dates.

Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

13.13.3 Minimum Quantity or Quality Levels.

The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

13.13.4 Copies of Standards.

Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not contained within the Contract Documents. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
13.13.5 Abbreviations and Acronyms for Industry Organizations.

Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

13.14 PRODUCTS

13.14.1 All products are to be new and not previously incorporated into or used in any other project or facility. Products salvaged or recycled from other projects are not considered new products and are not permitted.

13.14.2 The term product, as used in the Contract Documents, includes materials, equipment, systems, and like terms of similar intent.

13.14.3 Products include materials, machinery, components, equipment, fixtures and systems forming the Work and purchased for incorporation into the Work.

13.14.4 Do not reuse materials and/or equipment removed from existing premises except as specifically permitted by the Contract Documents.

13.14.5 Provide interchangeable components of the same manufacturer, for similar components.

13.14.6 Named products are items identified in the Contract Documents by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.

13.14.7 TRANSPORTATION AND HANDLING

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

13.14.7.2 Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

13.14.8 SHIPPING REQUIREMENTS

13.14.8.1 Preparation for Shipment: All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.

13.14.8.2 Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of District at the expense of Contractor.
13.14.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

13.14.9.1 Store products only in staging area per provisions of the Contract Documents.

13.14.9.2 Handle, store, and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.

13.14.9.3 For exterior storage of fabricated products, place on appropriate supports, above ground.

13.14.9.4 Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

13.14.9.5 Deliver, store and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

13.14.9.6 Contractor shall comply with the following without limitation:

(a) Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the Site and shall comply with the requirements specified herein and provide required information concerning the shipment and delivery of the materials specified in the Contract Documents.

(b) Electrical equipment and all equipment with antifriction or sleeve bearings shall be stored in weather-tight structures maintained at a temperature above 60 degree Fahrenheit. Electrical equipment controls and insulation shall be protected against moisture and water damage. All space heaters furnished in or with equipment shall be connected and operated continuously or according to manufacturer's requirements.

(c) Equipment and materials shall not have any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

(d) Store products to allow for inspection, measurement, and/or counting of units.

(e) Store materials in a manner that will not endanger adjacent Work.

(f) Store products that are subject to damage by the elements, under cover in a weather-tight enclosure above ground, with ventilation adequate to prevent condensation.

(g) Store cementitious products and materials on elevated platforms.

(h) Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR FOR CAUSE

14.1.1 Grounds for Termination.

The Contractor may terminate the Contract if the Work is stopped for a period of thirty (30) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons performing portions of the Work for whom the Contractor is contractually responsible, for only the following reasons:

(a) Issuance of an order of a court or other public authority having jurisdiction; or
(b) An act of government, such as a declaration of national emergency.

14.1.2 Notice of Termination.

If one of the above reasons exists, the Contractor may, upon written notice of seven (7) additional days to the District, terminate the Contract and recover from the District payment for Work executed and for reasonable costs verified by the Architect with respect to materials, equipment, tools, construction equipment, and machinery, including reasonable overhead, profit, and damages.

14.2 TERMINATION BY THE DISTRICT FOR CAUSE

14.2.1 Grounds for Termination.

The District may terminate the Contractor and/or this Contract for the following reasons:

(a) Persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
(b) Persistently or repeatedly is absent, without excuse, from the job site;
(c) Fails to make payment to Subcontractors, suppliers, materialmen, etc.;
(d) Persistently disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction; or
(e) Becomes bankrupt or insolvent, including the filing of a general assignment for the benefit of creditors; or
(f) Otherwise is in substantial breach of a provision of the Contract Documents.

14.2.2 Notification of Termination.

When any of the above reasons exist, the District may, without prejudice to any other rights or remedies of the District and after giving the Contractor and the Contractor's surety, if any, written notice of seven (7) days, except in the event of an emergency or critical path delay to the schedule in which case the District may give written notice of forty-eight (48) hours, terminate the Contract and may, subject to any prior rights of the surety:
(a) Take possession of the Project and of all material, equipment, tools, and construction
equipment and machinery thereon owned by the Contractor;

(b) Accept assignment of Subcontracts. Contractor acknowledges and agrees that if the
District (in its sole and absolute discretion) decides to takeover completion of the
Project, the Contractor agrees to immediately assign all subcontracts to the District
which the District has chosen to accept; and

(c) Complete the Work by any reasonable method the District may deem expedient,
including contracting with a replacement contractor or contractors.

14.2.3 Payments Withheld.

If the District terminates the Contract for one of the reasons stated in Paragraph 14.2.1, the
Contractor shall not be entitled to receive further payment until the Work is complete. All costs
associated with the termination and completion of the Project shall be the responsibility of the
Contractor and/or its surety.

14.2.4 Payments Upon Completion.

If the unpaid balance of the Contract Sum exceeds costs of completing the Work, including
compensation for professional services and expenses made necessary thereby, such excess shall be paid
to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to
the District. The amount to be paid to the Contractor, or District, as the case may be, shall be certified
by the Architect upon application. This payment obligation shall survive completion of the Contract.

14.3 TERMINATION OF CONTRACT BY DISTRICT (CONTRACTOR NOT AT FAULT)

14.3.1 Termination for Convenience.

District may terminate the Contract upon fifteen (15) calendar days of written notice to the
Contractor and use any reasonable method the District deems expedient to complete the project,
including contracting with replacement contractor or contractors, if it is found that reasons beyond the
control of either the District or Contractor make it impossible or against the District's interest to
complete the work. In such a case, the Contractor shall have no claims against the District except: (1)
the actual cost for labor, materials, and services performed which may be documented through
timesheets, invoices, receipts, or otherwise, and (2) ten percent (10%) profit and overhead, and (3) five
percent (5%) termination cost of the total of items (1) and (2). Contractor acknowledges and agrees that
if the District (in its sole and absolute discretion) decides to takeover completion of the Project, the
Contractor agrees to immediately assign all subcontracts to the District which the District has chosen to accept.

14.3.2 Non-Appropriation of Funds/ Insufficient Funds.

In the event that sufficient funds are not appropriated to complete the Project or the DISTRICT
determines that sufficient funds are not available to complete the Project, DISTRICT may terminate or
suspend the completion of the Project at any time by giving written notice to the Contractor. In the
event that the DISTRICT exercises this option, the DISTRICT shall pay for any and all work and materials
completed or delivered onto the site for which value is received, and the value of any and all work then
in progress and orders actually placed which cannot be canceled up to the date of notice of termination.
The value of work and materials paid for shall include a factor of fifteen percent (15%) for the Contractor’s overhead and profit and there shall be no other costs or expenses paid to Contractor. All work, materials and orders paid for pursuant to this provision shall become the property of the DISTRICT. DISTRICT may, without cause, order Contractor in writing to suspend, delay or interrupt the Project in whole or in part for such period of time as DISTRICT may determine. Adjustment shall be made for increases in the cost of performance of the Agreement caused by suspend, delay or interruption.

14.4 REMEDIES OTHER THAN TERMINATION

If a default occurs, the District may, without prejudice to any other right or remedy, including, without limitation, its right to terminate the Contract pursuant to Article 14.2, do any of the following:

(a) Permit the Contractor to continue under this Contract, but make good such deficiencies or complete the Contract by whatever method the District may deem expedient, and the cost and expense thereof shall be deducted from the Contract Price or paid by the Contractor to the District on demand;

(b) If the workmanship performed by the Contractor is faulty or defective materials are provided, erected or installed, then the District may order the Contractor to remove the faulty workmanship or defective materials and to replace the same with work or materials that conform to the Contract Documents, in which event the Contractor, at its sole costs and expense, shall proceed in accordance with the District’s order and complete the same within the time period given by the District in its notice to the Contractor; or

(c) Initiate procedures to declare the Contractor a non-responsible bidder for a period of two to five years thereafter.

All amounts expended by the District in connection with the exercise of its rights hereunder shall accrue interest from the date expended until paid to the District at the maximum legal rate. The District may retain or withhold any such amounts from the Contract Price. If the Contractor is ordered to replace any faulty workmanship or defective materials pursuant to Paragraph (b) above, the Contractor shall replace the same with new work or materials approved by the Architect and the District, and, at its own cost, shall repair or replace, in a manner and to the extent the Architect and the District shall direct, all work or material that is damaged, injured or destroyed by the removal of said faulty workmanship or defective material, or by the replacement of the same with acceptable work or materials. In no event shall anything in this Paragraph be deemed to constitute a waiver by the District of any other rights or remedies that it may have at law or in equity, it being acknowledged and agreed by the Contractor that the remedies set forth in this Paragraph are in addition to, and not in lieu of, any other rights or remedies that the District may have at law or in equity.

END OF SECTION 00700
SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 WORK DESCRIPTIONS WITHOUT FORCE
A. All general descriptions and/or general summaries of the work noted in this section, or elsewhere within the Contract Documents, are without force and effect on the Contract Work described and indicated in detail the Contract Documents. These general descriptions and summaries are for general reference and descriptive purposes only and in no way offer the complete and concise description of all the Work required by the Contract Documents.

1.3 WORK COVERED BY CONTRACT DOCUMENTS
A. The Contract Documents include but are not limited to Electrical and Low Voltage Work for construction of the Campus Safety Center located on Campus. This project includes work performed by multiple prime contractors. Other Work includes Site Work and Modular Buildings. The work will be performed concurrently with this contract. The contractors are required to coordinate their work.

B. General Electrical and Low Voltage work includes, but is not limited to:
1. Site electrical including connection to the campus power and communications systems.
2. Electrical connection of power and communications to the modular building panels.
3. Transformers for the electrical service.
4. Fire alarm in the modular building connected to the main campus alarm panel in another building.
5. Intrusion alarm, door access control and security cameras.
6. Telcom/data communications including all cabling and connection to the campus MPOE.
7. Power and data to site automatic gates and irrigation controllers.
8. Commissioning and testing of electrical and low voltage systems.

C. The scope of work is further defined by assigning primary responsibility for each specification section to the Site Contractor, Electrical and Low Voltage Contractor (ELV) or Modular Contractor. Refer to the matrix at the end of this section titled Exhibit A. Note that Electrical and Low Voltage Contractor and “Contractor” have the same meaning for the purposes of this contract.

1. PRIMARY responsibility means that the assigned Contractor is responsible for performing all the work described in that section of the specifications.
2. RELATED responsibility means the assigned Contractor has a portion of the work described in a section where another contractor has PRIMARY responsibility. A general description of the related portion of work is included in this section.
D. The Electrical and Low Voltage (ELV) Contractor has PRIMARY responsibility for all work in the following specification divisions. Refer to the responsibility matrix attachment at the end of this section:
   1. Division 26 – Electrical
   2. Division 27 – Communications
   3. Division 28 – Electronic Safety and Security

E. The Electrical and Low Voltage Contractor (ELV) has RELATED work in the following specification sections:
   1. 024000: ELV Contractor shall safe off the site electrical before the Site Contractor begins site clearing and demolition.
   2. 31233: The ELV Contractor will perform trench and backfill for electrical work only. This includes removal of spoils.
   3. 320523: The ELV shall provide concrete for its new electrical work such as, but not limited to light pole bases. ELV includes providing anchor bolts and templates for its equipment set in site concrete.
   4. 323113: The ELV Contractor shall provide power and data to the gates.
   5. 328400: The ELV Contractor shall provide power and data to the irrigation controller.
   6. 330516: The ELV Contractor shall provide electrical utility structures such as electrical boxes and vaults.

F. Site Contractor and Modular Contractor have RELATED work in sections where the ELV Contractor has PRIMARY responsibility.
   1. Site Contractor will remove existing underground ELV conduit to be demolished after ELV Contractor safes off the site.
   2. Modular Contractor (JTS) will provide boxes and conduit in the walls for low voltage raceways. ELV Contractor must coordinate outlet locations with JTS during assembly of modules in the factory. If ELV Contractor does not provide coordination for a box and conduit that is omitted at the factory, then ELV Contractor shall field install said work at no additional cost to the District.
   3. Modular Contractor (JTS) is providing light and power inside the modular units, including the main panels and connection of mechanical equipment.

G. Each contractor has responsibility for work under Division 1 General Requirements as it pertains to its primary work. Refer directly to specification sections within this Division.
   1. 01010 Field Engineering: The Site Contractor provides surveying and staking including control point staking for electrical underground utilities and offset staking for the modular building. The ELV Contractor must provide a written request for survey including all relevant information for survey of the underground electrical. ELV Contractor will coordinate layout with the surveyor. ELV Contractor is responsible for its layout from the survey control points provided by the Site Contractor.
   2. 01500: The Site Contractor will set up the site and establish and maintain temporary facilities, including basic electrical service for use by all prime contractors. Each
contractor shall be responsible for its own storage, trailer and communications. Refer to this section for ELV Contractor responsibilities.

3. 01505 Construction Waste Management: Site Clearing and demolition is the primary generator of waste for this project. Site Contractor provides dumpsters and manages the recycling program. ELV Contractor shall dispose of its own packaging for electrical equipment, materials and other construction waste generated by the ELV Contractor.

4. Each contractor will follow the work restrictions, provide its own quality control, closeout documents, demonstration and training, as it pertains to their scope of work. All prime contractors will attend a weekly OAC meeting run by the District’s Representative.

1.4 CONTRACTS

A. Perform the Electrical and Low Voltage work under a single, fixed-price prime Contract. The Site Contractor and Modular Contractor are separate bid packages, excluded from this one. The work will be performed concurrently with this contract. The prime contractors will coordinate their work.

1.5 WORK SEQUENCE

A. The general sequence of work shall be as follows:
   1. The Site Contractor shall provide temporary facilities and controls.
   2. The Site Contractor shall complete rough grading and provide a certified building pad.
   3. The Site Contractor and ELV Contractor shall install their respective site utilities concurrently.
   4. The Modular Contractor shall install under slab utilities and a concrete slab on grade as soon as the certified building pad is available.
   5. The Modular Contractor shall install modular building units and connect them to site utilities. The ELV Contractor shall connect the modular buildings to the electrical service.
   6. The ELV Contractor will install low voltage systems in the building.
   7. The Site Contractor shall fine grade and install paving, landscaping and fencing, as soon as the Modular Contractor completes setting the modular buildings and their exterior work at the modular buildings is completed. This work will be concurrent with Modular Contractor and ELV Contractor’s work inside the buildings.

B. During construction operations, various adjoining areas will be occupied and their functions maintained. Temporary construction separations such as walls for sound and dust control, as well as pathway barricades, signage and clearly marked temporary pedestrian path of travel detours will be required for work at the site and this work will be by the Site Contractor. ELV Contractor and the Modular Contractor will provide traffic control, as required, for their own operations and scope of work.

C. Scheduling of Contractor's use of the areas and times involved shall be determined in cooperation with the District. Notify the District a minimum of 10-days prior to commencement of work. See Section 01140, Work Restrictions, for additional information regarding scheduling.
D. Construction activities shall be performed between the hours of 7AM and 5PM, Monday through Friday, unless otherwise required. No Work shall be performed outside the above hours without prior written authorization from the District.

1.6 ADDITIONAL WORK SCHEDULE REQUIREMENTS: See Section 01140, Work Restrictions.

1.7 CAMPUS HOLIDAYS
A. The College is closed with no classes held on the following holidays: Labor Day; Native American Day; Veteran’s Day; Thanksgiving; Winter Recess; Martin Luther King Day; President’s Day; Spring Recess. The Contractor may work on these days with prior approval by the District.

1.8 USE OF PREMISES
A. Contractor shall only use the premises for work, storage, staging areas, and vehicular parking as designated in the Contract Documents.

1.9 EXISTING AREA CONDITION SURVEY
A. Prior to commencement of work, jointly survey the existing area to be remodeled with the District and Architect, noting and recording existing damage such as cracks, sags, and other damage (on Site Plan/Floor Plans).
B. This record shall serve as a basis for determination of subsequent damage to these items due to settlement, movement, demolition, or Contractor’s operations.
C. Existing damage observed shall be marked and the official record of existing damage shall be signed by the parties making the survey.
D. Cracks, sags, and damage to the area and other items not noted in the original survey but subsequently observed shall be reported immediately to the Architect.
E. Contractor shall take photographs or video recordings and submit these to the District for review of adequacy and approval in order to comply with this requirement.

1.10 PROTECTION OF EXISTING STRUCTURES AND UTILITIES
A. The Drawings may not show all existing water, gas, electrical, and hot water lines, and other items known or suspected to exist in the area of the work.
B. Contractor shall locate these installations before proceeding with demolition or other operations which may cause damage, maintain them in service where appropriate, and repair damage caused by the performance of the Work, at no increase in the Contract Sum.
C. In addition to notification, if a structure or utility is damaged, take appropriate action as specified in the General Conditions.

1.12 USE AND OCCUPANCY OF WORK PRIOR TO ACCEPTANCE BY DISTRICT
A. The District may use and occupy the building, or portions of the site, before formal acceptance under the following conditions:
1. A Certificate of Substantial Completion shall be prepared and executed as provided in the Contract Documents. The Certificate of Substantial Completion shall be accompanied by a written
endorsement of the Contractor’s insurance carrier and surety permitting occupancy by the District during the remaining period of the work.

2. Occupancy by the District shall not be construed as being an acceptance of that part of the Work occupied.

3. The Contractor will not be held responsible for damage to the occupied part of the Work resulting from the District’s occupancy.

4. Occupancy by the District shall not be deemed to constitute a waiver of existing claims the District or Contractor may have against each other.


6. The District will pay for utility costs associated with occupancy during construction.

1.13 PROTECTION OF EXISTING IMPROVEMENTS

A. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing improvements indicated to remain in place.

B. Protect improvements on adjoining properties as well as those on the District’s property.

C. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line.

D. Restore any improvements damaged by this work to their original condition as acceptable to the District or other parties or authorities having jurisdiction.

1.14 HAZARDOUS MATERIALS

A. Comply with all requirements included in other sections of Contract Documents.

1.15 MISCELLANEOUS PROVISIONS

A. Items shown, described or scheduled to be salvaged will remain the property of the District. Store as directed by the Construction Manager.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01010
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### SECTION 01010
#### SUMMARY OF WORK
### EXHIBIT A - PRIMARY RESPONSIBILITY MATRIX

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SECTION 01050
FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUBMITTALS
A. Contractor shall submit name and address of Surveyor and Professional Engineer to District for approval prior to their work on the Project.
B. On request of District and Architect, Contractor shall submit documentation to verify accuracy of field engineering work, at no additional cost to the District.
C. At completion of the Work, Contractor shall submit a certificate signed by a licensed engineer or surveyor certifying that all elevations and locations of improvements are in conformance with Contract Documents.

1.3 REQUIREMENTS
A. Contractor shall provide and pay for field engineering services by an engineer licensed in the State of California, required for the Project, including, without limitation:
   1. Survey work required in execution of the Project.
   2. Civil or other professional engineering services specified, or required to execute Contractor’s construction methods.

1.4 QUALIFICATIONS OF SURVEYOR OR ENGINEERS
A. Contractor shall only use a qualified licensed engineer or registered land surveyor, approved by the District, of the discipline required for specific service on Project, licensed in the State of California.
B. Submit evidence of Engineer's errors and omissions insurance coverage to District, in the form of a current Insurance Certificate.

1.5 SURVEY REFERENCE POINTS
A. Existing basic horizontal and vertical control points for the project are those designated on the Drawings.
B. Contractor shall locate and protect control points prior to starting Site Work and preserve all permanent reference points during construction. In addition, Contractor shall:
   1. Make no changes or relocation without prior written notice to District and Architect.
   2. Report to District and Architect when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
3. Require surveyor to replace project control points based on original survey control that may be lost or destroyed.

4. Contractor to locate and protect existing survey control and reference points.

5. Control datum for survey is that indicated on Drawings.

6. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

7. Promptly report to Architect, District, and Project Inspector the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

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

1.6 PROJECT RECORD DOCUMENTS

A. Maintain complete, accurate log of control and survey work as it progresses. Indicate dimensions, locations, angles, and elevations of construction and Site Work.

B. Submit Record Documents as required under provisions of these Contract Documents.

1.7 EXAMINATION

A. Verify locations of survey control points prior to starting Work. Promptly notify District and Architect of any discrepancies discovered.

1.8 SURVEY REQUIREMENTS

A. Provide field engineering services. Utilize recognized engineering survey practices.

B. Establish a minimum of two permanent bench marks on Site, referenced to established control points. Record locations, with horizontal and vertical data, on Project Record documents.

C. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, and ground floor elevations.

D. Periodically verify layouts by same means.

PART 2 – PRODUCTS - Not Used

PART 3 – EXECUTION

3.1 Contractor is responsible for meeting all applicable codes, OSHA, and other safety and shoring requirements.

3.2 Contractor is responsible for any re-surveying required by correction of nonconforming work with no additional cost to the District or its representatives.

END OF SECTION 01050
SECTION 01140
WORK RESTRICTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
   A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY OF WORK RESTRICTION REQUIREMENTS
   A. Prior to the start of Work, Contractor shall familiarize itself with the Work Restrictions as they relate to all Work required by the Contract Documents.
   B. Temporary Work Activity Plan shall include:
      1. Site Contractor shall provide a full-size drawing (36”x42”) of site logistics plan. Electrical and Low Voltage (ELV) Contractor and Modular Contractor will provide their information to be included on this plan. Showing the proposed locations and dimensions of temporary facilities and activities, including but not limited to
         a. all proposed trailers, equipment and material storage areas
         b. proposed haul routes
         c. all temporary construction
         d. way-finding signage
         e. temporary fenced areas
         f. temporary measures to maintain continuous and uninterrupted code compliant use of all occupied and surrounding areas impacted by construction activities.
         g. Indicate if the use of supplemental or other staging areas might be required. Modular Contractor will provide its own plan for staging the modular building installation. Coordinate the two plans.
      2. Site Contractor shall submit two (2) hard copies at the pre-construction meeting, and email Adobe PDF Format of the initial submittal of the Temporary Work Activity Plan for review by the District, Architect, and by personnel from the Campus (e.g., Buildings & Grounds, Police Department, and other representatives).
   C. Site Contractor shall construct fencing and other barriers as required prior to the start of demolition activities and it shall remain in place until the completion of the entire project. Coordinate fencing with the modular building staging and installation plan.
   D. Site Contractor shall perform and complete all Temporary Work Activities to ensure the following:
      1. The continuous and uninterrupted use of all adjacent parking areas and buildings that require 24/7 utility services.
      2. Protection of students, staff, faculty and personnel in occupied areas and surrounding and adjacent areas from the hazards and dust associated with construction.
3. The work areas, roads, parking lots, and streets are to be kept clear, clean, and free of loose debris, construction materials and partially installed work which would create a safety hazard or interfere with subcontractor and personnel duties and traffic. The Site Contractor shall sweep the areas clean at the end of each work day during phases of the work when it is on site. Modular Contractor shall be responsible for cost of this activity during the modular building installation phase of the project. Make every effort to keep dust and noise to a minimum at all times.

4. Prior to starting work, the Contractor shall provide a proposed schedule of temporary interruptions or shutdown of any utility or electrical/mechanical systems to the District Representatives. The Contractor shall provide written request (5) working days prior to the desired time for the proposed interruption(s). Work shall be performed at times other than the Campus’s normal hours of operation, or as directed by the District Representative. Temporary interruptions shall be completed prior to the start of the next business day at the Campus to maintain continuous and uninterrupted use of Campus facilities and utility systems.

1.3 SUMMARY OF WORK RESTRICTIONS

A. General: All Temporary Work Activities must be completed within the timelines, work shift times, and the scheduled time period as required by the Contract Documents. Comply with the following:
   1. The Temporary Work Activity Plan shall be approved by the District prior to any Work starting on the Project Site.
   2. Contractor shall have all temporary fencing, signage, ADA compliant pathways and other temporary measures described in Paragraph 1.2 above installed, operational and accepted by the District prior to starting demolition or other Work as applicable.

B. Parking, staging and truck traffic
   1. The Contractor’s staging area for trailers, construction vehicles, construction equipment and material is restricted to within the limits of the project construction area shown on the drawings.
   2. Adjacent Campus parking lots are not available to the Contractor. Parking on Castro Road is not available for vehicles (i.e., cars and trucks) of construction personnel. The Campus has a parking annex across Castro Road including the side yard for construction parking and additional staging or storage as needed. Contractor is responsible for procuring parking passes from the Campus Police Department.
   3. The truck entrance to the Campus shall be via Mission Bell Drive only. Trucks shall follow a direct route to the Project Site. Site Contractor shall submit a trucking plan for operations during demolition and grading.
   4. Comet Drive and Castro Road are busy main campus streets. Traffic control plans are required for work, or large deliveries that would impact traffic. Large equipment shall be delivered before 8 am or after 5pm. Notify the District in writing 2 work days in advance.

PART 2 - PRODUCTS
2.1 MATERIALS

A. All labor, equipment, materials, and all other requirements shall be provided and will be the sole responsibility of the Contractor for execution of entire work described in this specification section.

PART 3 - EXECUTION

3.1 MEANS AND METHODS OF CONSTRUCTION

A. Contractor to provide and shall be responsible for any and all means and methods that will be constructed, implemented and/or maintained on the site for all work described above.

B. The District will provide a Microsoft Project schedule to identify the approximate time periods the Contractor will have sole access to the site, when other prime contractors will have sole access to the site and when the site will be shared with other prime contractors. Contractor shall comply with the restrictions noted in said schedule, and it will be provided by addendum.

END OF SECTION 01140
SECTION 01312
PROJECT MEETINGS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY

A. This Section specifies administrative requirements and provides descriptions of the required project meetings for the Work and all phases of the Project. These meetings include, but not limited to, the following:
   1. Preconstruction Conference
   2. Schedule Review Meetings
   3. Weekly Project Progress Meetings
   4. Construction Schedule and Application for Payment Meetings
   5. Special Meetings

1.3 PRECONSTRUCTION CONFERENCE

A. District will schedule and conduct the Preconstruction Conference at a time and place to be determined.

B. Contractor and all major subcontractors, as requested by the District, shall attend the Preconstruction Conference.

C. Meeting agenda will include, but is not limited to, discussion of the following items:
   1. Construction Schedules
   2. Personnel and vehicle permit procedures
   3. Use of premises
   4. Location of Contractor’s on-Site facilities
   5. Security
   6. Housekeeping
   7. Submittal and RFI procedures
   8. Inspection and testing procedures, on-Site and off-Site
   9. Utility shutdown procedures
   10. Control and reference point survey procedures
   11. Injury and Illness Prevention Program
   12. Schedule of Values
13. Schedule of Submittals
14. Project Directory
15. Emergency Contact List

1.4 SCHEDULE OF VALUES & CONSTRUCTION SCHEDULE MEETING

A. See Section 00700, Contract General Conditions, for requirements. Meetings will be held as requested by the District, or as required by the District.

1.5 SHOP DRAWINGS & SUBMITTALS SCHEDULE MEETING

A. See Section 00700, Contract General Conditions, for specific requirements. Meetings will be held as requested by the District, or as required by the District.

1.6 WEEKLY PROGRESS MEETINGS

A. Weekly Progress Meetings will be scheduled throughout duration of Work at a time acceptable to the District. Weekly Progress Meetings will be held weekly unless otherwise directed by District.
   1. Meetings shall be held at Construction Manager’s on-site office, unless otherwise directed by the District.
   2. The District’s Construction Manager will prepare an agenda, if needed.
   3. The District or Architect will record meeting notes of the Weekly Progress Meetings. Within 3 working days after the meeting, the District or Architect will distribute minutes to attendees via e-mail, and to those affected by decisions made at the meeting. Attendees can either submit comments or additions to the minutes within 3 working days. The minutes will constitute a final documentation of the results of meeting.

B. Weekly Progress Meetings shall be attended by the Contractor’s project manager, project engineer, and job superintendent, District Construction Manager, Architect and Engineers, the Inspector of Record, and others as appropriate to agenda topics for each meeting.

C. Agenda will contain the following items, as appropriate:
   1. Review, revise as necessary, and approve previous meeting minutes
   2. Review Work progress since last meeting
   3. Status of Construction Schedule, delivery schedules, adjustments
   4. Submittal, RFI, and Change Order status
   5. Review of the Contractor’s safety program activities and results, including report on any serious injury and/or damage accidents
   6. Review of non-conforming Work (if any)
   7. Other items relating to or affecting progress of Work
1.7 Special Meetings

A. District may call special meetings by notifying the desired participants. Special meetings may be held without advance notice in emergency situations.

B. At any time during the progress of Work, District shall have authority to require Contractor to attend a meeting with any or all of the subcontractors engaged in the Work, or in other work, and notice of such meeting shall be duly observed and complied with by Contractor.

C. Contractor shall schedule and conduct its own periodic coordination meetings as necessary to discharge coordination responsibilities.

D. Contractor shall give District 5 work days written notice of its coordination meetings. Contractors shall maintain and distribute minutes of coordination meetings to District. Attendees shall have 3 work days to submit comments or additions to minutes. Minutes will constitute final documentation of results of coordination meetings.

1.8 GUARANTEES/WARRANTIES, BONDS, AND SERVICE & MAINTENANCE CONTRACTS REVIEW MEETING

A. Ten Months following date of final acceptance, Contractor to hold a meeting to review guarantees/warranties, bonds, and service maintenance contracts for materials and equipment. Implement repair or replacement of defective items, and extend service and maintenance contracts, as desired by District.

B. Attending shall be:
   1. District Project Representatives
   2. Architect and Architect’s consultants, as appropriate
   3. Campus Buildings & Ground Representatives
   4. Contractor
   5. Subcontractors, as appropriate
   6. Others, as appropriate

PART 2 - PART 2 – PRODUCTS - Not Used

PART 3 - PART 3 – EXECUTION - Not Used

END OF SECTION 01312
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY

A. This section specifies the information and format requirements for administrative forms and logs.

1.3 ADMINISTRATIVE FORMS & LOGS

A. The Contractor shall use District provided administrative forms for the Work. Administrative forms and logs include, but are not limited to, the following:
   1. Transmittal Form
   2. Submittal Transmittal Form
   3. Request for Information Form
   4. Substitution Request Form
   5. 3-Week Projected Construction Schedule Form
   6. 3-Week Testing & Inspection Schedule Form
   7. Proposed Change Order Form*
   8. Change Order Form*
   9. Request for Information Log Form
   10. Submittal Log Form
   11. Proposed Change Order Log Form
   12. Change Order Log Form
   13. Contractor’s Proposal for Contract Modification Form* (includes sample numbers to demonstrate calculations only)
   14. Contractor Production Report
   15. Construction Directive Form

B. Forms generated by project management software may be substituted if substitution forms contain essentially the same information as shown in these contract documents. Allowance for the use of substitute forms is at the sole discretion of the District, and shall be requested and approved before use of the substitute form. Forms marked with an asterisk (*) may NOT be substituted under any condition.

C. Microsoft Excel files of these forms are available for Contractor use from the District.
1.4 FORMS INCORPORATED BY REFERENCE

A. Forms available from the California Department of General Services, Division of the State Architect, http://www.dgs.ca.gov/dsa/Forms.aspx, related to administration, construction, testing, and inspection of public work school facilities are hereby incorporated by reference into these Contract Documents.

1.5 CONTRACTOR RESPONSIBILITIES

A. Nothing in this Section, including but not limited to, the above forms and log forms shall be construed to limit, relieve, or release Contractor from liability to District for any damages sustained as a result of inaccurate or incorrect information supplied by the Contractor.

PART 2 – PRODUCTS - Not Used.

PART 3 – EXECUTION - Not Used.

END OF SECTION 01340
SECTION 01400
QUALITY CONTROL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY
A. This Section includes Administrative and Procedural Requirements for Quality Control and Quality Assurance Services includes, but not limited to, the followings:
   1. Quality assurance and control of installation.
   2. References.
   3. Inspection and testing laboratory services
   4. Manufacturers’ field services and reports
   5. Field sample
   6. DSA Project Inspector if applicable
   7. Inspection by the Division of the State Architect if applicable
   8. Conflicts

1.3 QUALITY ASSURANCE/CONTROL OF INSTALLATION
A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions and workmanship, to produce Work of specified quality.
B. Comply fully with manufacturers' written instructions, including each step in sequence.
C. When manufacturers' instructions conflict with Contract Documents, request clarification from District’s Representative before proceeding.
D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
E. All Work shall be performed by persons qualified to produce workmanship of specified quality.
F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.
G. Contractor's Line of Authority: Contractor shall provide one person who shall be both knowledgeable and responsible for all work to be performed on the Project at all times during normal work hours. In Contractor’s absence, Contractor’s appointed representative shall be responsible for all directions given him and said directions shall be binding as if given to the Contractor. Contractor’s representative shall be responsible to coordinate all Work to be performed on the Project.
H. Shop and field work shall be performed only by mechanics skilled and experienced in the fabrication and installation of the work involved. All work on this Project shall be done in accordance with the best practices of the various trades involved and in accordance with the Contract Documents, approved shop drawings and these specifications.

I. All work shall be erected and installed plumb, level, square and true and in proper alignment and relationship to the work of other trades. All finished work shall be free from defects. The District’s Representatives reserve the right to reject any materials and workmanship that are not considered to be of the highest standards of the trades involved. Any such inferior material or workmanship shall be removed and replaced at no additional cost or time impact to the District.

J. The specifications and recommendations of the manufacturer whose materials are used shall be strictly adhered to during the application or installation of materials. Manufacturer’s specifications, installation instructions, and testing and startup directions shall be available for inspection on site.

K. Any additional work beyond that specified or illustrated in the Contract Documents, or any modification thereto, that is necessary to obtain the guarantees specified in the Contract Documents shall be provided by the Contractor without any additional cost or time impact to the District.

1.4 REFERENCES

A. Conform to reference standards in force on the most recent date of issue of the approved Contract Documents.

B. When specified reference standards conflict with Contract Documents, request clarification from District’s Representative before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

D. The Contractor shall be responsible for being current and knowledgeable for all building codes involved for all trades under his direction.

E. Provide all work and materials in full in accordance with the latest applicable Rules and Regulations of the California Code of Regulations Title 24 Building Code Standards, the State Fire Marshal, Safety Orders of the Division of Industrial Safety, and any other applicable laws or regulations. Nothing in these plans or specifications is to be construed to permit Work not conforming to these Codes.

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

   1. 29 CFR 1910, Subpart A, Section 1910.7: Definitions and Requirements for a National Recognized Testing Laboratory.

H. NIST: National Institute of Standards and Technology.

I. Furnish all material and labor required to comply with these Rules and Regulations without any additional cost to District.
1.5 **MANUFACTURERS' FIELD SERVICES AND REPORTS**

A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting, and balancing of equipment as applicable, and to provide instructions when necessary.

B. Provide four (4) sets of Manufacturer’s Field Representative report to District and Architect for review within 5 days of field observation.

C. Manufacturer’s Field Service: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections.

1.6 **FIELD SAMPLES**

A. Install field samples at the site for District and Architect review as required by individual Specifications Sections.

B. Samples accepted by the Architect in writing represent the quality level required for the Work.

C. Where a field sample is specified in individual sections to be removed, clear area after field sample has been accepted by Architect.

1.7 **PROJECT INSPECTOR**

A. District will employ a Project Inspector in accordance with the regulations of the DSA and subject to the provision of Part 1, Title 24, CCR. Project Inspector’s authority, rights and duties shall be as set forth in Section 4-342, Part 1, Title, 24, CCR.

1.8 **INSPECTION BY THE DIVISION OF THE STATE ARCHITECT**

A. Work will be monitored and observed through periodic site visits by the Division of the State Architect Field Inspector according to Section 4-334, Part 1, Title 24, CCR.

1.9 **CONFLICTS**

A. Contractor shall comply with rules of documents interpretation as indicated in Contract General Conditions including, but not limited to the following items:

1. Contract Documents take precedence over statutory requirements or standard when requiring materials of higher quality or performance, or larger sizes or capacity, or greater protection, safety or quantity than required by said codes or standards.

2. This shall not operate to allow deviations from code requirements, prior approvals and other provisions as specified.

3. Modifications to published statutory requirements currently adopted or enforced by regulating agencies having jurisdiction shall take precedence over said published requirements.

B. Conflicts within Contract Documents and/or between Project Manual (including specifications) Drawings, Addenda: The more stringent requirement shall govern.

C. Subcontractor, supplier, and installer work may be called for in any section of the Contract Documents; Project Manual Specifications, Drawings and Addenda. Work by any one
discipline is not limited to any specification section of the Project Manual, Drawings, Addenda, and Contract Documents shall be bid in total and not in parts.

D. If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding. Contractor shall, within (15) working days, notify the Architect in writing for the context of requirements.

E. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Contractor shall, within (15) working days, notify any uncertainties to the Architect and District for a decision before proceeding.

1.10 QUALITY CONTROL, GENERAL

A. District will provide inspections, tests, and similar quality control services required performed by the Division of the State Architect. All other tests are Contractor’s responsibility.

1. District will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

3. See Section 00700, Contact General Conditions, Article 13.5 for additional requirements.

1.11 QUALITY CONTROL: LABORATORY, TESTS, AND REPORTING REQUIREMENTS

A. Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation.

1. The laboratory’s scope of accreditation must include the appropriate ASTM standards (E 329, C 1077, D 3666, D 3740, A 880, E 543) listed in the technical sections of the specifications.

B. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the Corporate Office.

C. Laboratory Accreditation Authorities: Laboratory Accreditation Authorities include the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology at: http://ts.nist.gov/ts/htdocs/210/214/214.htm the American Association of State Highway and Transportation Officials (AASHTO) program at http://www.transportation.org/aashto/home.nsf/frontendpage , International Accreditation Services, Inc. (IAS) at http://www.iasonline.org, the American Association for Laboratory Accreditation (A2LA) program at http://www.a2la.org/.
D. Capability Check: The District retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract.

E. Test Results: Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item test or analyzed conforms or fails to conform to specified requirements.

1. If the item fails to conform, notify the District immediately. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable.

2. Test results must be signed by a testing laboratory representative authorized to sign certified test reports.

3. Furnish the signed reports, certifications, and other documentation to the District via the QC Manager.

4. Furnish the signed reports, certifications, and a summary report of field tests at the end of each month to the District. Attach a copy of the summary report to the last daily Contractor Quality Control Report of each month.

1.12 NOTIFICATION ON NON-COMPLIANCE

A. The District will notify the Contractor of any detected non-compliance with the Contract. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the District may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time for excess costs or damages by the Contractor.

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work constitutes acceptance of existing conditions by the Contractor.

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

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

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

3.2 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.

2. Description of the Work tested or inspected.

3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special Inspector conducting test or inspection.

B. Maintain test and inspection log at project site. Post changes and modifications as they occur. Provide access at the Project site to the District and Architect, during normal working hours, to Contractor generated test and inspection logs.

3.3 PREPARATION

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

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

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.4 PREPARATION AND PROTECTION

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

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor’s responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400
SECTION 01416
SPECIAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY
A. In Compliance with CEQA requirements, the District conducted an Initial Study to ascertain if the project may have an effect on the environment. The Initial Study identified potential impacts on the environment. However, all potential impacts of the proposed Project can be avoided or reduced to a less-than-significant level by implementation of the following mitigation measures. Contractor shall conform with the following mitigation measures, including but not limited to, the following:
   1. Noise Control
   2. Dust Control
   3. Traffic Control
   4. Spill Prevention, Control and Countermeasures
   5. Tree Protection
   6. Migratory Bird Protection
   7. Cultural Resources Protection
B. In no case shall the restrictions identified in this Section limit the Contractor’s responsibility for compliance with all Federal, state, and local safety ordinances and regulations.

1.3 NOISE CONTROL
A. The intent of this Section is to minimize construction noise within construction areas, lay-down areas, and communities adjacent to the construction site. To this end, the Contractor and all subcontractors, suppliers, and vendors, are required to comply with all applicable noise regulations, specification requirements, and the noise level limits specified herein.
B. The Contractor shall use equipment with efficient noise-suppression devices and employ other noise abatement measures such as enclosures and barriers necessary for the protection of the public, as necessary.
C. The Contractor shall schedule and conduct operations in a manner that will minimize, to the greatest extent feasible, the disturbance to the public in areas adjacent to the Work and to occupants of buildings in the vicinity of the Work.
D. Noise Control Measures. Contractor shall implement the following noise-control measures to reduce and control noise generated from construction, demolition, and construction related activities:
   1. Restrict noise-producing construction activities to between 7:00 a.m. and 7:00 p.m. on weekdays. If construction is scheduled for Saturdays or Sundays to avoid disrupting college operations, restrict noise-producing construction activities to between 9:00 a.m.
and 5:00 p.m. Construction on Sundays shall be avoided, if possible, and there will be no construction on public holidays without prior written request submitted to and written approval returned by the District, at its sole discretion. A decision by the District to deny Sunday or holiday work shall not be deemed to cause a delay in the Contract Time. When activities must occur outside the hours specified above, conform with notification requirements of this Section and utilize local barriers around equipment and other noise attenuating devices if necessary to limit noise to acceptable levels.

2. Comply with all City of San Pablo requirements regarding both allowable hours of Work and noise level limitations.

3. All construction equipment shall have appropriate mufflers, intake silencers, and other required noise-control features, shall be properly maintained and in compliance with State standards.

4. Vehicles and other gas or diesel powered equipment shall be prohibited from unnecessary warming up, idling, and engine revving.

5. Impact tools shall utilize “quiet technology” to minimize noise.

E. Secure written permission from Construction Manager at least three (3) working days prior to using noisy and vibratory equipment, such as jackhammers, concrete saws, impact tools, and high frequency electrical equipment. Cooperate with District if the use of noisy equipment becomes objectionable to college employees and/or students.

F. The work must be conducted so that nearby residents and college operations in surrounding facilities and classrooms will not be disturbed at any time during any phase of the Work including, but not limited to, the following requirements:

1. Do not use loud vocal or mechanical signals. Use of outside speakers, loud radios and similar devices are prohibited.

2. Work shall be performed in a manner to prevent nuisance conditions such as noise which exhibits a specific audible frequency or tone (e.g., backup alarms, poorly maintained equipment, brake squeal, etc.) or impact noise (e.g., jackhammers, hoe rams). The District will make any final interpretation concerning whether or not nuisance noise conditions exist. Only the District representatives and specifically designated College representatives have the authority to stop the Work until nuisance noise conditions are resolved, without additional Contract Time or compensation for the Contractor.

1.4 DUST CONTROL

A. Contractor shall implement dust control measures to protect air quality during construction to control dust emissions generated during construction, implement the following Bay Area Air Quality Management District (BAAQMD) measures for construction emissions of particulate matter over 10 microns in size (PM10).

1.5 TRAFFIC CONTROL

A. Contractor shall implement traffic control to minimize the effects of construction traffic on the campus and surrounding residential areas, as appropriate.

B. Contractor shall notify the District, Architect, Construction Manager, Project Inspector, Campus Police Department, city and county agencies, as applicable, a minimum of five (5) working days in advance of performing work which necessitates closing or interfering with traffic on public
thoroughfares, parking areas, driveways and walks. Obtain written permission prior to effecting such closures and interruptions.

1.6 SPILL PREVENTION, CONTROL AND COUNTERMEASURES

A. Contractor shall implement Spill Prevention, Control and Countermeasures to minimize the potential for and effects from spills of hazardous, toxic or petroleum substances during construction and demolition activities.

B. The federal reportable spill quantity for petroleum products, as defined in 40 CFR 110, is any oil spill that includes any of the following:
   1. Violates applicable water quality standards.
   2. Causes a film or sheen on or discoloration of the water surface or adjoining shoreline.
   3. Causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines.

C. If a spill is reportable, notify the District’s Representative and take action to contact appropriate safety and clean-up crews.
   1. A written description of reportable releases must be submitted to the District’s Representative and to the San Francisco Bay Regional Water Quality Control Board (RWQCB). This submittal must contain a description of the spill, including the type of material and an estimate of the amount spilled, the date of the release, an explanation of why the spill occurred and a description of the steps taken to prevent and control future releases. Document the releases on a spill report form.
   2. If a reportable spill has occurred and results determine that project activities have adversely affected surface water or groundwater quality, the District will engage a registered environmental assessor at Contractor’s expense for a detailed analysis to identify the likely cause of contamination. This analysis will conform to American Society for Testing and Materials (ASTM) standards and will include recommendations for reducing or eliminating the source or mechanisms of contamination.
   3. Based on this analysis, the Contractor shall select and implement measures to control contamination, with a performance standard that groundwater quality must be returned to baseline conditions. These measures will be subject to approval by the District.

1.7 TREE PROTECTION

A. Definitions:
   1. Dripline: If applicable, the area on the ground from the trunk of any tree to the point directly below the outermost tips of the foliage of that tree.
   2. Root Protection Zone ("RPZ"): If applicable, the areas enclosed with tree protection fencing as designated on the drawing(s).
   3. Tree damage: If applicable, tree damage shall include, but not limited to, the following: Significant injury to the root system or other parts of a tree including burning, application of toxic substances, damaging through contact with equipment or machinery, changing the natural grade within the Dripline or RPZ, compacting the soil within the Dripline or RPZ, interfering with the normal water requirements of the tree, unauthorized trenching or excavating within the Dripline or RPZ, or unauthorized removal of more than 1/3 of the live wood, foliage or roots.
B. Root Protection: No storage of materials or equipment will be allowed within the Dripline. Whenever possible, excavation shall be on a radial line, diverging from the tree trunk. For items of Work delayed materially beyond Date of Substantial Completion, provide update submittal within 14 Days after acceptance, listing date of acceptance as start of warranty period.

C. Exposure to harmful substances: No storage or dumping of any substances that may be harmful to trees shall occur at any location on the Site.

D. Where construction is to be performed in the vicinity of trees and shrubbery, the Work shall be carried on in a manner that will cause minimum damage. District will designate trees that are to be removed. Under no circumstances are additional trees to be removed without written permission from District. Trees and shrubbery that are not to be removed shall be protected from injury or damage resulting from Contractor’s operations.

E. Any tree that is removed without District’s permission or is irreparably damaged, in the opinion of District, shall cost Contractor in damages [$100.00] per square inch of cross section, measured at 4 ½ feet above ground, but not less than [$250.00], such cost to be deducted from monies due or to become due under the Contract. If tree protection is not performed or is not performed adequately and District determines that a tree has been irreparably damaged, Contractor shall pay the same amount of damages as for unauthorized removal of a tree. Contractor shall immediately report all tree damage to District, so that District may determine applicable damages.

1.8 MIGRATORY BIRD PROTECTION

A. If applicable, conduct vegetation and tree removal outside of the migratory bird nesting season. The typical nesting season for migratory birds in this part of California is March 1st through July 31.

B. If vegetation and tree removal must take place during the nesting season, these activities shall be preceded by a survey for nesting migratory birds by the District’s qualified ornithologist. If bird nests are discovered in the trees or on the buildings, they shall not be removed while the nest(s) are active.

1.9 CULTURAL RESOURCES PROTECTION

A. If buried cultural resources, such as chipped or ground stone, historic debris, building foundations or human bones or paleontological resources are discovered inadvertently during ground-disturbing activities, Contractor shall avoid any further disturbance of the materials and immediately discontinue earthwork within 100 feet of the find. Contractor shall notify District’s Representative immediately upon encountering cultural resources. Contractor shall be prepared to move on to another location or phase of work, allowing sufficient time for District’s Representative to evaluate the nature and significance of the find and implement appropriate management procedures.

B. In the event that prehistoric human remains are encountered, further excavation or disturbance of the site shall cease immediately, pursuant to Health and Safety Code 7050.5. Contractor shall notify District’s Representative immediately upon encountering human remains. Contractor shall move on to another location or phase of Work to allow proper assessment of the situation.

C. If human remains of Native American origin are discovered during project construction, it will be necessary to comply with State laws relating to the disposition of Native American burials,
which fall under the jurisdiction of the NAHC (Public Resources Code (PRC) Section 5097. Consequently, if any human remains are discovered or recognized in any location other than a dedicated cemetery, there will be no further excavation or disturbance of the site or any nearby areas reasonably suspected to overlie adjacent human remains:

1. Until the Contra Costa County Coroner has been informed and has determined that no investigation of the cause of death is required;

2. If the remains are of Native American origin;
   a. The descendants of the deceased Native American(s) have made a recommendation to the landowner or the person responsible for the excavation work regarding means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in PRC Section 5097.98 or
   b. The NAHC has been unable to identify a descendent or the descendent failed to make a recommendation within 24 hours after being notified by the NAHC.

**PART 2 – PRODUCTS** - Not Used.

**PART 3 – EXECUTION** - Not Used.

END OF SECTION 01416
1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this section without limitation.

1.2 REQUIRED TEMPORARY FACILITIES AND CONTROLS

A. Site Contractor has primary responsibility to provide and maintain all temporary facilities, utilities, and controls as required to perform the Work and as required herein. **These facilities shall remain in place for the duration of the project and shall be available to the other two prime contractors (Modular Contractor and ELV Contractor).** Materials, installation, and maintenance of temporary utilities and facilities shall comply with all applicable local and State regulatory requirements. Remove temporary utilities and facilities, including associated materials and equipment, when no longer required. Restore and recondition existing facilities used during construction and areas of the Site, roads, driveways, parking lots, landscaping, and any other existing improvements either damaged or disturbed by the installation of temporary facilities or utilities to their original condition. Remove and properly dispose of debris resulting from removal and reconditioning operations.

B. The District, Architect and Inspector will use existing facilities on campus for their offices and the weekly project OAC meeting. Each prime contractor may provide its own trailer or storage container as needed for its own use.

C. Site Contractor shall furnish and install requirements for temporary utilities, facilities, security, and protection, which include but are not limited to the following:

1. **Temporary Electric Power and Lighting**
   a. The District will make available existing electric power sources in its distribution system to facilitate the Contractor’s completion of the Work. However, the installation and removal of all temporary distributions of power to these existing facilities throughout the Site shall be the sole responsibility of the Site Contractor without adjustment to the Contract Sum or the Contract Time. The Contract Sum shall not be adjusted because of any disruption, reduction or elimination of electrical power service to the Site, unless the same is caused by the District’s non-payment of undisputed utility charges for such electrical power service. Site Contractor shall provide a minimum of 3 power poles with outlets for construction operations.

   b. Site Contractor shall provide and maintain electrical power at the Site for construction purposes, for temporary facilities and trailers, and for any other site offices or trailers required by the Contract Documents. Contractor shall provide all necessary wiring and appurtenances for connection to District’s system. Connect to District power at location(s) as directed by District.
c. The Site Contractor shall provide temporary power main service disconnect and over
current protection at convenient locations and as required by governing codes. Site
Contractor shall verify characteristics of District power available for temporary service
use. Provide all transformers and/or other equipment necessary to modify District
power for temporary use by the Contractor. Contractor shall pay all costs associated
with any necessary modifications to District power for temporary use on the Work. The
power main service shall be available to other prime contractors.

d. Each prime contractor shall be responsible for providing temporary power cords, spider
boxes and task lighting for its own work required from the points of connection
provided by the Site Contractor.

2. Temporary Communications/Telephone

a. The Site Contractor shall provide, maintain, and pay for a point of connection for
communications and data services such as telephone, facsimile, e-mail and internet.
Each prime contractor will provide its own field office, if needed, with its own
communications equipment. The installation and removal of all temporary telephone
and data distribution shall be the sole responsibility of the prime contractor ordering
the service without adjustment of the Contract Sum or the Contract Time. Routing of
the new lines shall be acceptable to the District prior to installation.

b. Site Contractor to provide a list of important telephone numbers at each telephone on
the site offices including, but not limited to the following:
   i) Police and Fire Departments
   ii) Campus Police
   iii) Ambulance Service
   iv) Contractor’s home office
   v) All Principal Subcontractors’ field and home offices
   vi) Architect’s office
   vii) Engineer’s office
   viii) District office
   ix) Project Manager
   x) Project Inspector
   xi) Building & Grounds Department
   xii) Testing Laboratory

c. Each prime Contractor shall provide its superintendent with cellular telephone for use
when away from field office.

3. Temporary Water

a. The District will furnish and pay for water during the course of the work to the extent
water is available on the Site. The Site Contractor shall be responsible for providing
all temporary facilities required to deliver District water from the campus point of
connection to connection points of intended use on the project site. The water
service shall be available to other prime contractors.
b. Prime contractors shall be allowed to utilize water from the District for domestic use only. Water shall not be provided nor used for dust control, street cleaning, cleaning tools, soil compaction, or vehicle washing. Water used for such purposes shall be provided by each Contractor as needed for its own work at its own expense.

c. Site Contractor shall provide at least 3 hose bib points of connection around the site. Each prime contractor shall provide and maintain its own, pipes, hoses, nozzles, and fittings as needed for its work. Before final acceptance, all temporary water supply components installed by Site Contractor shall be removed in a manner approved by District’s Representative.

d. Unnecessary waste of water will not be permitted. Special hydrant wrenches shall be used for opening and closing fire hydrants. In no case shall pipe wrenches be used for this purpose. Each prime contractor shall obtain written approval and pay all required fees of governing agencies having jurisdiction (e.g., EBMUD and Fire District) prior to using any fire hydrant water on or off Contra Costa Community College District property.

e. Site Contractor shall provide and use backflow preventers on water lines at point of connection to any District water supply. Backflow preventers shall comply with requirements of California Uniform Plumbing Code. The installation and removal of all temporary backflow preventers on the Site shall be the sole responsibility of the Contractor without any adjustment to either the Contract Sum or the Contract Time. Before final acceptance, all temporary connections and piping installed by Contractor shall be removed in a manner approved by District’s Representative.

f. Each prime contractor shall provide and make potable water available for human consumption to its work force.

4. **Temporary Fences**

a. Temporary Fencing: Site Contractor shall provide temporary fencing around construction site perimeter and any additional staging areas approved by the College for public safety, security and protection. Provide chain link fencing not less than eight (8) feet in height, complete with metal posts and required bracing for this high wind area, anchorage, visual screening, and with truck and pedestrian gates. All vehicle and pedestrian gates and openings shall have gates secured after hours of operation. Moveable fence sections are acceptable.

b. Temporary fencing as needed for utility work on campus, but outside the immediate project site, will be provided for the duration of that work by the prime contractor installing the utilities.

c. Site Contractor shall provide padlocks used for securing all gates. Padlocks shall be designed to prohibit cutting of shackle. Contractor shall coordinate keying strategy with District.

d. Site Contractor shall be responsible for locking gates while it is working on site. During phases of the work when the Site Contractor is not on site, the District’s Representative will assign this responsibility to another prime contractor. Gates shall be secured with minimum 3/8-inch-thick, 30 grade coil chain, minimum 5/16-inch cable. Gates shall be kept closed and locked at all times when not in use.
e. All existing fences affected by the Work shall be maintained by Site Contractor until Final Completion of Project. Fences which interfere with construction operations shall not be relocated or dismantled until District gives written permission to do so, and the timing of fence relocation or dismantling has been agreed upon. Where fences must be maintained across the construction easement, adequate gates shall be installed. Site Contractor shall furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gate.

f. In the event the ELV Contractor or Modular Contractor moves any fencing to facilitate its work, that prime contractor shall replace and secure the fencing at the end of each workday, or sooner if the work is finished before the end of the day.

g. Site Contractor will be responsible for maintaining security by limiting number of keys and restricting distribution to authorized personnel. One key shall be provided to each prime contractor.

h. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft and similar violation of security.

i. Each prime contractor shall provide secure lockup for its own stored materials and equipment which are of value or attractive for theft. Each prime contractor shall be responsible for project security for its own materials, tools, equipment, supplies and completed and partially completed Work.

j. On completion of the Work across any tract of land, Contractor shall restore all fences to their original or to a better condition, and to their original locations.

5. Temporary Protection of Public and Private Property

a. Each prime contractor shall protect, shore, brace, support and maintain service for all utilities affected by its work. This includes but is not limited to piping, conduit, utility structures, vaults, boxes, grates, covers and underground construction uncovered or otherwise affected by construction operations. Site Contractor has primary responsibility for protection and maintenance of underground gas, storm, sanitary, water, fire service and irrigation systems. Electrical and Low Voltage Contractor has primary responsibility for protection and maintenance of underground electrical power and communications utilities.

b. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences and other surfaces structures affected by construction operations, together with all sod and shrubs in yards, planting areas, and medians, shall be restored to their original condition, wherever affected by construction operations. All replacements shall be made with new materials.

c. Each prime contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from that contractor’s Work. Site or any part thereof, whether by contractor or subcontractors. The prime contractor responsible for damage shall be solely responsible without adjustment of the Contract Sum or the Contract Time to make satisfactory and acceptable arrangements with the District, or
the agency or authority having jurisdiction over the damaged property, concerning its repair or replacement or payment of costs incurred in connection with the damage.

d. All fire hydrants and water control valves shall be kept free from obstruction and available for use always by the Fire District.

6. **Temporary Sanitary Facilities**

   a. Site Contractor shall provide and maintain temporary sanitary toilets for use of all workers throughout the course of the Work. At a minimum, sanitary facilities shall be located at the trailer site, Contractor staging area(s) and adjacent to Work areas. *Temporary Sanitary facilities shall be available to all prime contractors for the duration of the project whether or not the Site Contractor is on site working at the time.*

   b. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the Project, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least (1) toilet will be furnished for each (15) persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

   c. Site Contractor shall comply with all minimum requirements of the Contra Costa Health Department or other public agency having jurisdiction.

   d. Maintain temporary facilities in a sanitary condition at all times during the Project.

   e. Site Contractor will keep sanitary facilities free from graffiti.

   f. Use of toilet facilities in the Work under construction shall not be permitted.

   g. Contractor is not permitted to use existing Campus toilet facilities.

   h. All Portable toilets shall be located within fenced areas of the Project Site

   i. Site Contractor shall be responsible for providing access to the temporary toilet facilities.

7. **Temporary Barriers and Enclosures**

   a. Site Contractor shall provide barriers to prevent unauthorized entry to construction areas to allow for District’s use of the Site, and to protect existing facilities and adjacent improvements from damage during construction operations.

   b. Site Contractor shall provide barricades as required by the Contract Documents, governing agencies, and/or field conditions to protect public access pathways to existing buildings scheduled to remain open during any Phase of the Work.

   c. Site Contractor shall provide and maintain temporary enclosures to prevent public entry to any construction area, and to protect all persons using other existing buildings and portions of the Site and/or Premises Contractor shall maintain safe access to all existing facilities to remain in operation during any phase of the Work.

8. **Temporary Pollution Control**

   a. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris and other substances resulting from construction activities. No sanitary wastes shall be permitted to enter any drain or watercourses other than sanitary sewers. No sediment, debris or other substance shall be permitted to enter
sanitary sewers without authorization of the receiving sanitary sewer service and all possible Best Management Practices (BMPs) shall be taken to prevent such materials from entering any drain to watercourse. Rate of discharge for storm water may be not increased by the Project during or following construction.

b. In the event that dewatering of excavations is required, Contractor shall obtain the necessary approval and permits for discharge of the dewatering effluent from the local jurisdiction. Contractor shall be responsible for assuring that water quality of such discharge meets the appropriate permit requirements prior to any discharge.

c. Contractor shall comply with the District’s Storm Water Pollution Prevention Plan, if applicable for this Project.

9. Construction Aids
   a. Contractor shall furnish, install, maintain and operate all construction aids as required for the performance of the Work. Such construction aids include, but are not limited to, elevators and hoists, cranes, temporary enclosures, swing staging, scaffolding, and temporary stairs.

10. Erosion Control
    a. Contractor shall comply with the District Storm Water Pollution Prevention Plan for this Project if applicable.
    b. Contractor shall prevent soil erosion on the Site and adjacent property resulting from its construction activities to the maximum extent practical, including implementation of Best Management practices. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation or other operations that will disturb the natural protection.
    c. Work shall be scheduled to expose areas subject to erosion for the shortest possible time and natural vegetation shall be preserved to the greatest extent practicable. Temporary storage, temporary construction buildings and temporary Field office buildings shall be located, and construction traffic routed to minimize erosion. Contractor shall provide temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

11. Vehicular and Pedestrian Traffic Controls
    a. The Campus is an active site, with vehicular and pedestrian traffic occurring at all times of the day and all days of the week. Contractor shall coordinate with District’s Representative concerning vehicular traffic associated with the construction to minimize disruption to college operations. Delivery trucks and large equipment shall enter the Contractor’s access gate and shall use the route mutually agreed upon between District and Contractor. Contractor shall provide signage directing construction and delivery traffic to this gate. Contractor shall provide information regarding sign types, size, material, text and locations to be reviewed and approved by the District Representative, and the Campus prior to installation. See Article 12 below for additional requirements.
    b. Contractor shall keep all required Fire District and emergency vehicle access paths free from obstruction always during the Project.
12. **Temporary Signage**

a. Sign must be reviewed and approved by the District and the Campus prior to installation. Contractor shall use an experienced sign company to produce all temporary signs. Install signs where indicated in Contract Documents, and/or as required by the District. Unauthorized signs are not permitted.

b. Site Contractor shall provide temporary directional way-finding signs around the Project site to guide faculty, students, and visitors to safely navigate around construction activities at the Project site and to warn faculty, students, and visitors of potential safety hazards. Contractor shall provide a minimum of 10 way-finding signs on metal posts to match existing at the Site, or on fencing or other structures as approved by the District. A sample way-finding sign is attached at the end of this section that provides basic dimensions, materials, backgrounds and related information. However, final proposed signs by Contractor shall be reviewed and approved by the District and Campus prior to fabrication and installation.

c. In addition to way-finding signs, additional safety sign types shall include, but not be limited to: Danger/Construction Area/No Trespassing; Caution/Demolition Work in Progress; Do Not Enter/Authorized Personnel Only; Warning/Hard Hat Required Beyond this Point; Eye Protection Required Beyond this Point; Danger/Flammable Materials/ No Smoking Within 25 Feet; Danger/Keep Gate Closed; Caution/Laser Operation in Use; Caution/Overhead Work in Progress; Power Actuated Tools in Use; All Visitors Report to Job Trailer; Eye Wash Station; Authorized Access Only; Danger/No Trespassing; Caution/Construction Traffic; Caution/Pedestrian Traffic; Building Closed, and Contractor Deliveries. All signs shall be in both English and Spanish; and shall be in a quantity required and applicable as approved by the District. A sample safety sign type is attached at the end of this section for general guidance, but final proposed signs by Contractor shall be reviewed and approved by the District and Campus prior to fabrication and installation.

d. Contractor shall maintain and touch-up signs so they are legible at all times.

**PART 2 – PRODUCTS**

2.1 **MATERIALS - Not used**

**PART 3 - EXECUTION**

3.1 **INSTALLATION, GENERAL**

A. Locate Contractor facilities where they will serve Project adequately and result in minimum interference with performance of Work. Relocate and modify facilities as required by progress of the Work during entire project.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

C. Contractor shall verify and coordinate all relocation of facilities with the District Representative.
3.2 **OPERATION, TERMINATION AND REMOVAL**

A. **Supervision:** Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. **Maintenance:** Maintain facilities in good operating condition until removal.

1. Where appropriate, maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. **Temporary Facility Changeover:** Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion and acceptance by the District.

D. **Termination and Removal:** Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use a permanent facility or no later than Final Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

13. Materials and facilities that constitute temporary facilities are property of Contractor. District reserves the right to take possession of Project Identification signs, if any, at no cost to the District.

14. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs and sidewalks at temporary entrances, as required by authorities having jurisdiction.

15. Clean and renovate permanent facilities used during construction period prior to Final Completion.

**END OF SECTION 01500**
SAMPLE 1

AA, BIO, HS, LA, & PS BUILDINGS, BOOKSTORE, LIBRARY, POLICE

- .080 ALUMINUM
- BACKGROUND: REFLECTIVE WHITE
- BLACK TEXT AND GRAPHICS
- ISA PAINTED FEDERAL BLUE WITH WHITE GRAPHIC AND BORDER
SAMPLE 2

Sign 0009  QTY ______

Sign 0010  QTY ______

Sign 0011  QTY ______

Sign 0012  QTY ______

WARNING: CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM ARE PRESENT IN YOUR WORK AREA

Aphalt, sand, diesel engine exhaust and other materials in your work area contain chemicals known to the state of California to cause cancer and/or reproductive harm. Exposure to some or all of these chemicals occurs during paving operations and related activities. Always familiarize yourself with the hazards of the materials and equipment you are using and follow the precautions indicated on the product labels, Material Safety Data Sheets and your health and safety training program.

WARNING ADVENTENCIA

NO SMOKING OR EATING INSIDE BUILDING

NO FUMAR O COMER DENTRO DEL EDIFICIO

DANGER PELIGRO

OVERHEAD POWER LINES
LINEAS ELECTRICAS ELEVADAS

CAUTION CUIDADO

OVERHEAD WORK IN PROGRESS
TRABAJO EN PROGRESO-ARRIBA
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY

A. The District has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

B. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

1.3 WASTE MANAGEMENT GOALS FOR THE PROJECT

A. The District has established that this Project shall minimize the creation of construction and demolition waste, and shall divert a minimum of 75% of Project generated waste from landfills. Factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination, shall be minimized. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized. Both recycled and waste need to be logged and documented by volume and weight.

B. Diversion Goals: A minimum 75% of total Project waste shall be diverted from landfill. The following waste categories, at a minimum, shall be diverted from landfill. These materials include, but not limited to:

1. Landscape and land clearing debris (green wood materials)
2. Asphalt pavement
3. Gravel and aggregate products
4. Concrete
5. Masonry scrap and rubble (brick, concrete, masonry, stone)
6. Metals (ferrous and nonferrous)
7. Clean wood (dimensional lumber, sheet goods, millwork, scrap, pallets)
8. Plastics (films, containers, PVC products, polyethylene products)
9. Asphalt/Bituminous roofing
10. Insulation Materials
11. Glass (un-tempered)
12. Door and window assemblies
13. Carpet and carpet pad
14. Fibrous acoustic materials
15. Ceiling Tiles
16. Plumbing fixtures and equipment
17. Mechanical equipment
18. Lighting fixtures and electrical components  
19. Cardboard packing and packaging  
20. Furniture  
21. Sheet Rock  
22. Electronic Waste  
23. Universal Waste  
24. Paper

1.4 REFERENCES AND RESOURCES


B. The following sources provided for references:
   1. BuildingGreen.com  
   2. California Integrated Waste Management Board  
   3. EPA Office of Solid Waste and Energy Response  

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.

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.

1.6 WASTE DIVERSION DOCUMENTATION

A. Provide the District with delivery receipts for the recovered materials and waste materials sent to the permitted recycling facilities, processing facilities, or landfill with the following information on a form to be approved by the District:
   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

B. Application for Progress Payments: Contractor shall submit with each Application for Progress Payment a Summary of the project waste generated. Failure to submit this information shall render the Application for Payment incomplete and shall delay Progress Payment. The District
and its representatives shall not be responsible for delaying Progress Payments. With each Application for Payment, submit required Progress Documentation, including:

1. manifest,
2. weight tickets,
3. receipts,
4. and invoices specifically identifying the project and waste material.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 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. Insure 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 District for disposal of the contaminated material. Directions from the District 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.

3.2 PROJECT CONDITIONS

A. 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 waste management process.
3. A site management plan shall be created by the Contractor including: work areas, materials processing areas, materials storage and disposal areas, worker hand-washing and changing stations, first aid and medical information.

END OF SECTION 01505
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in
      this document, and provisions in the General Conditions and other Specification Sections shall
      apply to this Section without limitation.

1.2 SUMMARY
   A. This section includes administrative and procedural requirements for Operation and
      Maintenance (O&M) data and documents.

1.3 FORMAT
   A. Contractor shall compile O&M manuals for all building equipment including mechanical,
      plumbing and electrical equipment, commissioned or not.
   B. Submit O&M Data specifically applicable to this contract and a complete and concise depiction
      of the provided equipment, product, or system, stressing and enhancing the importance of
      system interactions, troubleshooting, and long-term preventative maintenance and operation.
      Organize and present information in sufficient detail to clearly explain O&M requirements at
      the system, equipment, component, and subassembly level. Include an index preceding each
      submittal. Submit in accordance with this section and Section 00700, General Conditions.
      1. Package Quality. Documents must be fully legible. Poor quality copies and material with
         hole punches obliterating the text or drawings will not be accepted.
      2. Package Content. Data package content shall be as shown in the paragraph titled
         "Schedule of Operation and Maintenance Data Packages." Comply with the data package
         requirements specified in the individual technical sections, including the content of the
         packages and addressing each product, component, and system designated for data
         package submission.
      3. Changes to Submittals. Manufacturer-originated changes or revisions to submitted data
         shall be furnished by the Contractor if a component of an item is so affected subsequent
         to acceptance of the O&M Data. Changes, additions, or revisions required by the
         Architect or District Project Manager for final acceptance of submitted data, shall be
         submitted by the Contractor within 30 calendar days of the notification of this change
         requirement.

1.4 SYSTEMS COVERED
   A. The Contractor shall supply the required information for all systems identified in Contract
      Documents. A separate manual or chapter shall be provided for all new equipment or systems
      referenced in the Contract Documents.
1.5 **COMPUTER PROGRAMS**

A. When any equipment requires operation by computer programs, submit copy of original program on CD, with a hard-copy and an electronic copy (Adobe PDF format) of all user manuals and guides for operating the programs. Program shall be Windows compatible, latest edition or as requested by the District. Provide required licenses to District at no additional cost.

1.6 **SUPPLEMENTAL DATA**

A. Contractor shall prepare written text and/or special drawings to provide necessary information when manufacturer’s standard printed data is not available and/or additional information is necessary for a proper understanding and operation and maintenance of equipment or systems, or when it is necessary to supplement data included in the manual or Project documents.

1.7 **SCHEDULE OF INFORMATION FOR OPERATION AND MAINTENANCE DATA PACKAGES**

A. Supply all of the following, when and where applicable, for each O&M data package:
   1. Safety precautions
   2. Operator prestart
   3. Startup, shutdown, and post-shutdown procedures
   4. Normal operations
   5. Emergency operations
   6. Operator service requirements
   7. Environmental conditions
   8. Lubrication data
   9. Preventive maintenance plan and schedule
   10. Cleaning recommendations
   11. Troubleshooting guides and diagnostic techniques
   12. Wiring diagrams and control diagrams
   13. Maintenance and repair procedures
   14. Removal and replacement instructions
   15. Spare parts and supply list
   16. Special tools required to service or maintain the equipment
   17. Corrective maintenance man-hours
   18. Product submittal data
   19. O&M submittal data
   20. Parts identification
   21. Warranty information
   22. Personnel training requirements
   23. Testing equipment and special tool information
   24. Testing and performance data
   25. Installing Subcontractor information

**PART 2 – PRODUCTS** - Not Used.

**PART 3 – EXECUTION** - Not Used.

**END OF SECTION 01785**
SECTION 01820
DEMONSTRATION AND TRAINING PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Specification Sections shall apply to this Section without limitation.

1.2 SUMMARY
A. This Section includes administrative and procedural requirements for instructing District’s personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment
   2. Training in operation and maintenance of systems, subsystems, and equipment
   3. Demonstration and training videos

1.3 SUBMITTALS
A. At completion of training, provide two (2) complete training manuals for the District’s use.
B. Attendance Record: For each training module, provide list of participants and length of instruction time.

1.4 QUALITY ASSURANCE
A. Instructor Qualifications: A factory-authorized service representative or District approved equivalent, complying with requirements in Section 01400 (Quality Control Requirements), and technical specification sections where required. Service representative shall be experienced in operation and maintenance procedures and training for Project specific systems and equipment.
B. Contractor shall coordinate instruction schedule and verify availability of educational materials, instructor’s personnel, audiovisual equipment, and facilities needed to avoid delays.
C. For instruction that must occur outdoors, review weather forecast and provide alternatives if conditions are unfavorable.

1.5 COORDINATION
A. Contractor shall coordinate instruction schedule with District Construction Manager.
B. Provide written notice ten (10) working days in advance to District Construction Manager, and Architect prior to any scheduling instruction sessions. District Construction Manager shall furnish Contractor with names and positions of intended participants.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM
A. Program Structure: Contractor shall develop and provide instruction program that includes group training modules for each system and equipment not part of a system, but included in individual Specification Sections.
B. Training Modules: Contractor shall develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Review basis of system design
2. Operational requirements and criteria, including:
   a. System, subsystem, and equipment descriptions
   b. Operating standards
   c. Regulatory requirements
   d. Operating characteristics
   e. Limiting conditions
   f. Performance curves
3. Detailed review of documentation, including:
   a. Emergency manuals and procedures
   b. Operations manuals and procedures
   c. Maintenance manuals and procedures
   d. Identification systems
   e. Warranties and Guarantees
   f. Maintenance service agreements and similar continuing commitments
   g. Normal shutdown instructions
   h. Required sequences for electric or electronic systems
   i. Special operating instructions and procedures
   j. Troubleshooting and diagnostics
   k. Test and inspection procedures

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up as required at instructional location.

END OF SECTION 01820
PART 1  GENERAL

1.1 SUMMARY
A. Removing above-grade site improvements within limits indicated.
B. Disconnecting, capping or sealing, and abandoning site utilities in place.
C. Disconnecting, capping or sealing, and removing site utilities.
D. Disposing of objectionable material.

1.2 RELATED SECTIONS
A. Section 31 23 00 – Excavation and Fill.

1.3 RELATED DOCUMENTS
A. Geotechnical Report.

1.4 DEFINITIONS
B. CAL-OSHA: California Occupational Safety and Health Administration.

1.5 SUBMITTALS
A. Follow Submittal procedure outlined in Section 01 33 00 – Submittal Procedures.

1.6 PROJECT CONDITIONS
A. Except for materials indicated to be stockpiled or to remain the Owner's property, cleared materials are the Contractor's property. Remove cleared materials from site and dispose of in lawful manner.
B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store where indicated on plans or where designated by the Owner. Avoid damaging materials designated for salvage.
C. Unidentified Materials: If unidentified materials are discovered, including hazardous materials that will require additional removal other than is required by the Contract Documents, immediately report the discovery to the Owner. If necessary, the Owner will arrange for any testing or analysis of the discovered materials and will provide instructions regarding the removal and disposal of the unidentified materials.
PART 2 PRODUCTS

2.1 SOIL MATERIALS
A. Backfill excavations resulting from demolition operations with on-site or import materials conforming to structural backfill defined in Section 31 23 00 – Excavation and Fill.

PART 3 EXECUTION

3.1 PREPARATION
A. Protect and maintain benchmarks and survey control points during construction.
B. Protect existing site improvements to remain during construction.

3.2 RESTORATION
A. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.3 UTILITIES
A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned. Prior to demolition, contact Underground Service Alert.
B. Arrange to shut off indicated utilities with utility companies or verify that utilities have been shut off.
C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless authorized in writing by the Owner, and then only after arranging to provide temporary utility services according to requirements indicated.
D. Coordinate utility interruptions with utility company affected.
E. Do not proceed with utility interruptions without the permission of the Owner and utility company affected. Notify Owner and utility company affected two working days prior to utility interruptions.
F. Excavate and remove underground utilities that are indicated to be removed.
G. Securely close ends of abandoned piping with tight fitting plug or wall of concrete minimum 6-inches thick.

3.4 SITE IMPROVEMENTS
A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
B. Remove slabs, paving, curbs, and gutters, as indicated. Where concrete slabs, curb, gutter and asphalt pavements are designated to be removed, remove bases and subbase to surface of underlying, undisturbed soil.
C. Unless the existing full-depth joints coincide with line of pavement demolition, neatly saw-cut to full depth the length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
D. Remove driveways, curbs, gutters and sidewalks by saw cutting to full depth. If saw cut falls within 30-inches of a construction joint, expansions joint, score mark or edge, remove material to joint, mark or edge.
3.5 BACKFILL

A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 23 33 – Trenching and Backfill.

3.6 DISPOSAL

A. Remove surplus obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off the Owner’s property.

END OF SECTION
SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Stair railings and guardrails.
B. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS
A. Section 32 05 23 - Cement and Concrete for Exterior Improvements.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01330 - Submittal Procedures, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS
A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
B. Allow for expansion and contraction of members and building movement without damage to connections or members.
C. Dimensions: See drawings for configurations and heights.
D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
E. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM
A. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, galvanized finish.
B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
C. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.03 FABRICATION
A. Accurately form components to suit specific project conditions and for proper connection to building structure.
B. Fit and shop assemble components in largest practical sizes for delivery to site.
C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

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

3.02 PREPARATION
   A. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION
   A. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
   B. Install railings in compliance with ADA Standards for accessible design at applicable locations.
   C. Anchor railings securely to structure.
   D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES
   A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
   B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Benches.

1.02 RELATED REQUIREMENTS
A. Section 32 0523 - Cement and Concrete for Exterior Improvements: Bollard infill and underground encasement.

1.03 REFERENCE STANDARDS
D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

1.04 SUBMITTALS
A. See Section 01330 - Submittal Procedures, for submittal procedures.
B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.
C. Samples: Submit two sets of manufacturer's available colors for metal furnishings.

1.05 WARRANTY
A. See Section 01330 - Submittal Procedures, for additional warranty requirements.
B. Provide manufacturer's warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Metal Furnishings:
   1. Forms+Surfaces; www.forms-surfaces.com

2.02 METAL FURNISHINGS
A. Metal Furnishings, General:
   1. Cast iron components: Ductile iron castings complying with ASTM A536; cleaned, treated, and powder-coated.
      a. Color: As shown on drawings.
   2. Steel components: Plates, bars, and shapes complying with ASTM A36/A36M and tubing complying with ASTM A500/A500M; cleaned, treated, and powder-coated.
      a. Color: As shown on drawings.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that mounting surfaces, preinstalled anchor bolts, or other mounting devices are properly installed; and ready to receive site furnishing items.
B. Do not begin installation until unacceptable conditions are corrected.
3.02 INSTALLATION

A. Install site furnishings in accordance with approved shop drawings, and manufacturer's installation instructions.

B. Provide level mounting surfaces for site furnishing items.

END OF SECTION
1. **PART 1 – GENERAL**

1.1. **SUMMARY**
   a. This Section describes prefabricated, clear span, permanent modular structures. The prefabricated modular structure shall be erected at the designated site within the State of California, complete and ready for use by Owner.
   b. Extent of Prefabricated Modular Structure is shown on drawings and specified herein.
   c. Definitions:
      1. **Owner**: Contra Costa / Los Medanos College – Safety Center
      2. **Architect**: The entity contracted with the Owner to provide the schematic design and specifications of the modular building as well as design of the low voltage, fire alarm and data systems for the modular buildings.
      3. **Civil Engineer**: The entity contracted with the Owner to design the site improvements and site utilities.
      4. **Site Contractor**: The entity contracted with the Owner to construct the site improvements and site utilities as well as installation of the low voltage, fire alarm and data devices and cabling for the modular buildings.
      5. **Modular Building Contractor**: The entity contracted with the Owner to provide final structural design of the building foundations and modular buildings as well as factory-manufacture the buildings and install them on Owner’s site.
      6. **Temporary Facilities**: A field office is not required for the Modular Building Contract.

1.2. **SUBMITTALS**
   a. **General**: Submit the following according to conditions of contract.
      1. **Product Data**: Submit manufacturer’s product data for all specified materials, products, fixtures and equipment to Architect for verification of conformance with requirements.
      2. **Samples**: For all products or materials involving choices of color, pattern or texture, submit manufacturer’s full-range color cards, or actual samples where feasible, for selection by Owner.
      3. **CalGreen Code**: Submit documentation as necessary to demonstrate and comply with CalGreen Code Mandatory Measures as defined by DSA. Submit letter signed by Modular Building Contractor certifying that modular building complies with requirements.
   b. **Delegated-Design Submittal/Governing Agency Approval**: Project is under the jurisdiction of the California Division of the State Architect (DSA), manufacturer shall submit a delegated design submittal which must be approved by DSA prior to the start of construction.
      1. Submittal shall include necessary drawings, plans, elevations, sections, details of modular buildings, fabrication and installation requirements, anchorage details, and structural calculations prepared, stamped, and signed by a
structural engineer licensed in the State of California. The manufacturer shall be responsible for the design and engineering calculations, the drawings, and for responding to and resolving any comments or issues generated by DSA.

2. The Delegated Design Submittal shall be submitted to the Architect, and the Architect will transmit the submittal to the Division of the State Architect.

3. Manufacturer’s structural engineer shall accompany Architect for final DSA review and approval stamping at designated office of DSA.

1.3. QUALITY ASSURANCE

a. Governing Codes: All work and materials shall comply with the requirements of California Code of Regulations Title 24, 2016 Editions (including supplements) of Parts 1-6, Part 11 - CalGreen Code, regulations of the State Fire Marshal, and any other applicable state or local laws, ordinances and regulations (as required for permanent construction).

b. Modular building plans and structural calculations shall be stamped by a structural engineer registered in the State of California, or as otherwise required by governing agency.

c. The legal entity that manufactures the building modules shall also be their installer; no subcontracting of final installation allowed.

d. Factory Inspection: Inspection of in-plant work or an approved quality control program conducted by an independent agency shall be provided as required by DSA and other agencies having jurisdiction.

e. Modular Building Identification: On each building module, affix a permanent metal tag, 3 inches x 1.5 inches minimum size, with the following information:
   1. Manufacturer’s Name
   2. Manufacturer’s Address
   3. DSA Application Number
   4. Design Roof Loads
   5. Design Wind Load

1.4. WARRANTY

a. Modular Building Contractor unconditionally guarantees that work will be done in accordance with requirements of contract and remain free of defects in workmanship and materials for a period of one (1) year from date of acceptance. Modular Building Contractor agrees to repair or replace any and all work that may prove to be not in accordance with requirements or contract or that may be defective in workmanship or material within guarantee period, without any expense whatsoever to the district, ordinary wear and tear and abuse or neglect accepted.

b. Modular Building Contractor agrees that within fourteen (14) calendar days after being notified in writing by the Owner of any work requiring repair or replacement under warranty, they will commence and prosecute with due diligence all work necessary to fulfill terms of this warranty, and to complete the work within a reasonable period of time.

1.5. BUILDING DESIGN REQUIREMENTS

a. Building Type:
   1. Extent of work is shown on drawings.
   2. Modular buildings shall consist of all new prefabricated modules, including roof, walls, windows, finishes, lighting, electrical, plumbing and mechanical
services. Each module shall be slab-on-grade construction and be engineered by the Modular Building Contractor as follows:

a. A structural steel frame and wood panel framing system (light gauge, cold-formed primary frames not allowed. Light gauge framing allowed for architectural elements).

b. Dimensions as shown on plans may deviate slightly in order to accommodate an approved structural system.

c. Each module shall be capable of resisting all vertical and lateral loads during transportation.

3. Arrange modules as shown on drawings. Components must conform to architectural design appearance shown on plans and requirements specified hereinafter. When modules are assembled, joints shall blend in with the architecture of the building and be watertight.

4. The Modular Building Contractor shall provide drawings and calculations acceptable to the Architect, meeting the provisions of the California Code of Regulations. Modular Building Contractor shall bear all costs for production of drawings and associated structural calculations. Modular Building Contractor shall make all revisions and corrections to those documents required by DSA, and shall resubmit as required to obtain approvals.

5. Modular Building Contractor will deliver to Architect all original reproducible approved drawings and calculations. Original drawings cited here (as submitted by Modular Building Contractor) shall be the original drawings, bearing the original DSA stamp of approval.

6. The Architect’s decisions regarding design aesthetics shall be binding on the Modular Building Contractor. Basic design loads, as well as auxiliary and collateral loads, are as follows:

7. Exterior walls shall be designed to withstand wind loads perpendicular to wall plane equivalent to “Exposure C, 115 mph”. This requirement applies to all exterior walls of building section even though configuration of building may be such that some walls are not exposed to wind.

8. Roofs: Design live load of 20 psf. All roofs shall be designed as diaphragms for resisting applied horizontal loads. Building roof shall be sloped for drainage as indicated on plans. Roof framing shall be designed to withstand wind loads equivalent to “Exposure C; 115 mph”.

9. Design each member to withstand stresses resulting from combinations of loads that produce maximum percentage of actual to allowable stress in that member.

b. Fabrication Criteria:

1. Provide Modular Buildings as produced by a Modular Building Contractor who is regularly engaged in fabrication and erection of Modular Structures of type and quality indicated.

2. Design prefabricated components and necessary field connections required for erection to permit easy assembly.

C. Energy Requirements: Modular Building Contractor shall be responsible for providing and submitting complete energy compliance documentation and calculations as required by California State Energy Code as established by the Energy Efficiency
Standards for Buildings as prescribed by the California Energy Commission.

d. CalGreen Requirements: Modular Building Contractor shall be responsible for providing and submitting documentation as required by DSA and the Architect to demonstrate compliance with CalGreen Code Requirements.

e. Foundations: The building will be erected on a concrete slab foundation designed by the Modular Building Contractor.

f. Plan Approval Agency Submittal:
   1. Modular Building Contractor’s building drawings, standard details, and specifications for building assemblies manufactured hereunder shall be submitted to governing authorities in compliance with governing codes, rules and regulations, and stamped approval obtained thereon as prescribed by state regulations. Modulars must meet State of California, Department of General Services, Division of the State Architect construction requirements.
   2. Additional drawings and instructions deemed necessary to carry out the work included in Contract shall be supplied to or by the Modular Building Contractor.

2. PART 2 – PRODUCTS

2.1. GENERAL
   a. Manufacturers/Products/Substitutions: Manufacturers and products listed are intended to establish a level of quality, size, and material type and finish unless specific products are required for continuity and consistency with Owner’s existing facility.
   b. Single Product Responsibility: Provide products of the same manufacturer for each type of product incorporated into the work.

2.2. DIVISION 02 – EXISTING CONDITIONS
   a. Refer to Geotechnical Report

2.3. DIVISION 03 - CONCRETE
   a. Cast-in-Place Concrete:
      1. Summary: Cast-in-place concrete footings including excavation, slabs on grade, formwork, reinforcing steel, furnish and install all weld plates.
      2. Formwork for Exposed Surfaces: Fabricate forms of solid lumber, plywood, metal or similar form materials that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
         a. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
         b. Slab Flatness: As defined by Floor Flatness (FF) and Floor Levelness (FL) are the values that will provide a flat floor for proper attachment of the modular building
            i. The Specified Overall FF shall be: 100. The Minimum Local Value FF shall be: 50.
            ii. The Specified Overall FL shall be: 66 The Minimum Local Value shall be: 33.
      3. Reinforcing Steel: ASTM A 615/A615M, Grade 60, deformed
      4. Concrete Materials:

b. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

5. Underslab Vapor Retarder: Single ply membrane extruded from virgin grade high-impact polyolefin complying with ASTM E 1745, Class A.
   a. Available Products: Subject to compliance with requirements, provide one of the following products:
      i. Raven Industries Inc.; Vapor Block 15.
      ii. Insulation Solutions Inc.; Viper II 15 mil.
      iii. W.R. Meadows, Inc., Perminator
   b. Product Requirements
      i. Thickness: 15 mils.
      ii. Roll Width: 12 feet minimum.
      iii. Maximum Permeance: ASTM E96 new material 0.010 Perms; ASTM E154 Section 11 after weathering 0.010.
      iv. Puncture Resistance: ASTM D1709, Method B, not less than 3,000 Grams.

6. Concrete Mixtures: Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301, ACI 318, Chapter 4, and Chapter 19A of the California Building Code.
   a. 28 Day Strength: Slabs on grade 4,000 psi; footings 3,000 psi.
   b. Water/Cement Ratio: Slabs 0.45, footings 0.50.
   c. Slump: 4 inches.

7. Concrete Mixing: Ready-mixed concrete; measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

8. Concrete Finishing Slabs on Grade: Comply with ACI 302.1R recommendations or screening, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Provide slabs with trowel finish.

9. Field Quality Control:
   a. Testing and Inspecting Agency: Owner will engage and pay for a qualified independent testing and inspecting agency to perform tests and inspections as applicable and prepare reports.
   b. The Architect and the Division of the State Architect shall have the right to order the testing of any materials used in the concrete construction to determine if they are of the quality specified.
   c. Testing and inspections shall be in accordance with the 2013 California building Code, Section 1704A.4 and Table 1704A.4, DSA Testing and inspections form DSA 103, Structural Drawings Special Inspection Criteria.

b. Concrete Floor Sealer:
   1. Basis of Design: Curecrete Distribution, Inc.; Ashford Formula
      a. Subject to compliance with requirements, submit specified product or a comparable product subject to request for substitution.
   2. Product Description: Water-based chemically reactive penetrating sealer and hardener that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, and allows concrete to achieve full compressive strength, minimizing surface crazing and eliminating dusting.
      a. Abrasion Resistance to Revolving Disks: At least a 32.5% improvement over untreated samples when tested in accordance with ASTM C779.
b. Surface Adhesion: At least a 22% increase in adhesion for epoxy when tested in accordance with ASTM D3359.

c. Hardening: As follows when tested in accordance with ASTM C39:
   i. After 7 Days: An increase of at least 40% over untreated samples.
   ii. After 28 Days: An increase of at least 38% over untreated samples.

d. Coefficient of Friction: 0.86 dry, 0.69 wet when tested in accordance with ASTM C 1028.

e. Rebound Number: An increase of at least 13.3% over untreated samples when tested in accordance with ASTM C805.

f. Light Exposure Degradation: No evidence of adverse effects on treated samples when tested in accordance with ASTM G23.

2.4. DIVISION 04 – THIN BRICK VENEER

   a. Adhered veneer:
      1. Veneer shall be anchored in a manner which will not allow relative movement between the veneer and the wall.
      2. Anchored or adhered veneer shall not be used on overhead horizontal surfaces.
      3. Units of tile, masonry, stone or terra cotta which exceed 5/8” (916mm) in thickness shall be applied as for anchored veneer where used over exit ways or more than 20 feet in height above adjacent ground elevation.
      4. Veneer shall develop a bond to the backing in accordance with TMS 402, section 6.3.2.4

2.5. DIVISION 05 - METALS

   a. Structural Steel Framing
      1. Steel Materials: Structural steel members shall comply with CBC, Chapter 22A.
         a. W-Shapes: ASTM A992
         b. Plate, Bar, Channels and Angles: ASTM A36.
         c. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B, structural tubing.
         d. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B
         e. Sheet Steel: ASTM A-570 (Grade 33 or 40)
         f. Bolts
            i. General Use: Regular hexagon head type, ASTM A307, Grade A
            ii. High Strength: ASTM A325, Type 1 or 2
      2. Welded Connections: Comply with AWS D1.1 “Structural Welding Code-Steel” and AWS D1.8 “Structural Welding Code-Seismic”. Special inspection of welding shall comply with CBC Section 1704A.
      3. Steel frame building shall comply with the design requirements specified.
      4. Factory paint all members with manufacturer’s standard primer.

   b. Metal Fabrications
      1. Metal Fabrications: Steel shapes, plates, bars, pipe and tubing as indicated or required to support non-structural elements. Weld, bolt or screw components together as appropriate for assembly.
      2. Steel materials shall comply with material requirements as “Structural Framing.”

2.6. DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

   c. Wood Framing Standards: NFPA House Framing Manual, 15% moisture content and sized to accommodate R-19 wall insulation.
      1. Exterior Wall Framing: 2 inch by 6 inch nominal studs, 16 inches on center.
2. Interior Wall Framing: 2 inch by 4 inch nominal studs, 16 inches on center.
3. Grades: All framing lumber shall be D.F. No. 2 or better, except 6x posts and beams/headers shall be D.F. No. 1.
4. Fire Blocking: Continuous solid wood or as otherwise permitted by CBC Chapter 7; provide continuous line of 2x blocking at ceiling height.

d. Sheathing:
   1. Plywood Roof and Wall (shear panel) Sheathing: Minimum 15/32 inch thick APA rated, Exposure 1 plywood sheathing with exterior glue. Each panel shall be identified with the grade mark of the grading association and shall meet the requirements of DOC PS 1 or DOC PS 2. Provide span ratings as required by engineering calculations.
   2. Exterior Gypsum Sheathing: Glass-Mat Gypsum Wall Sheathing complying with ASTM C1177/1177M.
      a. Subject to compliance with requirements, provide “Dens-Glass Gold” by G-P Gypsum Corporation.
      b. Type and Thickness: 1/2 inch, unless otherwise indicated. c. Size: 48 by 96, 108, or 120 inches.
   3. National Gypsum PermaBase Cement Board

e. Plastic Laminate Casework and Countertops
   1. Frameless cabinets with flush overly door; WI Custom Grade.
   2. Plastic laminate countertops with square self-edge and coved backsplash; WI Custom Grade.
   3. Hardware: 5 knuckle wrap-around overlay door hinges. Other hardware per WI Grade specified.
   4. Color: Manufacturer’s full range

f. Fiberglass Reinforced Plastic

2.7. DIVISION 07 – THERMAL AND MOISTURE PROTECTION
a. Insulation
   1. Unfaced Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
   2. Reinforced-Foil-Faced Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, vapor-retarder membrane on 1 face.
   3. Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb./1000 sq. ft., with maximum permeance rating of 0.0507 perm. Provide material with Class A flame
b. Face Color: White or paintable.

c. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1. Raven Industries Inc.; DURA-SKIRM 6WW.

d. Installation: Install in cavities formed by framing members according to the following requirements:
1. Exterior Walls: Kraft faced vapor retarder thermal insulation. R-19; 6 inch thickness.
4. Insulation support material shall prevent movement of the insulation during transportation. The insulation and support material shall be intact upon delivery to the site and shall completely cover the building envelope.

e. Weather Resistive Barrier: ASTM E 1677, Type I water/air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to DuPont (E.I. du Pont de Nemours and Company); Tyvek CommercialWrap.
2. Provide sealing tape and fasteners as recommended by building wrap manufacturer.
3. Flexible Flashing: Self-adhesive, composite butyl rubber/asphalt tape bonded to high-density polyethylene film, for sealing exterior wall openings.
4. Installation: Extend barrier at modular joints, tape and seal in addition to interior and exterior caulk joint.

f. Acrylic Plaster Finish System:
1. Summary: Acrylic plaster finish system consisting of base coat, reinforcing mesh, and finish coat direct applied to solid substrate.
2. Basis of Design: Total Wall, Inc.; Total Wall Direct Applied (DA) system.
   a. Dryvit Systems, Inc.
   b. Parex USA, Inc.
   c. STO Corporation.
   d. Total Wall
3. Finish Coat: Total Wall, Inc.; 100% acrylic based finish coat.
   a. Color: As selected by Architect from manufacturer’s full range.
   b. Texture: “ShotBlast Fine” per Total Wall Inc.; texture should resemble a cement plaster light dash finish.
      i. Provide sample for Architect’s review and approval.
4. Base Coat: Total Wall, Inc.; EZ Base NCB (Non-Cement Base); factory packaged, ready to use base coat needing only mixing prior to use.
5. Reinforcing Mesh: Manufacturer’s standard polymer coated woven fiberglass mesh.
6. Auxiliary Materials: As recommended in writing by system manufacturer.
7. Application: System shall be applied over exterior gypsum sheathing or cementitious backer board as applicable

g. Single Ply Membrane Roofing:
      a. SRI of not less than 78 per ASTM E1980, initial value of 0.70 with an emissivity of not less than 0.75 when tested according to CRRC-1.
      b. Energy Star listed in DOE’s “Roof Products Qualified Product List”.
      c. Fire Classification: Class B, ASTM E 108 or UL 790.
      d. Wind Resistance: Roofing system shall comply with requirements of ASCE 7.
      e. Basis of Design: Carlisle; 60 mil PVC single ply, ASTM D D 4434, Type III, fabric reinforced, uniform, flexible PVC sheet containing KEE (Elvaloy) to reduce plasticizer migration.
   2. Special Project Warranty: 20 years from date of Substantial Completion, covering all components of membrane roofing system such as roofing membrane, base flashing, fasteners, cover boards, walkway products, crickets, roof curbs, skylights and/or any other type of roof penetration for a weather tight system.
   3. Auxiliary Materials: Provide glass-mat gypsum cover board, flashing sheets, adhesives, sealants, termination bars, fasteners and walk-pads, all as recommended by roofing manufacturer.

h. Preformed Metal Roofing
   1. REFERENCES
      b. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
      c. National Coil Coating Association (NCCA)
      d. Underwriters Laboratories:
         i. UL-790 Test for Fire Resistance of Roof Covering Materials Class ‘B’
         ii. UL-1897 Uplift Test for Roof Covering Systems
   2. QUALITY ASSURANCE
      a. Warranty:
         i. Manufacturer: a Twenty (20) year paint finish guarantee
      b. Roofing System Requirements:
         i. Roofing system shall meet U.L. 90 ratings for wind uplift.
         ii. Use geometrical watershed details to assure waterproofing with minimal reliance on sealants and caulking.
      c. Delivery, Storage, and Handling:
         i. Store and handle materials in conformance with the manufacturer’s latest written recommendations.

3. MANUFACTURERS
a. Metal Sales Magna Loc-24 GA
   i. Minimum Roof Slope Capability: 1:12
b. Metal Sales Clip-Loc-24 GA
   i. Minimum Roof Slope Capability: 1:12
c. AEP SPAN- SL_PSpanLock 24 gaugeCool weathered Copper Dura Tech 5000 or equal.

4. MATERIALS
a. Metal panels shall be 24 gauge 55% Al-Zn Galvalume steel minimum for free span panels and 24 Ga. minimum galvalume where the pans rest on a substrate. 5/8” minimum.
   i. Panels shall be 16’ wide.
   ii. Top finish shall be 1 mil. minimum thick fluoropolymer coating, Kynar 500 or equal.
   • Color as selected by Architect
   iii. Bottom finish shall be shop epoxy baked enamel.
b. Flashings, closures, and trim shall be fabricated of the same materials and finish as panels.
c. Roofing felts shall be 30 lb. asphalt-saturated glass base meeting ASTM D-226.
d. Sealants shall be non-drying, non-toxic, synthetic resin base, and inert inorganic extenders.
   i. Material shall be pre-extruded to 1/4” diameter and packed in paper-separated spools.
   ii. Materials shall properly adhere to both metals and plastics.
   iii. Materials shall retain their sealing properties within a temperature range of -30 degrees Fahrenheit and 180 degrees Fahrenheit.

5. ACCESSORIES OR HARDWARE
a. Fasteners shall be hot dipped galvanized plated in the sizes and spacing recommended by the material manufacturer.
b. Fastening clips shall meet U.L. 90 Standards.
c. U.L. 90-rated retaining clips shall be installed per manufacturer’s recommendations.
   i. In no case less than 12” on center for plywood substrata.

6. SEALANTS
a. Weather Sealants: Silicone or urethane, ASTM C 920. Provide Non-sag or NS type paintable sealant.
b. Non-weather and Acoustical Sealants: Acrylic or paintable siliconized latex, ASTM C 834. Provide Non-sag or NS type sealant.
c. Fire stopping Sealants: In fire rated construction, provide sealants with F, T and L ratings as required. Provide products tested and classified by UL or other accepted testing agency.

2.8. DIVISION 08 – OPENINGS
a. Hollow Metal Doors and Frames
1. Hollow Metal Doors: Doors of design indicated, fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
   a. Core Construction
      i. Exterior Doors: Manufacturer's standard polyisocyanurate core.
      ii. Interior Doors: Kraft paper honeycomb core; one inch cell, phenolic resin impregnated core, laminated to face sheets, full area.
      iii. Fire Rated Doors: Manufacturer’s standard as required to comply with fire-protection ratings indicated.
   b. Door Thickness: 1-3/4 inches unless otherwise indicated
   d. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
   e. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
   f. Exterior Doors: Level 2 and Physical Performance Level B, Extra Heavy Duty, minimum thickness of 0.053 inch thickness (16 gage).
      i. Edge Condition: Model 1.
      ii. Face Sheet Material: Fabricated from metallic-coated steel sheet.
      iii. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
   g. Interior Doors: Level 2 and Physical Performance Level A, Extra Heavy Duty, minimum thickness of 0.053 inch thickness (16 gage).
      i. Edge Condition: Model 1.
      ii. Face Sheet Material: Fabricated from cold-rolled steel sheet.
   h. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
2. Hollow Metal Frames:
   a. Comply with ANSI A250.8 and with details indicated for type and profile.
      i. Fabricate frames with mitered or coped full profile welded corners.
      ii. Frames shall be sized to provide full throat width equal to depth of wall including finishes plus 1/2 inch backbend on each side per SDI-100.
   b. Exterior Frames: Metallic-coated steel sheet, minimum thickness of 0.053 inch (16 gage).
   c. Interior Frames: Cold-rolled steel sheet, minimum thickness of 0.053 inch (16 gage).
   d. Hardware Reinforcement: Fabricate with reinforcement plates from same material as frames with minimum reinforcement according to ANSI/SDI A250.6 and the following:
      i. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
      ii. Lock Face, Closers, and Concealed Holders: Minimum 0.067 inch thick. Provide reinforcement for closers for all door frames whether closers are specified or not.
      iii. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
   e. Sound-deaden concealed faces with 1/8 inch thick undercoating.
   f. Jamb Anchors: Stud-wall type; designed to engage stud, welded to back of frames; not less than 0.042 inch thick. Provide not less than 3
3. Steel Finishes: Clean, pretreat, and apply manufacturer's standard primer.
4. Door Lite Frames: Anemostat Door Products, LoPro or LoPro-IS Series as required for glass thickness specified, or approved equal.
   a. Frame Material: 0.042 inch thick (18 gage) steel of material as follows:
      i. Interior Door Lite Frames: Cold rolled steel of thickness indicated.
      ii. Exterior Door Lite Frames: Hot dipped galvanized of thickness indicated.
      iii. Size: As indicated on Drawings.
      iv. Glazing Thickness: As indicated on Drawings.
      v. Finish: Baked enamel.
      vi. Fasteners: Oval head Phillips wood or sheet metal screws.
      vii. Provide one-way vandal resistant oval head wood or sheet metal screws at exterior doors.
5. Door Louvers: Anemostat Door Products, PLSL Series louver with security grille, or approved equal.
   a. Material: Hot dipped galvanized of thickness indicated.
   b. Security Grille: 0.1046 inch thick (12 gage) steel each side of door with 13/16 inch square holes spaced 1 inch on center each way.
   c. Louver Blades: 0.032 inch thick (20 gage) steel, non-vision inverted split ‘Y’.
   d. Size: As indicated on Drawings.
   e. Free Ventilating Area: 50%.
   f. Finish: Baked enamel.
   g. Fasteners: One-way vandal resistant oval head through bolt, blank one end.
   h. Insect Screens: Provide galvanized insect screens for exterior door louvers installed between split louvers.

b. Overhang Coiling Doors
c. Access Doors and Frames:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Babcock-Davis
      b. Dur-Red Products
      c. J. L. Industries, Inc.
      e. Larsen’s Manufacturing Company
      f. Milcor Inc.
      g. Nystrom Inc.
   2. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
   3. Non-Fire Resistance Rated Flush Access Doors and Frames with Exposed Trim:
      a. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer’s standard-width exposed flange, proportional to door size.
      b. Material:
         i. Uncoated or Metallic Coated Steel Sheet:
            • Locations: Non-fire resistance rated wall and ceiling surfaces
of painted gypsum board.

- Doors: Nominal 0.074 inch (uncoated) or 0.078 inch (coated) (14 gage) thickness.
- Frames: Nominal 0.060 inch (uncoated) or 0.064 inch (coated) (16 gage) thickness.
- Finish: Factory prime finish, manufacturer’s standard baked on rust inhibitive gray primer.

ii. Stainless Steel Sheet:

- Locations: Non-fire resistance rated wall and ceiling surfaces with ceramic tile finish or prefinished wall paneling.
- Doors: Nominal 0.062 inch (16 gage) thickness.
- Frames: Same material and thickness as doors.
- Finish: No. 4.

c. Hinges: Manufacturer’s standard concealed spring pin hinge.

d. Latch/Lock: Manufacturer’s standard key operated cylinder cam lock. Furnish two keys per lock and key all locks alike.

e. Size: As indicated on drawings or as required to provide access to valves and equipment concealed behind finished surfaces. Note: contractor shall furnish and install framing for opening.

d. Skylights: (NOT USED)

e. Door Hardware:

1. Summary: Hardware for swinging doors and gates as scheduled on Drawings and specified.


3. Key System: Integrate with existing masterkey system; confirm lock cylinders and keying with Owner and provide system as directed by the Owner.

a. Key System: Schlage Everest 29T Restricted high-security utility-patented keyway, interchangeable core throughout. Utility patent protection to extend at least until 2029. Key blanks available only from factory-direct sources, not available from after-market keyblank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner to determine system keyway, structure, degree of physical security and degree of geographic exclusivity. Submit Owner’s written approval of the system.

i. Existing master key system.

ii. Construction keying: furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner’s presence. Demonstrate that construction key no longer operates.

iii. Operates.

iv. Temporary cylinders/cores remain supplier’s property.

v. Furnish 10 construction keys.

vi. Furnish 2 construction control keys.

vii. Key Cylinders: furnish 6-pin solid brass construction.

b. Cylinders/cores: keyed at factory of lock manufacturer. Locksets and cylinders same manufacturer.
c. Permanent keys: use secured shipment direct from point of origination to Owner.
   i. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.
   ii. For estimate: VKC stamping plus “Do Not Duplicate”.

d. Biting List: use secured shipment direct from point of origination to Owner at completion.

4. Latches, Locks and Exit Devices: ANSI Grade 1 with lever handles where appropriate to specified function. UL listed for panic exit where applicable.
5. Hinges: Heavyweight, template full mortise butt hinges.
6. Closers: Heavy duty, surface mounted, parallel arm.
7. Exposed Hardware Finish: Satin chrome plated or stainless steel as applicable to base metal.
8. Manufacturers: Manufacturers of hardware shall be as follows:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MANUFACTURER</th>
<th>ACCEPTABLE SUB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinges</td>
<td>(IVE) Ives</td>
<td>Bommer</td>
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<tr>
<td>Key System</td>
<td>(SCH) Schlage</td>
<td>District Standard</td>
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<tr>
<td>Locks</td>
<td>Corbin Russwin</td>
<td>District Standard</td>
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<tr>
<td>Exit Devices</td>
<td>(SCH) Schlage</td>
<td>District Standard</td>
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<td>Closers</td>
<td>(LCN) LCN</td>
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<tr>
<td>Push &amp; Pull Plates</td>
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<td>Kickplates</td>
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<tr>
<td>Stops &amp; Holders</td>
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<tr>
<td>Seals &amp; Bottoms</td>
<td>(NGP) NGP</td>
<td>Pemko</td>
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Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

9. Occupancy Adjustment and Service: Approximately six months after the completion of the project, the Contractor, accompanied by the Architectural Hardware Consultant, shall return to the project and re-adjust every item of hardware to restore proper functions of doors and hardware. Consult with and instruct Owner’s personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.
10. Scheduled Door Hardware: Provide hardware as scheduled.
   a. Refer to Door Schedule in Drawings for hardware set assignments.

<table>
<thead>
<tr>
<th>HW SET: 01</th>
<th>Interior Single Door</th>
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<tr>
<td>3 each</td>
<td>Hinge 5BB1 4.5 x 4.5 652-Ives</td>
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<tr>
<td>1 each</td>
<td>Corbin-Russwin CL3151 626</td>
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<tr>
<td>1 each</td>
<td>Corbin-Russwin core 8000-6 626</td>
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<tr>
<td>1 each</td>
<td>1461 689-LCN</td>
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<td>1 each</td>
<td>Seal 5050CL Clear-NGP</td>
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<tr>
<th>HW SET: 02</th>
<th>Exterior Single Door with Electrified - with Panic</th>
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<tr>
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<td>Hinge 24HD EPT 630-Ives</td>
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<td>Exit Device EL99NL-AX x 990NL-AX 626-Von Duprin</td>
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<td>1 each</td>
<td>Corbin-Russwin 1080-CT6 Cylinder collar 626</td>
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<td>1 each</td>
<td>Corbin-Russwin Core 8000-6 626</td>
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<tr>
<td>1 each</td>
<td>Ives pull VR900-NL 6</td>
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<tr>
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<tr>
<td>1 each</td>
<td>Kick plate 8400 10&quot; x 2&quot; LDW 630-Ives</td>
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</table>

| HW SET: 05 | Interior Single Door – |
f. Glazing: Float flat glass, silicone tapes/sealants and installation materials for the indicated openings.

1. Exterior Window Glass: Dual pane, 1" thick overall (1/4" thick panes spaced 1/4"), solar bronze or gray tint (50-54% L.T., sgl. pane) at exterior pane with clear coating on 2nd surface; clear interior pane; aluminum spacer; silicone primary and secondary seals.

2. Interior Glass (including doors): ¼" thick clear.

with continuous aluminum J bottom channel, wall mastic and top clips not more than 2 ft. o.c.

4. Safety Glass: Approved, fully tempered (FT) glass where indicated or required by code, ASTM C1048, with permanent fired-on identification label.


6. UL Level 3-Air Gap: Glazing must be installed in a UL level 3 bullet resistant frame system. Holes must be covered with UL listed device. All glazing should be installed in accordance with the guidelines set forth in the current edition of the Glass Association of North America (GANA) Glazing and Sealant Manuals. Glazing system should incorporate a weep system to allow moisture and water to escape the glazing channel.
   a. Recommended manufacturer: Global security Glazing
   b. Product code IC-322

2.9. DIVISION 09 – FINISHES

1. Gypsum Board: Gypsum Board: Gypsum wallboard comply ing with ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and cementitious backer units.
   a. Gypsum Wallboard:
      i. 5/8 inch thick, tapered at long edges.
         • 5/8”, unless otherwise indicated.
         • Moisture and Mold Resistant Type at walls of toilet and janitor rooms and walls within 2 feet (horizontally) of plumbing fixtures.

2. Tape and fill all joints and fasteners. Where gypsum board is scheduled for painted finish, apply texture coat (medium orange peel) complying with ASTM C840 Finish Level 4.

   b. Suspended Acoustic Ceiling:
      1. Grid: 1-½” tall x 1” wide exposed white painted face, steel tee-bar grid system, heavy duty, direct hung wire suspension, ASTM C 635.
         a. Manufacturer/Product: Chicago Metallic; 1210-01 cross-runners and 270-01 main runners or approved equal.
         a. Manufacturer/Product: USG Interiors Radar, or approved equal.
      3. Suspended ceiling system installation shall comply with ASTM C 636 and applicable portions of the California Building Code. Provide manufacturer’s proprietary wall clip providing required range of movement while using standard 1 inch wide wall angle, as evidenced by a current ICC-ESR document.

   c. Painting:
      1. Material Compatibility: Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
      2. Material Quality: Provide manufacturer’s best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
3. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction and as required by the 2013 California Green Building Standards Code.

4. Manufacturers: Manufacturer and product designations indicated in the scheduled paint systems are for the purpose of establishing minimum requirements; unless otherwise indicated, paint products are based on products manufactured by the following:
   a. Pittsburg Paints
      i. Subject to compliance with requirements, provide the named product or comparable products by one of the following:
         • Dunn-Edwards Paints
         • Fuller O’Brien Paints
         • Glidden Professional

5. Painting: Apply paints according to manufacturer’s written instructions and recommendations in “MPI Manual.” Paint/stain exposed surfaces, except where schedules indicate that a surface or material is not to be painted/stained or is to remain natural. If schedules do not specifically mention an item or surface to be painted, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
   a. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work: Paint items where exposed to view within normally occupied spaces and where exposed to view at the building exterior.

6. Interior Paint Systems:

<table>
<thead>
<tr>
<th>SURFACE</th>
<th>PAINT SYSTEM</th>
<th>COATS</th>
<th>MANUFACTURER’S DESIGNATION</th>
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<td>SpeedHide Interior Latex</td>
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<td>(2) Ferrous Metal</td>
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7. Exterior Paint Systems:

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2.1.0 DIVISION 10 – SPECIALTIES

a. Signage:
   1. ADA and CBC compliant fiberglass or acrylic plaque signs:
      a. Identify each accessible building entrance with an International Symbol of Accessibility, 6 inches square.
      b. Wall mounted ADA signage with raised text, Braille translation and pictogram at each toilet room.
      c. Door mounted geometric shapes (triangle=male; circle=female) at each toilet room per CBC.
      d. Tactile exit signs at each exit and where else required along egress route.
      e. Room names and numbers where indicated on drawings. Note: Final room names and numbers will be decided at a later date. Color: as selected by Architect from manufacturer’s full color range. If signage is to be installed on glass, furnish and install a ‘blank’ plate on opposite side, same size and sign.
   2. Provide blocking and backing in walls for installation of panel signs; secure signs with tamper-resistant fasteners

b. Toilet Compartments:
   1. Accessible Toilet Compartments: Toilet compartments and urinal screens designated as accessible shall comply with applicable provisions in the 2010

<table>
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<tr>
<th>(1)</th>
<th>Concrete</th>
<th>P50.C</th>
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<td>Semi-Gloss Acrylic Enamel</td>
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</tbody>
</table>

   | 6-900XI | 124 | DTM Pitt Tech Primer SpeedHide Acrylic Latex SpeedHide Acrylic Latex |


3. Toilet Compartments: solid phenolic-core toilet compartments configured as toilet enclosures and urinal screens; floor anchored and overhead braced.
   a. Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. toilet compartments or comparable products by one of the following:
      i. Accurate Partitions Corporation
      ii. General Partitions Mfg. Corp
   b. Toilet Enclosure Style: Floor anchored, overhead braced.
   c. Urinal Screen Style: Wall hung.
   d. Doors, Panels, and Pilasters: Solid, phenolic-core, not less than 3/4 inch thick doors and pilasters, 1/2 inch thick panels, seamless, with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated) and with eased and polished edges.
   e. Color and Pattern: As selected by Architect from manufacturer’s full range of standard colors. Selected color will be from among those having flame spread/smoke developed ratings as required by Code.
   f. Wall Backing Support for Compartments: Furnish and install backing as required.
   g. Wall Brackets for Compartments: Continuous full height aluminum with bright dipped silver anodized finish.
      i. Profile: Double-ear profile unless single-ear, U-shaped or H-shaped profile is required for project conditions.

C. Toilet Room Accessories:
   1. Regulatory Requirements: Toilet room accessories and mounting heights of accessories to be used by persons with disabilities shall comply with accessibility requirements of the 2010 ADA Standards for Accessible Design and the 2013 California Building Code, Chapter 11B, “Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.”
   2. Toilet Room and Custodial Accessories:
      a. Basis of Design: Drawings and Specifications are based on products manufactured by Bobrick Washroom Equipment, Inc.
      i. Subject to compliance with requirements, provide products indicated or equivalent products by one of the following:
         • American Specialties, Inc.
         • Bradley Corporation
      b. Finish: Exposed stainless steel surfaces of accessories shall have a satin finish unless otherwise indicated.
      c. Grab Bars for wheelchair accessible water closets: Bobrick B-6806 x 42, B-6806 x 48. 1-1/2 inch diameter, satin finish, concealed mounting with snap flange. At each wheelchair accessible water closet, provide one 48 inch grab bar at the side wall and one 42 inch grab bar at the wall behind the water closet. Wall Backing Support for Accessories: Furnish and install backing as required.
      e. Mirror: Bobrick B-165 Series (size as indicated on drawings). Channel framed mirror with 1/2 x 1/2 x 1/2 type 430 stainless steel channel frame,
bright finish, mitered corners, 1/4-inch mirror glass (10 year warranty), concealed mounting with theft resistant locking device.

f. Toilet Tissue Dispensers:
   i. Accessible Compartments: Furnished by Owner, installed by Contractor.
   ii. Non-Accessible Compartments: Bobrick B-2892; Toilet tissue dispenser, surface mounted, jumbo-roll, with flush tumbler lock.

g. Under lavatory Guard: Basis-of-Design Product: Drawings and Specifications are based on Truebro, Inc., Lavguard2 series underlavatory guard.
   i. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
      • Plumberex Specialty Products, Inc.
   ii. Description: Antimicrobial, white molded-plastic underlavatory guard assemblies. Underlavatory guard assemblies shall cover waste piping and hot and cold water supply piping, allow service access without removing coverings, and shall prevent contact with hot surfaces and/or sharp objects.
   iii. Locations: Provide underlavatory guard assemblies at all lavatories and/or sinks in all toilet rooms, and at sinks in cabinets/counter tops that are indicated to be accessible to persons in a wheel chair.

h. Specialty plumbing fixtures:
   i. Accorn toilet sink combo Penal-Ware 1449
   ii. Toilet seat cover dispenser, sanitary napkin disposal and toilet tissue dispenser Bobbrick B3574

d. Fire Extinguishers and Cabinets
   1. Fire Extinguisher: Multi-purpose dry chemical with a UL rating of 2A-10B:C.
   2. Fire Extinguisher Mounting: Cabinet.
   3. Cabinets: Semi-recessed with 2½” rolled edge trim all around, with all corners mitered. Fabricate door and trim from extruded aluminum with a clear satin anodized finish. Provide door panel of clear acrylic.
   4. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to:
      a. J. L. Industries, Inc.
      b. Larsen’s Manufacturing Company
      c. Potter Roemer LLC.

e. Marker/Display boards provided and installed by Owner. Provide wall backing at display board locations indicated.
   1. Cover: Extruded vinyl/acrylic (Acrovyn), minimum 0.078-inch wall thickness; as follows:
      a. Profile: Rectangular.
         i. Dimensions: Nominal 4 inches high by 3/4 inch deep.
         ii. Surface: Shadow grain texture.
      b. Color: As selected by Architect from manufacturer’s full range of not less than 60 solid colors.
   2. Mounting: Secure continuous retainer to solid backing in wall through a spacer to permit tackboard wall finish above and below chair rail. Provide manufacturer’s standard end caps.

2.11. DIVISION 11 – EQUIPMENT
2.12. DIVISIONS 12 THRU 21 (Not Used)

2.13. DIVISION 22 – PLUMBING

a. Furnish and install all fixtures, piping, fittings, valves, cleanouts, equipment and appurtenances necessary for complete and lawful systems including but not necessarily limited to sanitary sewer, domestic water, fuel gas and condensate drainage.

1. All interior piping shall be concealed within walls or above ceilings. No surface-mounted piping is permitted.
2. Domestic water piping shall be hard temper seamless copper, ASTM B88, wrought copper fittings, ANSI B16.22. Type L with brazed joints (1100°F min.) 1-1/2" and smaller above grade may be soldered, 95-5 tin-antimony solder. All nipples shall be red brass (85% copper).
3. Sewer/Vent piping shall be Schedule 40 PVC
4. Gas piping shall be schedule 40 black steel pipe, ASTM A120/A53. 150 psi malleable iron screwed fittings, ANSI B16.3, ANSI B31.8. Flexible connections shall be convoluted yellow brass with dielectric couplings, AGA Approved.
5. HVAC Condensate drains shall be Type L copper with capped T at all changes in direction.
6. Provide building shut-off valve in approved location, Williams Class 150 full port ball valve, stainless steel construction.

b. Fixture Schedule: Refer to Architectural Floor Plan, and Plumbing Schedule for reference. Products identified as part of bid documents are intended to establish current Owner standards only, and are not intended to certify CalGreen compliance. Contractor shall review CalGreen requirements and submit/substitute CalGreen compliant products as closely matching Owner standards based on Manufacturer and product type, meeting or exceeding standards thereof.

c. Water Heaters:
   1. Provide point-of-use electric instant-hot water heaters for restroom lavatories, breakroom sinks, and mop sinks. Chronomite Model M Series Electric

2.14. DIVISION 23 - MECHANICAL

a. Air Conditioning Units:
   1. Provide parts warranty (excluding refrigerant) for one year from start-up or 18 months from shipment, whichever occurs first.
   2. Provide five-year extended warranty for compressors.
   3. Provide ten-year heat exchanger limited warranty.

b. Approved Manufacturers: One of the following:
   1. Day & Night

c. General Unit Description: Unit(s) furnished and installed shall be combination heating and cooling or cooling only packaged rooftop(s) as scheduled on contract documents and these specifications. Cooling capacity ratings shall be in accordance with AHRI testing procedures. Unit(s) shall consist of insulated weather-tight casing with compressor(s), air-cooled condenser coil, condenser fans, evaporator coil, return-air filters, supply motors and unit controls and drives.
   1. Unit(s) shall be 100% factory run tested and fully charged with R-410A.
   2. Unit(s) shall have a minimum 15 SEER efficiency rating.
   3. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.
   4. Units shall be convertible airflow design as manufactured.
   5. Wiring internal to the unit shall be colored and numbered for identification.

d. Unit Casing:
1. **Cabinet**: Zinc coated galvanized steel, phosphatized, and finished with a weather resistant baked enamel coating with removable access panels. Structural members shall be 18 gauge with access doors and removable panels of minimum 20 gauge.

2. Units cabinet surface shall be tested 1000 hours in salt spray test in compliance with ASTM B117.

3. Cabinet construction shall allow for all service/maintenance from one side of the unit.

4. Cabinet top cover shall be one piece construction or where seams exits, it shall be double-hemmed and gasket-sealed.

5. **Access Panels**: Water- and air-tight panels with handles shall provide access to filters, heating section, return air fan section, supply air fan section, evaporator coil section, and unit control section.

6. Units base pan shall have a raised 1 1/8 inch high lip around the supply and return openings for water integrity.

7. **Insulation**: Provide 1/2 inch thick fiberglass insulation with foil face on all exterior panels in contact with the return and conditioned air stream. All edges must be captured so that there is no insulation exposed in the air stream.

8. Provide openings either on side of unit or through the base for power, control, condensate, and gas connections.

9. The base of the unit shall have 3 sides for forklift provisions. The base of the units shall have rigging/lifting holes for crane maneuvering.

e. **Air Filters**: Factory installed filters shall mount integral within the unit and shall be accessible through access panels. Clean set up 2-inch MERV 8 filters shall be installed in unit prior to acceptance of building by owner.

f. **Fans and Motors**:
   1. Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan.
   2. Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings.
   3. Unless otherwise indicated on drawing schedule, provide units with belt driven supply fans with adjustable motor sheaves.
   4. Outdoor and Indoor Fan motors shall be permanently lubricated and have internal thermal overload protection.
   5. Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical discharge position.
   6. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

g. **Gas Fired Heating Section**: Completely assembled and factory installed heating system shall be integral to unit, UL or CSA approved specifically for outdoor applications for use downstream from refrigerant cooling coils. Threaded connection with plug or cap provided. Provide capability for gas piping through the side of the unit.
   1. Heating section shall be factory run tested prior to shipment.
   2. Induced draft combustion type with direct spark ignition system, redundant main gas valve, and 2-staged heat.
   3. **Gas Burner Safety Controls**: Provide safety controls for the proving of combustion air prior to ignition, and continuous flame supervision. Provide flame rollout switches.
   4. Induced draft blower shall have combustion air proving switches and built-in thermal overload protection on fan motor.
5. **Heat Exchanger:** Provide tubular section type constructed from 409 stainless steel.

6. **Burners:** Burners shall be of the in-shot type constructed of stainless steel.

7. **Limit controls:** High temperature limit controls will shut off gas flow in the event excessive temperatures resulting from restricted indoor airflow or loss of indoor airflow.

h. **Evaporator Coil:**
   1. Provide configured aluminum fin surface mechanically bonded to copper tubing coil.
   2. Provide factory installed thermal expansion valve (TXV) for each refrigerant circuit. Factory pressure tested at 600 psig and assembled unit leak tested at 465 psig.
   3. Provide a removable, reversible, cleanable double sloped drain pan for base of evaporator coil constructed of PVC.

i. **Condenser Section:**
   1. Provide internally finned seamless copper tube mechanically bonded to configured aluminum fins. Factory pressure tested to 600 psig and assembled unit leak tested at 465 psig.
   2. Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motors shall be permanently lubricated, with integral thermal overload protection in a weather tight casing.
   4. Provide factory coil guards for condenser section.

j. **Refrigeration System:**
   1. **Compressor(s):** Provide scroll compressor with direct drive operating at 3600 rpm. Integral centrifugal oil pump. Provide suction gas cooled motor with winding temperature limits and compressor overloads.
   2. Provide each unit with one refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, suction and liquid line pressure ports.

k. **Outside Air Section – Fully Modulating:**
   1. Provide a fully integrated, CEC Title 24 compliant, field-installed 100% modulating outside air economizer with unit return and barometric relief air dampers, minimum position setting, preset linkage, wiring harness with plug. Unit operation is through primary temperature controls that automatically modulate dampers to maintain space temperature conditions.
   2. Provide economizer with dry bulb control only.
   3. Provide adjustable minimum position control located in the economizer section of the unit.
   4. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

l. **Operating Controls:**
   1. Provide factory-wired roof top units with 24-volt electro-mechanical control circuit with control transformers, contactors pressure lugs or terminal block for power wiring. Units shall have single point power connection as standard. Field wiring of zone controls to be NEC Class II.
   2. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.
   3. Provide an anti-cycle timing and minimum on/off between stages timing in the microprocessor.
   4. **Economizer Preferred Cooling (if supplied with economizer)** – Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of
less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

m. Roof Curb: Contractor shall provide calculated roof curb stamped by Structural Engineer licensed in the state of California, made of heavy gauge steel with supply and return air gasketing and wood nailer strips. Curb shall be sloped to match slope of roof. Provide hold-down clips.

n. Thermostat: 7-day programmable, CEC 2013 Title 24 compliant, 2-hour pushbutton override, wireless capable; Honeywell Visionpro8000.

o. Exhaust Fans
   1. General: All exhaust fans shall be tested according to AMCA Standard 210 in an AMCA registered laboratory. Fans exposed to weather shall have ventilated weatherproof housing over motor and drive assembly. All direct drive fans shall be provided with CM motors with motor mounted speed control, unless otherwise noted. All motors 1 horsepower and larger shall be the high efficiency type. Ceiling Fan: Ceiling mounted direct drive centrifugal exhaust fan with exhaust grille. Motor mounted in rubber-in-shear isolators. Motor and fan removable through grille. Acoustically lined housing. Backdraft damper. UL listed. Breidert, Carnes, Greenheck, Penn.


q. Installation of HVAC Equipment:
   1. Complete all wiring to load center.
   2. Install units and thermostats complete with all accessories, all required exhausts and registers as per manufacturer’s written instruction.
   3. Disconnect switch shall be located on or adjacent to the unit.
   4. All ductwork materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.
   5. All joints sealed with water-based duct sealant ‘Uni-Mastic 181’ by McGill Airseal or Design Polymetrics DP-1010.
   6. All supply and return ductwork shall be insulated with fiberglass blanket, 3/4 lb/ft3, 1-1/2” thick, R-4.2.
   7. Metal ductwork shall be galvanized sheet steel, lock forming quality, ASTM A653 with gage and construction to match SMACNA Standard for pressure required (26 gage minimum).
   8. Flexible ductwork shall be Class 1 insulated duct, Continuous inner liner bonded to galvanized steel wire helix, R-8 insulation with seamless vapor barrier jacket.
   9. Supply/Return/Exhaust ductwork from equipment through first change in direction shall be internally lined with 1” thick 1.5 lb/ft3 acoustic lining.
   10. The completed job shall be demonstrated by the Heating and Ventilating Contractor to the Owner’s maintenance representative so as to function in accordance with the manufacturer’s design, and to the complete satisfaction of the Owner.
   11. The Contractor shall replenish all refrigerant and oil lost for a period of one (1) year without charge to the Owner.
   12. Contractor shall provide the services of an independent Test and Balance Agency to test, adjust and balance, retest and record performance of the HVAC systems to obtain design quantities as specified. Test and Balance Agency shall be certified by the Associated Air Balance Council.
(AABC) or National Environmental Balancing Bureau (NEBB). Procedure shall be in accordance with AABC’s “National Standards for Total System Balance” or equivalent NEBB standards. System shall be in full continuous operation during test. Balance quantities shall be plus 10%, minus 5% of design quantities. Correct all deficiencies noted in the test and balance report prior to acceptance of the project. Contractor shall assume responsibility for correcting all items determined to be the result of improper or incomplete installation. Additional testing required due to such deficiencies will be at the Contractors expense.

2.15. **DIVISIONS 24 AND 25 (Not Used)**

2.16. **DIVISION 26 – ELECTRICAL**

a. Furnish and install all electrical conduit, outlets, wire, and switches, transformers, panelboards, fixtures, lamps, services and appurtenances, including wiring and electrical connections to HVAC and plumbing equipment.

b. Panelboards: Bolt-on circuit breaker type with hinged door and lock, sized with circuit breakers as required by C.E.C. to serve lighting, receptacle, A/C and other load circuits and shall include automatic main circuit breaker. Electrical panels shall be surface mounted in the janitorial room or mounted to the building exterior in the mechanical equipment area.

c. Building power systems shall be compliant with the 2013 California Energy Code. Provide all compliance forms as required by code.

d. Conductors: Insulated copper. For #12 and #10: solid copper. For #8 and larger: stranded copper. All wires to be type THHN.

e. Disconnect/Safety switches: Equipment disconnect and safety switches shall be heavy-duty type.

f. Conduit: Rigid steel, IMC or electrical metallic tubing or galvanized steel flexible raceway where permitted by code in lieu of rigid raceway.

g. Interior Lighting: Surface mounted LED fixtures, die-formed of 22 gauge steel, minimum of 4” deep housing and finished with baked-on 80% reflective white enamel.

1. Lighting System shall be designed for 50 foot-candles maintained at desk level. Provide lighting fixtures at locations shown on the drawings.

   a. LED luminaires shall be 4000K, minimum 80 lumens per watt.
   b. Avoid light troughs that collect dust and other items.
   c. Avoid high reaches that require a hoist to provide service.
   d. Provide lighting in all storage rooms.
   e. All light switches, even if the lights are controlled by a sensor, should be mounted by the door.
   f. Keyed light switches are permitted in restrooms only. All other rooms should have regular switches located adjacent to primary entry.
   g. Assure adequate lighting in the storage room.
   h. Avoid the use of recessed fixtures which require custom framing for installation.
   i. Provide illuminated exit signs where code requires.
   j. Lighting system and controls shall be compliant with the 2013 California Energy Codes. Provide all compliance forms for interior lighting as required by code.

h. Receptacles shall be 20A and shall be GFCI type. Cover plates shall be plastic, ivory color; or equal. Provide receptacles at locations indicated on the Electrical drawings.
i. Exterior Lights: Exterior light fixtures as indicated on the Electrical drawings. Lighting fixtures shall have emergency battery backup to provide no less than 90 minutes of egress illumination where required per the California Building Code.

1. Exterior lighting and controls shall be compliant with the 2013 California Energy Code. Provide all compliance forms for exterior lighting as required by code.

j. Fire Alarm and telecommunication systems: Provide raceways, back-boxes, junction boxes and other provisions shall be as shown on Drawings.

k. Telecommunications System: Provide telephone and data raceways, conduit and junction boxes as indicated on Drawings.

l. Electrical Acceptance Testing
   a. Circuit Breakers rated 100A or greater All circuit breakers, 100 amps or more, shall be tested by an independent testing agency in accordance with NETA specifications and a report submitted to the architect and engineer. Any circuit breaker that does not pass the test shall be replaced.

2. Grounding System
   a. Ground tests shall meet the requirements of the California Electrical Code and comply with UL 467. The grounding electrode system at the modular building shall be tested by an Independent Testing Agency in accordance with the three point fall of potential method as specified in IEEE Standard V81-1983. Maximum ground resistance shall be 5 OHMS. A copy of the test report shall be submitted to the architect and engineer of record.

2.17. DIVISION 27 – 30 (NOT USED)

2.18. DIVISION 31 – EARTHWORK
   a. Site Clearing: Site clearing is responsibility of the Sitework Contractor.
   b. Earthwork:
      1. Sitework Contractor earthwork responsibility shall include preparation of building pad, including over excavation, fill, compaction, and finish grading.
      2. Modular Building Contractor earthwork responsibility shall include excavation for building footings, granular/sand base, vapor barrier for concrete slabs on grade and termite control.
      3. General: Earthwork shall comply with requirements and recommendations in Owner’s Geotechnical Report. A representative from the Owner’s geotechnical testing agency shall be present during earthwork operations.
      4. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
      5. Excavate/over-excavate, fill, and compact soil in accordance with Geotechnical Report and as directed by Owner’s geotechnical engineer.
      6. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner’s property.
   c. Termiticide Treatment:
      1. Summary: Soil treatment with termiticide. Termiticide treatment work shall be the responsibility of the Modular Building Contractor.
      2. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for
application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product’s EPA-Registered Label.

d. **Area of Application:** Apply termiticide to areas under concrete slabs and grade and around the perimeter of the building as recommended by the termiticide manufacturer.

3. **PART 3 – EXECUTION**

3.1. **COORDINATION AND EXAMINATION**

a. It is the Contractor’s responsibility to make all necessary prior arrangements with the Owner’s authorized representative for access to building site and removal of obstructions, if necessary. Provide Owner with a plan of proposed property entry point and path of travel to the building site for approval at least two weeks prior to delivery.

b. Notify Architect and Owner at least 48 hours prior to delivery of modules on site.

c. Report any unacceptable conditions to the Architect. Do not deliver any building modules until unacceptable conditions have been corrected.

d. Coordinate and cooperate with the Site Contractor to prevent conflicts between the separate portions of work.

3.2. **PROTECTION**

a. Protect Owner’s property, facilities and utilities from damage during transportation and erection of building modules. Repair or replace any damage to satisfaction of Owner.

3.3. **INSTALLATION AT SITE**

a. **Site Construction:** Once delivery of modules is made, erection shall commence immediately and be pursued in a timely and continuous manner until complete. All modules called for at that site shall be scheduled for delivery and erection in one continuous time frame.

b. **Construction Progress:** The Contractor shall furnish materials, articles and equipment in ample quantities and at such times as to assure uninterrupted progress of the work. Failure to provide adequate working force, or material of proper quality, or failure in any other respect to prosecute the work with diligence and force specified herein are grounds for declaring a default on the contract.

c. Set building modules plumb, level and square; straight and true to line with foundation.

d. **Site Security:** Security of the buildings against vandalism is the sole responsibility of the Site Contractor until completion and structures have been accepted by the Owner.

e. **On-site Inspection:** Arrange for inspections of work on-site by DSA as required by that agency. Submit copies of inspection reports to Architect and Owner.

3.4. **CLEAN UP AND ADJUSTING**

a. The adjacent site and the structures shall be cleaned and made ready for occupancy prior to acceptance by the Owners.

b. Test and adjust controls and operating functions. Repair or replace any damaged or malfunctioning hardware, fixtures, equipment or controls.

3.5. **UTILITY HOOK-UPS**

a. **Utility Connections:** All utility connection points shall be located per the approved drawings to accommodate hook-ups provided at the site. Unless otherwise indicated on drawings, extend utility connections (five) 5 feet from building and terminate with appropriate temporary closures. Final utility connections are by the Site work Contractor.

3.6. **OWNER INSTRUCTION AND DOCUMENTATION**
a. Provide instruction to Owner’s designated personnel in operation and maintenance of all equipment, fixtures and utilities included in the modular building.

b. Deliver operating manuals, parts lists and warranties for all equipment and fixtures in modular building to Owner.

c. Provide Owner with final certificate of occupancy from authorities having jurisdiction.

END OF SECTION 131600
PART 1 - GENERAL

1.01 SUMMARY

A. Work included: This Section includes general administrative and procedural requirements for Division 26. The following administrative and procedural requirements are included in this Section to supplement the requirements specified in Division 01.

1. Quality assurance.
2. Definition of terms.
4. Coordination.
5. Record documents.
6. Operation and maintenance manuals.
7. Excavation.
8. Rough-in.
10. Cutting, patching, painting and sealing.
11. Field quality control.
12. Project closeout.

B. Related work:

1. General and supplementary conditions: Drawings and general provisions of Contract and Division 01 of the Specifications, apply to all Division 26 Sections.
2. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, etc. Refer to Division 02, Existing Conditions and Division 31 Earthwork.
3. Concrete work: Include forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, light pole foundations, pull box slabs, vaults, housekeeping pads, etc. Refer to Division 03, Concrete.
4. Miscellaneous metal work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, lighting fixtures, panelboards, distribution boards, switchboards, motor control centers, etc. Refer to Division 05, Metals.
5. Miscellaneous lumber and framing work: Include wood grounds, nailers, blocking, fasteners, and anchorage for support of electrical materials and equipment. Refer to Division 06, Wood, Plastics, and Composites.
6. Moisture protection and smoke barrier penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. All penetrations through vapor barriers at slabs on grade shall be taped and made vaportight. Refer to Division 07, Thermal and Moisture Protection.
7. Access panels and doors: Required in walls, ceilings, and floors to provide access to electrical devices and equipment. Refer to Division 08, Openings, Division 05, Metals.
8. Painting: Include surface preparation, priming and finish coating as required for electrical cabinets, exposed conduit, pull and junction boxes, etc. where indicated as field painted in this Division. Refer to Division 09, Finishes.
9. Lighting fixture supports: Provide slack fixture support wire for lighting fixtures installed in acoustical tile or lay-in suspended ceilings. Refer to Division 09, Acoustical Ceilings.
1.02 QUALITY ASSURANCE

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Such codes or standards shall be considered a part of this Specification as though fully repeated herein.

B. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred authority for reducing the quality, requirements or extent of the Drawings and Specifications. The contract documents address the minimum requirements for construction.

C. Work shall be performed in accordance with all applicable requirements of the latest edition of all governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:


D. Standards: Equipment and materials specified under this Division shall conform to the following standards where applicable:

ACI American Concrete Institute
ANSI American National Standards Institute
ASTM American Society for Testing Materials
CBM Certified Ballast Manufacturers
ETL Electrical Testing Laboratories
FS Federal Specification
IEEE Institute of Electrical and Electronics Engineers, Inc.
IPCEA Insulated Power Cable Engineer Association
NEMA National Electrical Manufacturer's Association
UL Underwriters' Laboratories

E. All base material shall be ASTM and/or ANSI standards.

F. All electrical apparatus furnished under this Section shall conform to NEMA standards and the NEC and bear the UL label where such label is applicable.

G. Certify that each welder performing work has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.

H. All materials, equipment and parts comprising the units specified in these Sections shall be new and unused, and of current manufacturer.

I. Only products and applications listed in these Sections may be used on the project unless otherwise submitted.

1.03 DEFINITION OF TERMS

A. The following list of terms as used in the Division 26 documents shall be defined as follows:

1. "Provide": Shall mean furnish, install and connect unless otherwise indicated.
2. "Furnish": Shall mean purchase and deliver to project site.
3. "Install": Shall mean to physically install the items in-place.
4. "Connect": Shall mean make final electrical connections for a complete operating piece of equipment.
5. "As directed": Shall be as directed by the District or their authorized representative.

1.04 SUBMITTALS

A. Format: Furnish submittal data neatly bound in an 8-1/2" x 11" folder or binder for each Specification Section with a table of contents listing materials by Section and paragraph number.

B. Submittals shall consist of detailed shop drawings, specifications, block wiring diagrams, "catalog cuts" and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, and material finish. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded. Furnish quantities of each submittal as noted in Division 1.

C. Each submittal shall be labeled with the Specification Section Number and shall be accompanied by a cover letter or shall bear a stamp stating that the submittal has been thoroughly reviewed by the Contractor and is in full compliance with the requirements of the Contract Documents. Cover letters shall list in full the items and data submitted. Failure to comply with this requirement shall constitute grounds for rejection of data.

D. The Contractor shall submit detailed drawings of all electrical equipment rooms and closets if the proposed installation layout differs from the construction documents. Physical size of electrical equipment shown on the drawings shall match those of the electrical equipment that is being submitted for review, i.e.: switchboards, panelboards, transformers, control panels, etc. Minimum scale: 1/4" = 1'- 0". Revised electrical equipment layouts must be approved prior to release of order for equipment and prior to installation.

E. As part of the equipment submittals, the manufacturer shall provide anchorage calculations for floor, wall and ceiling mounted electrical equipment so that it shall remain attached to the mounting surface after experiencing dead, live, wind and earthquake loads. Calculations shall be performed in accordance with the current California Building Code, Section 1604 “General Design Requirements” and reference document American Society of Civil Engineers Standard ASCE7-05 Minimum Design Loads for Buildings and Other Structures, Chapter 13, “Seismic Design Requirements for Non-Structural Components”. Calculations shall be prepared and signed by a California Registered Structural Engineer.

F. The manufacturer shall recommend the method of anchoring the equipment to the mounting surface and shall provide the Contractor with the assembly dimensions, weights and approximate centers of gravity.

G. All resubmittals shall include a cover letter that lists the action taken and revisions made to each drawing and equipment data sheet in response to Submittal Review Comments. Resubmittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.

H. Substitutions:
   1. All requests for substitutions shall conform to the general requirements and procedure outlined in Division 01.
   2. Where items are noted as "or equal," a product of equal design, construction and performance will be considered. Contractor must submit to the engineer all pertinent test data, catalog cuts and product information required substantiating that the product is in fact equal to that specified. Only one substitution will be considered for each product specified.
   3. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to
establish standards of quality, utility and appearance. Materials, processes or equipment, which, in the opinion of the Engineer, are equal in quality, utility and appearance, will be approved as substitutions to that specified.

4. Whenever any material, process or equipment is specified in accordance with an ASTM standard, an ANSI specification, UL rating or other association standard, the Contractor shall present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, support test data to substantiate compliance shall be submitted by the Contractor at no additional cost.

5. Substitutions shall be equal, in the opinion of the Architect/Engineer, to the specified product. The burden of proof of such shall rest with the Contractor. When the Architect/Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted article or material to be equal to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Specifications.

6. The Contractor shall be responsible for all expenses in connection with the substitution materials, processes and equipment, including the effect of his substitution on him, his subcontractor's or other Contractor's work. No substitution of material, processes or equipment shall be permitted without written authorization of the Architect/Engineer. Any assumptions on the acceptability of a proposed substitution prior to acceptance by the Engineer are at the sole risk of the Contractor.

1.05 COORDINATION

A. Discrepancies:
1. In the event of discrepancies within the Contract Documents, the Engineer shall be so notified, within sufficient time, as delineated in Division 01, prior to the Bid Opening to allow the issuance of an Addendum.

2. If, in the event that time does not permit notification or clarification of discrepancies prior to the Bid Opening, the following shall apply: The drawings govern in matters of quantity, and the specifications govern in matters of quality. In the event of conflict within the drawings involving quantities, or within the specifications involving quantities, or within the specifications involving quality, the greater quantity and higher quality shall apply. Such discrepancies shall be noted and clarified in the Contractor's Bid. No additional allowances will be made because of errors, ambiguities, or omissions that reasonably should have been discovered during the preparation of the Bid.

B. Job conditions:
1. Examination of site: The Contractor shall visit the site and thoroughly review the locale, working conditions, conflicting utilities and the conditions in which the electrical work will take place. Verify all existing conditions in the field. No allowances will be made subsequently for any costs that may be incurred because of any error or omission due to failure to examine the site and to notify the Engineer of any discrepancies between Drawings and Specifications and actual site conditions.

2. Protection: Keep conduits, junction boxes, outlet boxes and other openings closed to prevent entry of foreign matter. Cover fixtures, equipment, devices, and apparatus and protect them against dirt, paint, water, chemical or mechanical damage, before and during construction period. Prior to final acceptance, restore to original condition any fixture, apparatus or equipment damaged including restoration of damaged factory applied painted finishes. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.

3. Supervision: Contractor shall personally or through an authorized and competent representative constantly supervise the work from beginning to completion and, within reason, keep the same foreman and workmen on the project throughout the project duration.
C. Preparation:

1. Drawings
   a. Layout: General layout shown on the Drawings shall be followed except where other work may conflict with the Drawings.
   b. Accuracy: Drawings for the Work under this Section are essentially diagrammatic within the constraints of the symbology applied.

1.06 RECORD DOCUMENTS

A. Provide project record drawings as described herein:

1. Drawings shall fully represent installed conditions including actual locations of outlets, true panelboard connections following phase balancing routines, correct conduit and wire sizing as well as routing, revised fixture schedule listing manufacturers and products actually installed, and revised panel schedules. Contractor shall record all changes in the work during the course of construction on blue or black line prints. These prints shall be made subject of monthly review by the District's representative to ascertain that they are current. If not current monthly payments may be withheld.

2. Record drawings shall be the transfer of information on these prints to the construction documents via computer aided drafting (CAD) process. A set of CAD files of the electrical documents will be provided to the contractor in either Autocad Release 2008 file format.

3. Record drawing submissions shall be provided to the Engineer to review upon the completion of the following phases of work:
   a. All underground installation.
   b. Building electrical rough-in.
   c. Final electrical installation.

4. Include in the record drawing submission the following shop drawing submission with all updated installation information:
   a. Fire alarm system.

5. A single set of half size prints of the record drawings shall be submitted for review. Upon receipt of the engineer's review comments, corrections shall be made and the contractor shall provide the following:
   a. Two sets of full size prints.
   b. Four sets of half size prints.
   c. One set of full size reproducibles.
   d. Autocad files of drawings.

B. Panel schedules: Typewritten panel schedules shall be provided for panelboards indicating the loads served and the correct branch circuit number. Schedules shall be prepared on forms provided by the manufacturer and inserted in the pocket of the inner door of each panelboard. See Section 26 47 00: Panelboards for requirements.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Prior to project closeout furnish to the District, six (6) hard back 3-ring binders containing all bulletins, operation and maintenance instructions, part lists, service telephone numbers and other pertinent information as noted in each section all equipment furnished under Division 16. Binders shall be indexed into division sections and labeled for easy reference. Bulletins containing more information than the equipment concerned shall be properly stripped and assembled.

PART 2 - PRODUCTS

Not Used
PART 3 - EXECUTION

3.01 EXCAVATION

A. General: Cutting and digging shall be under the direct supervision of the General Contractor, and included as necessary for the Work of this Section.

B. Excavation for underground vaults and electrical structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete formwork, installation or services, other construction, and for inspection.

1. Excavate, by hand, areas within drip-line of large trees. Protect the root system for damage and dry-out. Maintain moist conditions for root system and over exposed roots with burlap. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint.

2. Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.

C. Trenching: Excavate trenches for electrical installation as follows:

1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearances on both side of raceways and equipment.

2. Excavate trenches to depth indicated or required.

3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.

4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.

D. Backfilling: Place soil materials in layers to required subgrade elevations for each area classification, using materials and methods specified in Division 01, General Requirements.

1. Under building slabs, use drainage fill materials.

3.02 ROUGH-IN

A. Contractor shall verify lines, levels and dimensions shown on the Drawings and shall be responsible for the accuracy of the setting out of Work and for its strict conformance with existing conditions at the site.

B. Verify final locations for rough-ins with field measurements and with the requirements for the actual equipment to be connected.

C. Refer to equipment specification in Divisions 02 through 26 for rough-in requirements.

3.03 ELECTRICAL INSTALLATION

A. Preparation, sequencing, handling and installation shall be in accordance with manufacturer's written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Comply with the following requirements:

1. Shop drawings prepared by manufacturer.

2. Verify all dimensions by field measurements.

3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.

4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting height is not detailed or dimensioned, contact the Architect for direction prior to proceeding with rough-in.

7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.

8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

9. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

10. Coordinate electrical systems, equipment, and materials installations with other building components.

11. Provide access panel or doors where devices or equipment are concealed behind finished surfaces. Furnish and install access doors per the requirements of Division 08.

12. Install systems, materials, and equipment giving right-of-way priority to other systems that are required to maintain a specified slope.

13. Conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

3.04 CUTTING, PATCHING, PAINTING AND SEALING

A. Structural members shall in no case be drilled, bored or notched in such a manner that will impair their structural value. Cutting of holes, if required, shall be done with core drill and only with the approval of the Architect and Structural Engineer.

B. Protection of installed work: During cutting and patching operations, protect adjacent installations.

C. Application of joint sealers:
   1. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
   2. Installation of fire-stopping sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops and fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.05 FIELD QUALITY CONTROL

A. General: Perform tests to prove installation is in accordance with contract requirements. Perform tests in presence of the District's representative and furnish test equipment, facilities and technical personnel required to perform tests. Tests shall be conducted during the construction period and at completion to determine conformity with applicable codes and with these Specifications.

B. Tests: In addition to specific system test described elsewhere, tests shall include:
   1. Insulation resistance: Perform 1000-volt DC tests for one minute on all equipment rated 300 volts and higher, feeder and branch circuit conductors, including the neutral. Make a typed record of all readings to be included in the
maintenance instructions. Repair or replace circuits showing less than 10 megohms resistance to ground.

2. Circuit continuity: Test all feeder and branch circuits for continuity. Test all neutrals for improper grounds.

3. Equipment operations: Test motors for correct operation and rotation.

4. Lighting control circuits: Test lighting circuits for correct operation through their control devices.

5. Alarm and interlock systems: Produce malfunction symptoms in operating systems to test alarm and interlock systems. In addition, all specific tests described in the fire alarm system shall be performed.

6. Circuit numbering verification: Select on a random basis various circuit breakers in the panelboards and cycle them on and off to verify compliance of the typed panel directories with actual field wiring.

C. Product failure: Any products which fail during the tests or are ruled unsatisfactory by the District's representative shall be replaced, repaired or corrected as prescribed by the District's representative at the expense of the Contractor. Tests shall be performed after repairs, replacements or corrections until satisfactory performance is demonstrated.

D. Miscellaneous: Include all test results in the maintenance manual.

E. Cleaning: After other work such as sanding, painting, etc. has been completed; clean lighting fixtures, panelboards, switchboards and other electrical equipment to remove dust, dirt, grease or other marks. Leave work in clean condition.

F. Voltage check:
   1. At completion of job, check voltage at several points of utilization on the system that has been installed under this Contract. During test, energize all installed loads.
   2. Adjust taps on transformers to give proper voltage, which is 118 to 122 volts for 120 volt nominal systems and proportionately equivalent for higher voltage systems. If proper voltage cannot be obtained, inform the District and the serving Utility Company.

3.06 PROJECT CLOSEOUT

A. Training: At the time of completion, a period of not less than 24 hours shall be allotted by the Contractor for instruction of building operating and maintenance personnel in the use of all systems. This 24 hours training is in addition to any instruction time called out in the Specifications for specific systems, i.e., Fire Alarm, etc. All personnel shall be instructed at one time, the Contractor making all necessary arrangements with manufacturer's representative. The equipment manufacturer shall be requested to provide product literature and application guides for the users' reference. Costs, if any, for the above services shall be paid by the Contractor.

B. Special tools: Provide one of each tool required for proper operation and maintenance of the equipment provided under this Section. All tools shall be delivered to the District at the Project completion.

C. Keying: Provide two keys for each lock furnished under this Section and turn over to District.

END OF SECTION
SECTION 26 05 00
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes the following:
   1. Electrical equipment coordination and installation.
   2. Sleeves for raceways and cables.
   3. Sleeve seals.
   4. Common electrical installation requirements.

1.03 DEFINITIONS
B. EPDM: Ethylene-propylene-diene terpolymer rubber.
C. NBR: Acrylonitrile-butadiene rubber.

1.04 SUBMITTALS
A. Product Data: For each type of product indicated.

1.05 QUALITY ASSURANCE
A. Test Equipment Suitability and Calibration: Comply with NETA ATS, "Suitability of Test Equipment" and "Test Instrument Calibration."

1.06 COORDINATION
A. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Panels."

D. Coordinate electrical testing of electrical, mechanical, and architectural items, so equipment and systems that are functionally interdependent are tested to demonstrate successful interoperability.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application

2.03 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
E. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs, under wall footings and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
   1. Cut sleeves to length for mounting flush with both surfaces of walls.
   2. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
   3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require a different clearance.
   4. Seal space outside of sleeves with grout for penetrations of concrete and masonry with approved joint compound for gypsum board assemblies.

G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

H. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

J. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

K. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.03 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
3.04 FIELD QUALITY CONTROL

A. Inspect installed sleeve and sleeve-seal installations and associated firestopping for damage and faulty work.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Conduit, ducts, and duct accessories for in single duct runs.
   2. Handholes and boxes.

1.03 DEFINITION

A. RNC: Rigid nonmetallic conduit.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Duct-bank materials, including separators and miscellaneous components.
   2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
   3. Accessories for manholes, handholes, boxes.
   4. Warning tape.

B. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:
   1. Duct entry provisions, including locations and duct sizes.
   2. Cover design.
   4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.05 INFORMATIONAL SUBMITTALS

A. Product Certificates: For concrete and steel used in precast concrete handholes, as required by ASTM C 858.

1.06 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.
1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete and other factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.08 COORDINATION

A. Coordinate layout and installation of ducts, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.01 CONDUIT


B. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.02 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT; a division of Cable Design Technologies.
11. Spiraduct/AFC Cable Systems, Inc.
B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

C. Duct Accessories:
1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.

2.03 PRECAST CONCRETE HANDHOLES AND BOXES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Carder Concrete Products
2. Christy Concrete Products
3. Elmhurst-Chicago Stone Co
4. Oldcastle Precast Group
5. Riverton Concrete Products; a division of Cretex Companies, Inc
6. Utility Concrete Products, LLC
7. Utility Vault Co
8. Wausau Tile, Inc

B. Comply with ASTM C 858 for design and manufacturing processes.

C. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
1. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
3. Cover Legend: Molded lettering, As indicated for each service.
4. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
   a. Extension shall provide increased depth of 12 inches (300 mm).
6. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.04 HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.
1. Color: Gray
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, As indicated for each service.
6. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long and larger shall have factory-installed inserts for cable racks and pulling-in irons.
B. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Armorcast Products Company
   b. Carson Industries LLC
   c. CDR Systems Corporation
   d. NewBasis
   e. Oldcastle Precast Group

PART 3 - EXECUTION

3.01 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

B. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

C. Underground Ducts for Telephone, Communications, or Data Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank, unless otherwise indicated.

3.02 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less, Including Telephone, Communications, and Data Wiring:
   1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-20 structural load rating.
   2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.

3.03 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Section 017329 "Cutting and Patching."

E. Direct-Buried Duct Banks:
1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.

2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches (150 mm) between tiers.

3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches (150 mm) in nominal diameter.

4. Install backfill as specified in Section 312000 "Earth Moving."

5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches (100 mm) over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

6. Depth: Install top of duct bank at least 24 inches below finished grade, unless otherwise indicated.

7. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose.
   b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.04 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole :
   1. Comply with ASTM C 891, unless otherwise indicated.
   2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
   3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:
   1. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
   2. Where indicated, cast handhole cover frame integrally with handhole structure.

3.05 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

E. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.06 GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.07 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:
   1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
   2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
   3. Test handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.08 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
   A. Work included:
      1. Power system grounding.
      2. Electrical equipment and raceway grounding and bonding.
   B. Related work:
      1. Division 05: Metals.
      2. Division 22: Cold Water Plumbing.

1.02 REFERENCES
   A. Comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
      1. Underwriters Laboratories, Inc. (UL):
         a. UL 467; Grounding and Bonding Equipment.
      2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
         a. IEEE No. 142; Recommended Practice for Grounding of industrial and Commercial Power Systems.

1.03 SYSTEM DESCRIPTION
   A. Grounding of the electrical service system neutral at the service entrance equipment is existing and part of the existing main switchboard. Electrical contractor shall arrange and pay for the services of an independent testing agency to perform all electrical testing required herein to ensure the continuity of the grounding system.
   B. Except as otherwise indicated, the complete electrical installation including the neutral conductor, metallic conduits and raceways, cable trays, boxes, cabinets and equipment shall be completely and effectively grounded in accordance with all code requirements, whether or not such connections are specifically shown or specified.
   C. Resistance:
      1. Resistance from the main switchboard ground bus through the ground electrode to earth shall not exceed 5 OHMS unless otherwise noted.
      2. Resistance from the farthest panelboard, switchboard, etc. ground bus through the ground electrode to earth shall not exceed 20 OHMS

1.04 SUBMITTALS
   A. Submit in accordance with the requirements of Section 26 01 00: Basic Electrical Requirements, the following items:
      1. Data/catalog cuts for each product and component specified herein, listing all physical and electrical characteristics and ratings indicating compliance with all listed standards.
      2. Clearly mark on each data sheet the specific item(s) being submitted and the proposed application.
      3. Submit manufacturer’s installation instructions.

1.05 QUALITY ASSURANCE
A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Only products and applications listed in this Section may be used on the project unless otherwise submitted.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:

1. Ground Rods:
   a. Weaver.
   b. Erico “Cadweld” Products, Inc.

2. Ground Wells:
   a. Christy Concrete Products, Inc.
   b. Forni Corp.

3. Ground Bushings, Connectors, Jumpers and Bus:
   a. O-Z/Gedney.
   b. Thomas & Betts Corp.

B. Substitutions: Under provisions of Section 26 01 00: Basic Electrical Requirements.

2.02 GROUND CONDUCTORS

A. General purpose insulated: UL approved and code sized copper conductor, with dual rated THHN/THWN insulation, color identified green. Where continuous color-coded conductors are not commercially available, provide a minimum 4” long color band with green, non-aging, plastic tape in accordance with NEC.

B. Bare conductors in direct contact with earth or encased in concrete: #4 AWG copper minimum. U.O.N.

C. Bonding pigtails: Insulated copper conductor, identified green, sized per code, and provide with termination screw or lug. Provide solid conductors for #10 AWG or smaller and stranded conductors for #8 AWG or larger.

2.03 DRIVEN (GROUND) RODS

A. Copper clad steel, minimum ¾-inch diameter by 10 feet long, unless otherwise noted.

2.04 GROUND WELL BOXES FOR GROUND RODS

A. Precast concrete box nominal 9” throat diameter x 14” deep with light duty concrete cover for non-traffic areas or steel plate for traffic areas. Cover shall be embossed or engraved with "GROUND ROD".

2.05 INSULATED GROUNDING BUSHINGS

A. Plated malleable iron or steel body with 150 degree Centigrade molded plastic insulating throat and lay-in grounding lug.

2.06 CONNECTIONS TO PIPE

A. For cable to pipe: UL and NEC approved bolted connection.

2.07 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS, OR SPLICES
A. Where required by the drawings, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds or high pressure compression type connectors.

1. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Cadweld or equal. Each particular type of weld shall use a kit unique to that type of weld.

2. High-pressure compression type connectors shall be used for cable-to-cable and cable-to-ground rod connections. Connections shall be as manufactured by Thomas & Betts #53000 series or equal.

2.08 EXTRA FLEXIBLE, FLAT BONDING JUMPERS

A. Where required by the drawing or specified herein.

2.09 MAIN BUILDING REFERENCE GROUND BUS

A. Shall be furnished under a separate contract integral with the main service switchboard.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Contractor shall thoroughly examine site conditions for acceptance of grounding system installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.02 INSTALLATION

A. Grounding electrodes:

1. Metal underground water pipe: Cold water metal piping system: Where the underground cold water service line is metal, in direct contact with the earth for 10 feet or more, the contractor shall install a grounding electrode conductor from the main incoming cold water line ahead of the meter and extend to the main building reference ground bus in the main electrical room. The electrode shall be sized per NEC Table 250-66. Electrode connection should be accessible.

2. Concrete encased grounding electrode (UFER ground): Provide a #4 AWG minimum bare copper conductor encased along the bottom of concrete foundation or footings which are in direct contact with the earth and where there is no impervious water-proofing membrane between the footing and the soil. The electrode shall extend through a horizontal length of 20 feet minimum and shall be encased in not less than 2 or more than 5 inches of concrete separating it from surrounding soils. The electrode shall emerge from the concrete slab through a protective non-metallic sleeve and shall be extended to the main building reference ground bus.

3. Supplementary grounding electrode (ground ring, grid, and driven rods): Provide, as shown on the drawings, driven ground rod(s) installed in listed ground well box(s) and filled with gravel after connection is made. Interconnect ground rod with structural steel and adjacent rods with minimum #4 AWG bare copper conductor. Ground rod shall not be less than 10 foot from any other electrode of another electrical system or from adjacent ground rod(s).

B. Grounding electrode conductor: Provide grounding electrode conductor as indicated on the drawings or sized per NEC Table 250-66, whichever is greater.

C. Power system grounding:

1. Provide a grounding electrode connection at each individual building on the campus. Connect the following items using NEC sized copper grounding conductors to lugs on each buildings service ground bus:
a. Grounding electrode conductor from metal underground water pipe, concrete encased electrode, and supplementary grounding electrodes. Ground electrode connections may already exist at each building, but where there are not existing they shall be provided.

b. Bonding conductor to metallic cold water piping system.

c. Bonding conductor to building structural steel.

D. Equipment bonding/grounding:
   1. Provide a NEC sized insulated copper ground conductor in all 120VAC through 600 VAC feeder and branch circuit distribution conduits and cables.
   2. Provide a separate grounding bus at panelboards, switchboards. Connect all metallic enclosed equipment so that with maximum fault current flowing shall be maintained at not more than 35 volts above ground.
   3. Conduit terminating in concentric, eccentric or oversized knockouts at panelboards, cabinets, gutters, etc. shall have grounding bushings and bonding jumpers installed interconnecting all such conduits.
   4. Provide bonding jumpers across expansion and deflection couplings in conduit runs, pipe connections to water meters, dielectric couplings in metallic cold water piping system.
   5. Provide internal ground wire in flexible conduit connected at each end via grounding bushing.
   6. Provide external ground wire wrapped around flexible conduit and terminate to connectors designed for the purpose.

3.03 FIELD QUALITY CONTROL

A. Independent Testing: Electrical contractor shall arrange and pay for the services of an independent testing agency to perform all quality control electrical testing required herein.

B. Prefunctional testing:
   1. Provide testing agency with contract documents for their review prior to the commencement of ground testing.
   2. Visual and mechanical inspection:
      a. The testing agency shall inspect the grounding electrode and connections prior to concrete encasement, burial, or concealment.
      b. Check tightness and welds of all ground conductor terminations.
      c. Verify installation complies with the intent of the contract documents
   3. Obtain and record ground resistance measurements both from electrical equipment ground bus to the ground electrode and from the ground electrode to earth. Furnish and install additional bonding and add grounding electrodes as required complying with resistance limits specified under this Section of the Specification.
   4. Typewritten records of measured resistance values shall be submitted for review and included with the operation and maintenance manual furnished to the District at the time of project closeout and before certificate of final payment is issued.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Work included:
   1. Electrical equipment nameplates.
   2. Main Switchboard directories
   3. Distribution Panelboard.
   4. Panelboard directories.
   5. Dry Type Transformers
   6. Wire and cable identification.
   7. Buried electrical line warnings.
   9. Inscribed device coverplates.

B. Related work:
   1. Division 9: Painting.

1.02 SUBMITTALS

A. Submit in accordance with the requirements of Section 26 01 00: Basic Electrical Requirements, the following items:
   1. Data/catalog cuts for each product and component specified herein.
   2. Schedules for nameplates to be furnished.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:
   1. Conduit and wire markers:
      a. Thomas & Betts Corp
      b. Brady
      c. Griffolyn
   2. Inscription Tape:
      a. Kroy
      b. Merlin

B. Substitutions: Under provisions of Section 26 01 00: Basic Electrical Requirements.

2.02 NAMEPLATES

A. Type NP: Engraved, plastic laminated labels, Signs, and Instruction Plates. Engrave stock melamine plastic laminate 1/16-inch minimum thickness for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Engraved nameplates shall have white letters and be punched for mechanical fasteners.

B. Color and letter height as specified in Part 3: Execution.
2.03 BRASS TAGS
   A. Type BT: Metal tags with die-stamped legend, punched for fastener.
   B. Dimensions: 2" diameter 19 gauge.

2.04 PANELBOARD DIRECTORIES (400 AMP OR LESS)
   A. Directories: A 6" x 8" minimum size circuit directory frame and card with clear plastic covering shall be provided inside the inner panel door.
   B. Circuit numbering: Starting at the top, odd numbered circuits in sequence down the left hand side and even numbered circuits down the right hand side. Multi-section panelboards shall have continuous consecutive circuit numbers, i.e. Section 1 (circuit numbers 1-42), Section 2 (circuit numbers 43-84), and Section 3 (circuit numbers 85-126).

2.05 WIRE AND TERMINAL MARKERS
   A. Provide self-adhering, pre-printed, machine printable or write-on, self-laminating vinyl wrap around strips. Blank markers shall be inscribed using the printer or pen recommended by manufacturer for this purpose.

2.06 CONDUCTOR PHASE MARKERS
   A. Colored vinyl plastic electrical tape, 3/4" wide, for identification of phase conductors. Scotch 35 Brand Tape or equal.

2.07 UNDERGROUND CONDUIT MARKER
   A. 6-inch wide, yellow polyethylene tape with a trace wire, with continuous black imprinting reading "Caution - Buried Electric Line Below".

2.08 INSCRIBED DEVICE COVERPLATES
   A. Coverplate material shall be as specified in Section 26 14 00: Wiring Devices.
   B. Methods of inscription: (Unless otherwise noted)
      1. Type-on-tape:
         a. Imprinted or thermal transfer characters onto tape lettering system.
         b. Tape trimmer.
         c. Matte finish spray-on clear coating.
      2. Engraving:
         a. 1/8" high letters.
         b. Paint filled letters finished in black.

PART 3 - EXECUTION

3.01 EXAMINATION
   A. Contractor shall thoroughly examine site conditions for acceptance of identification device installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.
3.02 NAMEPLATES

A. Installation:
   1. Degrease and clean surfaces to receive nameplates.
   2. Install nameplates parallel to equipment lines.
   3. Secure nameplates to equipment fronts using machine screws.

B. Provide type ‘NP’ color coded nameplates that present, as applicable, the following information:
   1. Equipment or device designation.
   2. Amperage, KVA or horsepower rating, where applicable.
   3. Voltage or signal system name.
   4. Source of power or control.
   5. Examples:
      a. Boards: HD2A; 225A; 277/480V, 3PH, 4W; Served from: EH2A-4
      b. Transformers: TX-2A; 150KVA; 480V pri. - 120/208V, 3PH, 4W sec.;
         Served from: HD2A; Load Served: L2A
      c. Disconnects or Individual Motor Starters: EF-1; 20HP; 480V, 3PH, 3W;
         Served from MCC-1A
      d. Signal: STB-3; Public Address System; Served from STBM

C. Nameplates for power system distribution equipment and devices are to be black.

D. Nameplates for signal systems equipment and devices are to be black except as follows:
   1. Fire alarm and life safety - Red.
   3. Clock, intercom, PA, MATV, CATV - Blue.

E. Minimum letter height shall be as follows:
   1. For panelboards, switchboards, etc.: ½ inch letters to identify equipment designation. Use ¼ inch letters to identify voltage, phase, wires, etc.
   2. For individual circuit breakers, switches and motor starters in panelboards and switchboards use 3/8-inch letters to identify equipment designation. Use 1/8-inch letters to identify all other.
   3. For individual mounted circuit breakers, disconnect switches, enclosed switches and motor starters use 3/8-inch letters to identify equipment designation. Use 1/8” letters to identify all other.
   4. For equipment cabinets, terminal cabinets, control panels and other cabinet enclosed apparatus use 3/8-inch letters to identify equipment designation.

3.03 BRASS TAGS

A. Provide type BT tags for individual ground conductors to exposed ground bus indicating connection i.e. "UFER", "Cold water bond", etc.

B. Provide tags for all feeder cables in underground vaults and pull boxes.

C. Provide tags for empty conduits in underground vault, pull boxes, and stubs.

3.04 PANELBOARD DIRECTORIES (400 AMP OR LESS)

A. Provide typewritten directories arranged in numerical order denoting loads served by room number or area for each circuit.

B. Verify room numbers or area designation with project manager.
C. Mount panelboard directories in a minimum 6" x 8" metal frame under clear plastic cover inside every panelboard.

3.05 WIRE AND CABLE IDENTIFICATION

A. Provide wire markers on each conductor in panelboards, pull boxes, outlet and junction boxes and at load connection. Identify with branch circuit or feeder number for power and lighting circuits and with control wire number as indicated on equipment manufacturer’s shop drawings for control wiring.

B. Provide colored phase markers for conductors as noted in Section 26 12 00: Conductors and Cables. Apply colored, pressure sensitive plastic tape in half-lapped turns for a distance of 3 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Do not cover cable identification markings by taping.

3.06 UNDERGROUND CONDUIT MARKERS

A. During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

3.07 JUNCTION BOX IDENTIFICATION

A. The cover of junction, pull, and connection boxes for both power and signal systems, located above suspended ceilings and below ceilings in non-public areas, shall be clearly marked with a permanent ink felt pen. Identify the circuit(s) (panel designation and circuit numbers) contained in each box, unless otherwise noted or specified.

3.08 INSCRIBED DEVICE COVERPLATE

A. General:
1. Lettering type: Helvetica, 12 point or 1/8" high.
2. Color of characters shall be black.
3. Locate the top of the inscription 1/2" below the top edge of the coverplate.
4. Inscription shall be centered and square with coverplate.

B. Application:
1. Provide inscribed coverplates for devices as outlined below:
   a. Receptacles.
   b. Outlets in surface raceways.
2. Type-on-tape inscriptions shall be provided for the following devices:
   a. Receptacles.
   b. Outlets in surface raceways.
3. Type-on-tape installation:
   a. Tape shall be trimmed to the height of the letters.
   b. Trim tape length to 1/4 inch back from each edge of coverplate.
   c. Contractor hands shall be clean or covered with surgical type glove prior to application of tape. Tape installations with visible fingerprints or smudges will not be acceptable.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:
   1. Division 02 Section Existing Conditions.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
   1. Custom enclosures and cabinets.
   2. For handholes and boxes for underground wiring, including the following:
      a. Duct entry provisions, including locations and duct sizes.
      b. Frame and cover design.
      c. Grounding details.
      d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
      e. Joint details.
C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 26 Section 26 07 10 "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For professional engineer and testing agency.

F. Source quality-control test reports.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   2. Alflex Inc.
   3. Allied Tube & Conduit; a Tyco International Ltd. Co.
   4. Anamet Electrical, Inc.; Anaconda Metal Hose.
   5. Electri-Flex Co.
   7. Maverick Tube Corporation.
C. Rigid Steel Conduit: ANSI C80.1.

D. Aluminum Rigid Conduit: ANSI C80.5.

E. IMC: ANSI C80.6.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   1. Comply with NEMA RN 1
   2. Coating Thickness: 0.040 inch minimum.

G. EMT: ANSI C80.3.

H. LFMC: Flexible steel conduit with PVC jacket.

I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMAFB1 listed for type and size raceway with which used and for application and environment in which installed.
   2. Fittings for EMT: Steel set-screw for 1 inch size conduits or less and steel compression type for conduits greater than 1 inch.
   3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch with overlapping sleeves protecting threaded joints.

J. Joint Compound for Rigid Steel Conduit of IMC: Listed for use in cable connector assemblies and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.02 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Condux International, Inc.
   3. ElecSYS, Inc.
   4. Electri-Flex Co.
   5. Lamson & Sessions; Carlon Electrical Products.
   7. RACO; a Hubbell Company.
   8. Thomas & Betts Corporation.

C. ENT: NEMA TC 13.

D. RNC: NEMA TC 2, Type EPC-40-PVC unless otherwise indicated.

E. LFNC: UL 1660.

F. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

G. Fittings for LFNC: UL 514B.

2.03 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS
A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arnco Corporation
2. Endot Industries, Inc.
3. IPEX Inc.
4. Lamson and Sessions; Carlon Electrical Products

C. Description: Comply with UL 2024; flexible type, approved for general-use installation.

2.04 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1 for indoor and Type 3R for outdoor.

D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

E. Wireway Covers: Hinged type, with lockable doors.

F. Finish: Manufacturer's standard enamel finish.

2.05 NONMETALLIC WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

C. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

D. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap on cover and mechanically coupled connections with plastic fasteners.

E. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
2.06 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. EGS/Appleton Electric.
   6. O-Z/Gedney; a unit of General Signal
   7. RACO; a Hubbell Company.
   10. Spring City Electrical Manufacturing Company.

C. Sheet Metal Outlet and Device Boxes: NEMA OS 1

D. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, Galvanized steel with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated. Galvanized-steel, finished inside and out with manufacturer's standard enamel.

I. Cabinets:
   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage
   5. Accessory feet where required for freestanding equipment.

2.07 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.
   2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
   3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
   4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   5. Cover Legend: Molded lettering, "ELECTRIC", "TELECOMMUNICATIONS", "FIRE ALARM" as indicated for each service
   6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
   7. Handholes: Sized per code. Larger non-standard handholes shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
B. Concrete Handholes and Boxes with Steel Cover rated H/20: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   3. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. CDR Systems Corporation.
      d. Christy

2.08 SLEEVES FOR RACEWAYS
A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

2.09 SLEEVE SEALS
A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
C. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
   1. Advance Products & Systems, Inc.
   2. Calpico, Inc.
   3. Metraflex Co
   4. Pipeline Seal and Insulator, Inc.
D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
   1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
   2. Pressure Plates: Stainless steel. Include two for each sealing element.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.10 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES
A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
   1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.

3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
   1. Exposed Conduit: Rigid steel conduit.
   2. Concealed Conduit, Aboveground: EMT.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
   6. Application of Handholes and Boxes for Underground Wiring:
      a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
      b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units with polymer-concrete frame and cover, SCTE 77, Tier 8 structural load rating.
      c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT
   2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit.
   3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations
   5. Damp or Wet Locations: Rigid steel conduit.
   6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 3R stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.02 INSTALLATION
A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Electrical Supports and Seismic Restraints."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
   1. Provide minimum conduit size as shown on drawings. Larger size conduits are permitted for ease of installation or standardization.
   2. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where otherwise required by NFPA 70.
N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet.

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F temperature change.
   d. Attics: 135 deg F temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.

3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

Q. Set metal floor boxes level and flush with finished floor surface.

R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.03 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 for pipe less than 6 in nominal diameter.
2. Install backfill as specified in Division 31.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp back fill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31.
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
   b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

RACEWAYS AND BOXES
6. Warning tape: Bury warning tape with trace wire approximately 12 inches above direct-buried conduits. Align tape along the width and along the centerline of conduit.

3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade

D. Install handholes and boxes with bottom below the frost line, below grade

E. Install removable hardware, including pulling eyes cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Install removable hardware, including pulling eyes, cable stanchions, Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.05 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Concrete Slabs, wall footings and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs, under wall footings and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve cross-section rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
   2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway unless sleeve seal is to be installed.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

K. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.06 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.07 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION
SECTION 26 12 00
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes the following:
1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.
B. Related Sections include the following:
1. Division 27- Communications and Division 28 – Fire Alarm System

1.03 DEFINITIONS
A. EPDM: Ethylene-propylene-diene terpolymer rubber.
B. THWN: Moisture-resistant and heat-resistant thermoplastic.
C. THHN: Heat-resistant thermoplastic.
D. XHHW: Moisture-resistant thermoset.

1.04 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Qualification Data: For testing agency.
C. Field quality-control test reports.

1.05 QUALITY ASSURANCE
A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Comply with NFPA 70.
1.06 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   3. General Cable Corporation.
   4. Senator Wire & Cable Company.
   5. Southwire Company.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

E. Multiconductor Cable: Type “MC” cable NOT PERMITTED.

2.02 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   3. O-Z/Gedney; EGS Electrical Group LLC.
   4. 3M; Electrical Products Division.
   5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
2.04 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
   1. Advance Products & Systems, Inc.
   2. Calpico, Inc.
   3. Metraflex Co.
   4. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
   1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
   2. Pressure Plates: Stainless steel. Include two for each sealing element.
   3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Per PG&E Requirements.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN, single conductors in raceway.

G. Class 1 Control Circuits: Type THWN, in raceway.
H. Class 2 Control Circuits: Type THWN, in raceway.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Electrical Supports and Seismic Restraints."

F. Identify and color-code conductors and cables according to Division 26 Section "Electrical Identification."

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.05 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

B. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

C. Rectangular Sleeve Minimum Metal Thickness:
   1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
   2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both wall surfaces.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed.
H. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.06 SLEEVE-SEAL INSTALLATION
A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.07 FIELD QUALITY CONTROL
A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:
1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and branch circuit conductors.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
   a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 6 months after date of Substantial Completion.
   b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

D. Test Reports: Prepare a written report to record the following:
1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION
SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
   1. Distribution transformers.

1.03 ACTION SUBMITTALS
A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.
B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.04 INFORMATIONAL SUBMITTALS
A. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
B. Qualification Data: For testing agency.
C. Source quality-control test reports.
D. Field quality-control test reports.

1.05 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.
1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

C. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.08 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ACME Electric Corporation; Power Distribution Products Division.
2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
3. Controlled Power Company.
5. Federal Pacific Transformer Company; Division of Electro-Mechanical Corp.
2.02 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.
   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Copper.

2.03 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Ventilated NEMA 250, Type 2.
   1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Enclosure: Ventilated, NEMA 250, Type 3R.
   1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

F. Transformer Enclosure Finish: Comply with NEMA 250.
   1. Finish Color: ANSI 61 gray.

G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity]

H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

I. Energy Efficiency for Transformers Rated 15 kVA and Larger:
   1. Complying with NEMA TP 1, Class 1 efficiency levels.
   2. Tested according to NEMA TP 2.

J. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
   1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
   2. Indicate value of K-factor on transformer nameplate.
K. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
   1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
   2. Include special terminal for grounding the shield.
   3. Shield Effectiveness:
      a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
      b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
      c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

L. Wall Brackets: Manufacturer's standard brackets.

M. Fungus Proofing: Permanent fungicidal treatment for coil and core.

N. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.04 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.05 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."
B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

3.03 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Remove and replace units that do not pass tests or inspections and retest as specified above.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.05 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.


3.06 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION
SECTION 26 47 60
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes the following individually mounted, enclosed switches and circuit breakers:
1. Fusible switches – Heavy duty.
2. Nonfusible switches – Heavy duty.
5. Enclosures.

1.03 DEFINITIONS
A. GD: General duty.
B. GFCI: Ground-fault circuit interrupter.
C. HD: Heavy duty.
D. RMS: Root mean square.
E. SPDT: Single pole, double throw.

1.04 SUBMITTALS
A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   4. UL listing for series rating of installed devices.
   5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
B. Shop Drawings: Diagram power, signal, and control wiring.
C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 26 Section "Electrical Supports and Seismic Restraints." Include the following:
   1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
      b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic
forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Field quality-control test reports including the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Manufacturer's field service report.

G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures, Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.
1.07  COORDINATION
   A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.08  EXTRA MATERIALS
   A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      1. Spares: For the following:
         c. Fuses and Fusible Devices for Fused Circuit Breakers: 12.
      2. Spare Indicating Lights: Six of each type installed.

PART 2 - PRODUCTS

2.01  MANUFACTURERS
   A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
      1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
      2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.02  FUSIBLE AND NONFUSIBLE SWITCHES – HEAVY DUTY
   A. Manufacturers:
      1. Eaton Corporation.
      2. General Electric Co.; Electrical Distribution & Control Division.
      4. Square D/Group Schneider.
   B. Fusible Switch, 600A and Smaller: NEMA KS 1, Type GD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
   C. Nonfusible Switch, 600A and Smaller: NEMA KS 1, Type GD, lockable handle with ept two padlocks, and interlocked with cover in closed position.
   D. Accessories:
      1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
      2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
      3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.03  MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES
A. Manufacturers:
1. Eaton Corporation.
2. General Electric Co.; Electrical Distribution & Control Division.
5. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
3. Electronic Trip-Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I²t response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

C. Molded-Case Circuit-Breaker Features and Accessories:
1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style with compression lug kits suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

D. Molded-Case Switches: Molded-case circuit breaker with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

E. Molded-Case Switch Accessories:
1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
2. Application Listing: Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Key Interlock Kit: Externally mounted to prohibit operation; key shall be removable only when switch is in off position.

2.04 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
1. Outdoor Locations: NEMA 250, Type 3R.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.
PART 3 - EXECUTION

3.01 EXAMINATION
   A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 CONCRETE BASES
   A. Coordinate size and location of concrete bases. Verify structural requirements with structural engineer.
   B. Concrete base is specified in Division 26 Section "Electrical Supports and Seismic Restraints," and concrete materials and installation requirements are specified in Division 3.

3.03 INSTALLATION
   A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
   B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.
   C. Comply with mounting and anchoring requirements specified in Division 26 Section "Electrical Supports and Seismic Restraints."
   D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.04 IDENTIFICATION
   A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification."
   B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Electrical Identification."

3.05 FIELD QUALITY CONTROL
   A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
   B. Prepare for acceptance testing as follows:
      1. Inspect mechanical and electrical connections.
      2. Verify switch and relay type and labeling verification.
      3. Verify rating of installed fuses.
      4. Inspect proper installation of type, size, quantity, and arrangement of mounting or anchorage devices complying with manufacturer's certification.
   C. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
   D. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
E. Perform the following field tests and inspections and prepare test reports:

1. Test mounting and anchorage devices according to requirements in Division 26 Section "Electrical Supports and Seismic Restraints."

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

4. Infrared Scanning:
   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
   b. Follow-Up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
   c. Instruments, Equipment and Reports:
   d. Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   e. Prepare a certified report that identifies enclosed switches and circuit breakers included and describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

3.06 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.07 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION
SECTION 27 00 00
BASIC COMMUNICATIONS REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes general administrative and procedural requirements for Division 27, and is intended to supplement, not supersede, the general requirements specified in Division 00.

B. The requirements described herein include the following:

1. References
2. Definitions
3. Submittals
4. Quality Assurance
5. Delivery, Storage, and Handling
6. Scheduling
7. Warranty
8. Product Substitutions
9. Project Management and Coordination Services
10. Permits and Inspections
11. Field Quality Control
12. Project Closeout and Record Documents

C. Related Items

1. General and Supplementary Conditions: General provisions of the Prime Contract and Divisions 00 and 01 apply to Division 27.

2. Consult other Divisions and Sections, determine the extent and character of related work, and coordinate Work of Division 27 with that specified elsewhere to produce a complete and operable installation.

3. Section 27 05 26, “Communication Grounding and Bonding”

4. Section 27 05 28, “Communication Building ISP Pathways”

5. Section 27 05 33, “Communication Building Pathways – Conduits and Boxes”

6. Section 27 08 11, “Communication Twisted Pair Testing”

7. Section 27 08 21, “Communication Optical Fiber Testing”

8. Section 27 11 00, “Communication Equipment Rooms”

9. Section 27 13 14, “Communication Backbone OSP Twisted Pair Cabling”

10. Section 27 13 24, “Communication Backbone OSP Fiber Optic Cabling”
11. Section 27 15 13, “Communication Horizontal Twisted Pair Cabling”

1.2 REFERENCES

A. General

1. Codes, standards, and industry manuals/guidelines listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Consider such codes and/or standards a part of this specification as though fully repeated herein.

2. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

3. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid unless otherwise specifically stated.

B. Codes: Perform work and furnish materials and equipment under Division 27 in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. California Code of Regulations (CCR):
   a. Title 8, “Industrial Relations”
      1) Chapter 3.22, “California Occupational Safety and Health Regulations (CAL/OSHA)”
   b. Title 24, “California Building Standards Code”
      2) Part 2, “California Building Code” (CBC)
      3) Part 3, “California Electrical Code” (CEC)
      4) Part 11, “California Green Building Standards Code” (CALGeen)”

2. National Fire Protection Agency (NFPA)
   a. NFPA 75, “Protection of Information Technology Equipment”

   b. Part 27, “Miscellaneous Wireless Communications Services”
   c. Part 68, “Connection of Terminal Equipment to the Telephone Network”
   d. Part 90, “Private Land Mobile Radio Services”

4. Other applicable national, state, and local binding building and fire codes

C. Standards: Perform work and furnish materials and equipment under Division 27 in accordance with the latest editions of the following standards as applicable:
1. Building Industry Consulting Services International (BICSI):
   a. Telecommunications Distribution Methods Manual (TDMM)
   c. Wireless Design Reference Manual (WDRM)
2. EIA testing standards
3. National Electrical Contractors Association (NECA):
4. Telecommunications Industry Association (TIA):
   a. ANSI/TIA-568-C.0, “Generic Telecommunications Cabling for Customer Premises”
   b. ANSI/TIA-568-C.1, “Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements”
   c. ANSI/TIA-568-C.2, “Balanced Twisted Pair Telecommunications Cabling and Components”
   e. ANSI/TIA-569-B, “Commercial Building Standard for Telecommunications Pathways and Spaces”
   f. ANSI/TIA/EIA-598-B, “Optical Fiber Cable Color Coding”
   g. ANSI/TIA-606-B, “Administration Standard for Telecommunications Infrastructure”
   h. ANSI-TIA-607-B, “Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises”
   i. ANSI/TIA-758-A, “Customer-Owned Outside Plant Telecommunications Infrastructure Standard”
   j. ANSI/TIA-1005, “Telecommunications Infrastructure Standard for Industrial Premises”
   k. Definitions

D. The definitions of Divisions 00 and 01 shall apply to Division 27 sections.

E. In addition to those definitions of Divisions 00 and 01, the following list of terms as used in this specification defined as follows:

1. “AFF”: Above Finished Floor
2. “As directed”: As directed or instructed by the Owner, or their authorized representative
3. “AHJ”: Authority Having Jurisdiction
4. “Cabling”: installed media ready for electronic or optical signal circuit use; a complete media connection comprised of cables, termination apparatus (patch panels, blocks, connectors), outlets, connecting media (path cord, crossconnects), labeling
5. “CBC”: California Building Code (CCR Title 24 Part 2)
6. “CCR”: California Code of Regulations
7. “CEC”: California Electrical Code (CCR Title 24 Part 3)
8. “Connect”: To install patch cords, equipment cords, crossconnect wire, etc. to complete an electronic or optical signal circuit
9. “Cord”: a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”
10. “Engineer”: TEECOM
11. “Furnish”: To purchase, procure, acquire, and deliver complete with related accessories
12. “General Contractor”: successful bidder
13. “Identifier”: A unique code assigned to an element of the Telecommunications infrastructure that links it to its corresponding record
14. “Install”: To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to the Owner, parts, items, or equipment supplied by contractor or others. Make installation complete and ready for regular operation
15. “IOR”: Inspector Of Record
16. “ISP”: Inside Plant
17. “LED”: Light Emitting Diode
18. “MSDS”: Material Safety Data Sheets
19. “NEC”: National Electrical Code (NFPA 70)
20. “NEMA”: National Electrical Manufacturers Association
22. “NIC”: Not In Contract (work or equipment)
23. “OFCI”: Owner-furnished contractor-installed; coordinate the integration of components furnished by the Owner; provide mounting hardware, cable, connectors, etc. to ensure proper integration of OFCI equipment
24. “OFE”: Owner Furnished Equipment
25. “OSP”: Outside Plant
26. “Owner”: Contra Costa Community College District
28. “Pigtail”: a length of cordage having connectors at one end
29. “Provide”: To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation
30. “UL”: Underwriters Laboratories

1.3 SYSTEM DESCRIPTION AND PROJECT CONDITIONS

A. In circumstances where the Specifications and Drawings conflict, the Drawings shall govern quantity and the Specifications shall govern quality.
1.4 SUBMITTALS

A. Submit required submittals to the General Contractor in the quantities and formats as required under the general contract. In the absence of requirements, provide as described in the following with reference to quantity and format.

B. Failure to comply with requirements in part or whole shall constitute grounds for rejection.

C. Resubmittals: For resubmittals, provide a cover letter with the resubmittal that lists the action taken and revisions made to each product in response to the Engineer's submittal review comments. Lack of this actions-taken cover letter shall constitute grounds for non-review and/or rejection of resubmittal packages.

D. Submittal Description: Product Data

1. Obtain written approval from the Engineer for the product data submittal prior to materials and equipment purchase order and prior to installation.

2. Quantity and Media: Submit product data as described in Division 01. In the absence of requirements given, submit product data submittal as directed in writing either as an electronic submittal (preferred) via approved means (e.g., email, e-transmit) or as four printed submittals (not preferred).

3. Format and Organization – Electronic Submittal:
   a. File format shall be PDF, either as a single compiled PDF file or as a PDF portfolio. PDF files should be produced from original electronic media, not scans of printed media. If scans from prints are the only option, annotate electronically, not on the prints prior to scanning.
   b. Pages should be letter size (8.5” x 11”)
   c. Organize the Content in the following order:
      1) Cover
      2) Table of Contents (TOC)
      3) Statement of compliance
      4) Product information
      5) Seismic calculations (as required)
   d. Clearly and precisely indicate the submitted product and accessories by part number using an electronic annotation (arrow, rectangle, oval, etc.). Where the product data presents “part number builds”, list the exact part number of the submitted products and accessories.
   e. Add page numbers in numerical order with no gaps to each page that correctly correspond to the TOC.

4. Content:
   a. Cover: Include a cover that clearly displays the following information:
      1) Owner name
      2) Project name and address
3) Submittal name (e.g., “Product Data Submittal for Telecommunications Equipment Rooms”)

4) Project submittal number

5) Contractor’s submittal number (discretionary)

6) Submittal date; format: Month Day, Year (e.g., “January 1, 2019”)

7) Specification section numbers included in the submittal (e.g., “Section 27 11 00”)

8) Contractor name and contact information

b. Table of Contents (TOC): Include a TOC that lists materials by section number, article and paragraph number. Add a brief product description (what it is, size or color or other optional features), manufacturer and part number. List the submittal page number per product. Example heading for TOC:

<table>
<thead>
<tr>
<th>Section</th>
<th>Article</th>
<th>Paragraph</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part #</th>
<th>Page #</th>
</tr>
</thead>
</table>

b. Statement of Compliance: Include a “Statement of Compliance” letter or memorandum on the submitter’s company letterhead from the highest-ranking employee assigned to this project stating the submittal has been reviewed (quality control check) and is in full compliance with the requirements of the contract documents, and listing the submittal’s contents. Wet sign (and stamped, if applicable) the letter.

d. Product Information: Include manufacturer’s technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary) that clearly describe the product’s characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color and finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Include products listed in the specifications, at a minimum. Include relevant products that will be installed, which are not listed in the specifications.

e. Seismic Calculations: Include structural calculations for anchorage and seismic restraint of floor-mounted equipment (such as racks, frames, cabinets), wall-mounted equipment (such as video display equipment, etc.), and overhead-mounted equipment (such as cable tray, overhead cable support, etc.) in conformance with CBC, Section 1601A. Calculations shall be based on fully loaded equipment and support systems. Calculations shall demonstrate that the equipment and support systems will remain attached to the mounting surface during and after experiencing seismic forces in conformance with the CBC. A Structural Engineer registered in the State of California shall prepare Structural Calculations, and shall wet stamp and sign them. Obtain approval from approving agency for the calculations.

E. Submittal Description: Shop Drawings

1. Prior to the start of work, submit shop drawings and obtain written approval from the Engineer for the shop drawings submittal.
2. Quantity and Media: Submit shop drawings as described in Division 01. In the absence of requirements given, submit shop drawings as directed in writing either an electronic submittal (preferred) via approved means (email, e-transmit, FTP upload) or four printed and bound sets on bond.

3. Format:
   a. Use the same sheet size as the contract drawings.
   b. Use the same title block as the contract drawings, modified to include contractor information.
   c. Text: 3/32” - 1/8” high when plotted at full size.
   d. Use identical symbols as those in the contract drawings.
   e. Screen background information.
   f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
   g. Scaling:
      1) Scale floor plans and reflected ceiling plans at 1/8” =1’-0”
      2) Scale enlarged room plans at 1/4” =1’-0”
      3) Scale wall elevations at 1” =1’-0”
      4) Scale rack elevations at 1” =1’-0”

4. Content:
   a. Cover Letter: Accompany each shop drawing submittal with a cover letter stating that the shop drawings have been thoroughly reviewed by the Contractor and are in full compliance with the requirements of the contract documents. Have the person who prepared the submittal sign (and stamped, if applicable) the cover letter and include a drawing index. Failure to comply with this requirement shall constitute grounds for rejection of submittal.
   b. Drawings: Shop drawing submittals shall consist of symbols list, point-to-point diagrams, block diagrams, riser diagrams, line diagrams, floor plans, reflected ceiling plans, enlarged room plans, wall and rack elevations, installation details, and other aspects of the system. Include detailed labeling examples for cables, outlets, termination apparatus, devices, equipment, etc.
   c. Seismic Calculations: Include structural calculations for anchorage and seismic restraint of floor-mounted equipment (such as racks, frames, cabinets), wall-mounted equipment (such as video display equipment, etc.), and overhead-mounted equipment (such as cable tray, overhead cable support, etc.) in conformance with CBC, Section 1601A. Calculations shall be based on fully loaded equipment and support systems. Calculations shall demonstrate that the equipment and support systems will remain attached to the mounting surface during and after experiencing seismic forces in conformance with the CBC. A Structural Engineer registered in the State of California shall prepare Structural Calculations, and shall wet stamp and sign them. Obtain approval from approving agency for the calculations.

F. Submittal Description: As-Built Drawings
1. Quantity and Media: Submit as-built drawings as described in Division 01. In the absence of requirements given, submit as-built drawings as directed in writing as electronic files via approved media (or four printed and bound sets on bond, if approved).

2. Format:
   a. Use the same sheet size as the contract drawings.
   b. Use the same title block as the contract drawings, modified to include contractor information.
   c. Text: 3/32” - 1/8” high when plotted at full size.
   d. Use symbols identical to the symbols shown on the contract drawings.
   e. Screen background information.
   f. Plot system components (symbols, outlet, devices, pathways, cable routes, etc.) and text using a heavier line weight sufficient enough to stand out against background information.
   g. Electronic files shall be native format and plotted PDF files. The file names shall include the sheet number.

3. Content:
   a. Submit as-built drawings that fully represent actual installed conditions and that incorporate modifications made during the course of construction.
   b. Symbols List
   c. Diagrams, such as (but not limited to) point-to-point diagrams, block diagrams, riser diagrams, line diagrams, and other diagrams that conceptually describe the system
   d. Floor Plans and Reflected Ceiling Plans: Scale plans at 1/8” =1'-0". Plans shall show:
      1) Locations and identifiers of telecommunications outlets
      2) Routes, types, sizes, and quantities of pathways (such as cable trays, conduits, hangers, and other pathways)
   e. Enlarged Rooms Layouts: Applicable rooms: Server Room, Network Patching Facility, PBX Equipment Room, Entrance facilities, MTR, TRs, MDF, BDFs, IDFs. Room drawings shall show:
      1) Floor layouts – scaled at 1/4” = 1'-0", showing dimensioned placement of equipment cabinets/frames, rack bays, etc.
      2) Overhead layouts – scaled at either 1/4” =1'-0” or 1/2” =1'-0”, showing dimensioned placement of overhead cable support (e.g., cable tray, cable runway, conduit sleeves, etc.)
      3) Rack elevations – scaled at 1” =1'-0", showing placement of termination apparatus and other equipment installed onto rack bays
      4) Wall Elevations – scaled at 1” =1'-0", showing dimensioned placement of termination apparatus (e.g., termination/crossconnect blocks)

G. Submittal Description: Operation and Maintenance (O&M) Manual
1. **Quantity and Media:** Submit O&M Manual as described in Division 01. In the absence of requirements given, submit one packaged O&M Manual set.

2. **Format and Organization:**
   a. Include contents in a 3-ring binder with front cover and spine clear pockets for insertion of the cover information.
   b. Cover shall include the following information:
      1) Owner name
      2) Project name and address
      3) Manual name (e.g., “Operation and Maintenance Manual for Telecommunications Cabling System”)
      4) Date; format: Month Day, Year (e.g., “January 1, 2019”)
      5) Contractor name and contact information
   c. Include a TOC at the beginning that lists the contents.
   d. Include tabbed separators for improved navigation through the manual.

3. **Content:**
   a. Instructions on making a warranty claim during the warranty period
   b. Contact information during the warranty period
   c. Contact information beyond the warranty period for maintenance and related service
   d. As-built drawings, as described above, printed on tabloid size (17”x11”) paper and as electronic files – both native files and plotted PDF files
   e. Product catalog/technical information sheets for each component provided under applicable section (typically, this is the {or similar to} the accepted product data submittal), printed on letter size (8.5” x 11”) paper and as electronic files in PDF format
   f. Warranty certificate from the manufacturer and the contractor, printed on letter size (8.5” x 11”) paper, wet signed as applicable
   g. Manufacturer’s instructions for system or component use
   h. Instructions and requirements for proper maintenance (according to the manufacturer) and as to maintain warranty

1.5 **QUALITY ASSURANCE**

A. **Manufacturer Qualifications**
   1. Five continuous years, minimum, design and manufacture of the materials and equipment specified herein.
   2. Manufacturer(s) of products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that the specifications are met. Include in the program, at a minimum, provisions for:
      a. Incoming inspection of raw materials
b. In-process inspection and final inspection of the cable product

c. Calibration procedures of test equipment to be used in the qualifications of the product

d. Recall procedures in the event that out of calibration equipment is identified.

3. Conform to government standards on quality assurance for applications within these specifications.

B. Contractor Qualifications:

1. A current, active, and valid and C7 or C10 California State Contractors License

2. Five, minimum, continuous years of experience

3. Five, minimum, completed projects similar to scope and cost

4. Evidence of technicians qualified for the work

C. Materials

1. Materials, support hardware, equipment, parts comprising units, etc., shall be new, unused, without defects and of current manufacturer, materials

2. Use specified products and applications, unless otherwise submitted and approved in writing.

D. Regulatory Requirements

1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Work under Division 27 shall confirm to the most stringent of the applicable codes.

2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The contract documents address the minimum requirements for construction.

E. Drawings

1. Follow the general layout shown on the drawings except where other work may conflict with the drawings.

2. Drawings for the work within this division are essentially diagrammatic within the constraints of the symbology applied.

3. The drawings do not fully represent the entire installation. Drawings indicate the general route for pathways and cables, and show general locations of outlets. The drawings might not expressly show every conduit, sleeve, hanger, etc., but a complete system is required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Do not deliver products to the site until protected storage space is available.

2. Coordinate materials delivery with installation schedule to minimize storage time at jobsite.
3. Deliver materials in manufacturer’s original, unopened, undamaged packaging and containers with identification labels (name of the manufacturer, product name and number, type, grade, UL classification, etc.) intact.

4. Immediately replace equipment damaged during shipping at no cost to the Owner, so as not to impact the construction schedule.

B. Storage and Protection

1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.

2. Comply with manufacturer’s storage requirements for each product. Comply with recommended procedures, precautions or remedies as described in the MSDS as applicable.

3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.

4. Storage outdoors covered by rainproof material is not acceptable.

5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling

1. Handle materials and equipment in accordance with manufacturer’s written instructions. Handle with care to prevent damage, breakage, denting, and scoring.

2. Do not install damaged materials and equipment. Replace damaged equipment at no cost to the Owner.

1.7 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Sections within Division 27 may be combined into a single, overall schedule.

B. Do not proceed without written approval from the Owner or Owner’s Representative for schedule of this Work.

1.8 PROJECT MANAGEMENT AND COORDINATION

A. Project Management and Coordination Services

1. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility include, but are not limited to, the items listed in this section.

2. Review of Shop Drawings Prepared by Other Subcontractors:

   a. Obtain copies of shop drawings for equipment provided by others that require telecommunication service connections or interface with work.

   b. Thoroughly review other trades’ shop drawings to confirm compliance with the service requirements contained in the Division 27 contract documents. Document discrepancies or deviations as follows:

      1) Prepare memo summarizing the discrepancy

      2) Submit a copy of the specific shop drawing, indicating via cloud, the discrepancy
c. Prepare and maintain a shop drawing review log indicating the following information:
   1) Shop drawing number and brief description of the system/material
   2) Date of the review
   3) Name of the individual performing the review
   4) Indication if follow-up coordination is required

3. Should existing conditions prohibit construction progress as submitted and approved, coordinate the adjusted installed locations with the other contractors (AV, electrical, etc).

B. Concurrent Installation

1. The network will be installed concurrent with the work of Division 27. Coordinate your work with the Owner’s work. For example, coordinate scope and dates for rack and cabling (terminations) readiness to allow the network integrator to plan and schedule installation of the network equipment (for example, access switches).

C. Role of the Engineer

1. The Owner has retained the Engineer’s services through construction. During construction, the Engineer will work with and assist the Contractor as follows (in general):
   a. Review product data and shop drawings submittals for general compliance with the contract drawings and specifications.
   b. Provide interpretation and clarification of project contract documents
   c. Reply to (and ‘process’) relevant Requests for Information (RFIs)
   d. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
   e. Interpret field problems for Owner, and translate between Owner and Construction Team.
   f. Review the testing procedures to confirm compliance with industry-accepted practices.
   g. Observe the work for general compliance with the contract documents and to ensure that the installation meets the design intent of the system, and report progress to the Owner.

D. Use of Electronic Drawing Files

1. Should the Contractor require the Engineer’s electronic files to produce shop drawings and/or as-built drawings, the Engineer will require the Contractor sign a file release agreement.

1.9 WARRANTY

A. As a minimum, warrant products and labor provided will, under normal use and service, be free from defects and faulty workmanship for period of 5 years from the date of acceptance. During the warranty period the entire system shall be kept in operating condition at no additional material or labor costs to the Owner. Also refer to specific sections for additional warranty requirements that supersedes the project’s minimum warranty.
B. Render service within 24 hours of system failure notification. Note deviations or improvements to this service at the time of bid and obtain written acceptance from the Owner, or Owner's Representative.

C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. Provide complete replacement parts within 24 hours during the warranty period.

D. Conformance to certain government standards on quality assurance may be required for some applications outlined in these specifications.

PART 2 PRODUCTS

2.1 GENERAL

A. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.

B. Product numbers are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the Engineer and/or Owner in writing prior to ordering the material and performing installation work.

2.2 PRODUCT SUBMITTAL AT TIME OF BID

A. At the time of bid, include a list of major products in the Contract documenting the intended cabling system solution, AV equipment, etc.

2.3 SUBSTITUTIONS

A. Conform to the substitutions requirements and procedures outlined in Division 01.

B. Only one substitution for each product specified will be considered.

C. Where products are noted as "or equal", a product of equivalent design, manufacture, and performance will be considered. Submit product data (product information, catalog cuts, pertinent test data, etc.) to substantiate that the product is in fact equivalent to that specified. The burden of proof that the substituted product is equivalent to the specified product rests with the Contractor. Whenever material, process or equipment is specified in accordance with an industry specification (ANSI, TIA, etc), UL rating, or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance.

D. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when "or equal" follows the manufacturers' names or model number(s).

E. When the Engineer accepts a substitution in writing, it is with the understanding that the Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Do not provide substituted material, processes, or equipment without written authorization from the Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by the Engineer, are at the sole risk of the Contractor.
F. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from provisions of the specifications.

G. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or other Contractor's work.

PART 3 EXECUTION

3.1 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.

B. Furnish materials and execute workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.

D. Arrange and pay for review/inspection from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

3.2 EXAMINATION

A. Verify existing conditions, stated under other sections, are acceptable for installation in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman to supervise the crew performing the work and who is present at the job site at times work is being performed.

B. Construction Meetings: Participate in construction coordination meetings throughout the course of construction to review the progress and to resolve issues and conflicts. Prepare and distribute meeting agenda for telecommunication issues prior to, and meeting notes after meetings, in a format acceptable to the Owner. Publish meeting notes within 3 business days following the meeting.

C. Scheduling: Perform the work within the approved construction schedule. Keep the construction schedule current, based on the results of the construction meetings. At minimum, schedule shall document critical due dates, tasks, and milestones. Submit revised schedules for approval within 3 business days whenever there are modifications.

D. Inspection: Inspect the work after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion ready for inspection. Document completion and inspection as required.

3.4 INSTALLATION

A. Complete work in a neat, high-quality manner, relative to common industry practices, and in accordance to NECA “Standard of Installation”.

B. Complete work in conformance to applicable federal, state and local codes, and telephone standards.

C. Coordinate the entire installation throughout the construction team (general contractor and subcontractors).
D. Manufacturer's Instructions: Comply with manufacturer's published installation instructions, product data, product technical bulletins, product catalog, and other instructions for installation. Maintain a file on the jobsite of MSDSs for each product delivered to jobsite packaged with an MSDS.

E. Adjusting: Make changes and revisions to systems to optimize operation for final use. Make changes to systems such that defects in workmanship are corrected and completed systems pass the minimum test requirements.

F. Protection: Protect installed products and finish surfaces from damage during construction.

G. Repair/Restoration: Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement. Repair defects prior to system acceptance.

3.5 CLEANING
A. Remove temporary coverings and protection of adjacent work areas. Remove unused, excess, and left over products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Legally dispose of debris.

E. Clean installed products in accordance with manufacturer's instructions prior to Owner's, or Owner’s Representative’s, punch walk.

3.6 PUNCH WALKS AND PUNCH LISTS
A. Punching the Work of individual Sections of Division 27 may be combined when noted so.

B. Execute a punch walk with the Engineer and the Owner or Owner’s Representative to observe Work.

C. Develop a punch list for items needing correction. Issue this punch list to Engineer.

D. Correct the Work as noted on punch list.

E. Execute follow up punch walk with the Engineer and the Owner or Owner’s Representative to verify punch list items have been corrected.

3.7 SYSTEM ACCEPTANCE
A. Complete corrections (punch list items) prior to submitting acceptance certificate.

B. On completion of the acceptance test, submit system acceptance certificate to the Owner or Owner’s Representative requesting their signature and return of the certificate. Issue copies of the signed certificate back to the Owner or Owner’s Representative with copy to the Engineer.

3.8 TRAINING
A. After acceptance, schedule a time convenient with the Owner, or Owner's Representative, for instruction in the configuration, operation, and maintenance of the system.
B. Refer to individual sections within Division 27 for additional training requirements.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Communications Grounding Backbone and bonding of communications infrastructure and equipment to Communications Grounding Backbone.

B. Related Sections

1. Comply with the Related Sections requirements of Section 27 00 00.

1.2 REFERENCES

A. Comply with the References requirements of Section 270000.

B. In particular or addition to the codes and standards listed in Section 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. NFPA 70, “National Electrical Code”, particularly the following Articles:
   a. Article 250: Grounding
   b. Article 770: Optical Fiber Cables and Raceways
   c. Article 800: Communications Systems
   d. Article 810: Radio and Television Equipment
   e. Article 820: Community Antenna Television and Radio Distribution Systems

2. Underwriters Laboratories, Inc. (UL) UL 467: Grounding and Bonding Equipment

3. Electronic Industries Association/Telecommunication Industry Association:

4. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1.3 DEFINITIONS

A. Definitions as described in Section 270000 shall apply to this section.

B. In addition to those Definitions of Section 270000, the following list of terms as used in this specification defined as follows:

1. “BCT”: Bonding Conductor for Telecommunications

2. “CM” and “cmil”: Circular Millionths of an inch
3. “GE”: Grounding Equalizer Conductor
4. “MBRGB”: Main Building Reference Grounding Busbar
5. “TBB”: Telecommunications Bonding Backbone
6. “TBC”: Telecommunications Bonding Conductor
7. “TGB”: Telecommunication Grounding Busbar
8. "THHN": Thermoplastic High Heat-resistant Nylon-coated
9. “TMGB”: Telecommunication Main Grounding Busbar

1.4 SYSTEM DESCRIPTION

A. Base Bid Work: The Work under this section includes furnishing materials, installation, and coordination through the General Contractor with other trades for a Communications Grounding Backbone and for bonding of telecommunications equipment and apparatus to the Communications Grounding Backbone.

B. Communications Grounding Backbone System: The Communications Grounding Backbone System contains grounding busbars, grounding conductors, bonding conductors, and connecting devices (including but not limited to pressure connectors, lugs, clamps, or exothermic welds). These components, upon completion of installation and testing, shall provide the means of a low impedance path to earth for unintentional and/or stray voltages or spurious signals present on telecommunications media and equipment. The Communications Grounding Backbone System will consist of the following aspects (refer to Drawings for additional information)

1. TMGB: Locate the TMGB in the IDF Room with the following connections:
   a. MBRGB, via BCT (refer to Drawings for wire size)
   b. Each TBB
   c. Ground bushings installed on each entrance conduit opening within the space, via TBC
   d. Overhead cable support within the space, via TBC
   e. Dedicated power panel’s ACEG within the space serving communication equipment, via TBC
   f. Metallic pathways (conduits, surface raceway, etc.) within the space, via TBC

2. TBB: TBB(s) are the primary bonding conductor between the TMGB and other TGBs provided throughout a single building. The length of TBBs shall not exceed 500 feet. The TBB shall route from the MDF through each of the IDF’s bonding each of the TGBs to the TMGB. Maintain TBB continuity and do not break continuity in order to bond to a TGB.

3. TGB: Locate the TGB in each IDF with the following connections:
   a. TBB
   b. Building steel, via TBC
   c. Each entrance conduit into the space, via TBC and ground bushings
   d. Overhead cable support within the space, via TBC
e. Panelboard’s ACEG within the space serving telecommunication equipment, via TBC
f. Metallic pathways (conduits, surface raceway, etc.) within the space, via TBC

C. Performance Criteria for the Grounding Backbone:

1. Resistance from any point of the communication grounding backbone system to the ground electrode and to earth shall not exceed 20 Ohms.

2. Field test resistance and document, both electronically and printed, measured values.

D. Bonding: Bonding consists of TBCs within telecommunications rooms from the TMGB and TGBs to the following components:

1. Rack bay
2. Overhead cable support and vertical cable support
3. Wall-mounted termination equipment
4. Conduit ground bushings
5. Exit pathways
6. Bonding jumpers between basketway, cable runway, and cable tray joints & splices, and between basketway/cable runway/tray and equipment racks

E. Conductor Gauge Criteria:

1. Size BCT as the greater of either 2,000 cmil per linear foot up to 3/0 AWG or the largest TBB.

2. Size TBB, GE, and TBCs as 6 AWG minimum, then as 2,000 cmil per linear foot up to 3/0 AWG.

1.5 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 27 00 00.

B. Submittal Requirements at Start Of Construction:

1. Product Data Submittal
2. Shop Drawing Submittal(s), if the Contractor’s installation intent differs from the Contract Documents or the design intent

C. Substitutions

1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

D. Submittal Requirements at Closeout: Submit to the Owner at the time of project closeout the following and before certificate of final payment is issued:


2. As-Built Drawings, consisting primarily of the Communications Grounding Backbone (not necessarily each bonded component or apparatus)

1.6 QUALITY ASSURANCE
A. Comply with Quality Assurance requirements of Section 27 00 00.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.8 1.08 WARRANTY
A. Warrant Work to perform as described within this Section for a period of 5 years. Correct deficiencies within 24 hours of notification.

PART 2 PRODUCTS
2.1 GROUNDING AND BONDING CONDUCTORS
A. Application: Suitable for indoor installation as a BCT, TBB, GE, and/or TBC.
B. Type: THHN (or THWN)
C. Approvals:
   1. UL 83 as Type THHN
D. Conductor: soft drawn annealed copper, stranded
E. Gauge: Refer to System Description for conductor sizing criteria.
F. Insulation: PVC, high-heat and moisture resistant
G. Jacket: Nylon, abrasion, moisture, gasoline and oil resistant
H. Color: Green
I. Flame Resistance: Meet the flame resistance requirements of IEEE 383, CSA FT-4 and UL VW-1.

2.2 CONNECTOR – “PARALLEL” TAP
A. Application: H-type thick wall compression tap, for making conductor–to–conductor (e.g., TBB-to-TBC) permanent connection (pigtailling, tapping, or splicing). Connectors shall be UL Listed.
B. Manufacturers:
   1. Panduit
      a. #HTCT2-2-1; “H-type” compression tap, run = #6-#2, tap = #2-#6.
      b. #HTCT250-2-1; “H-type” compression tap, run = #2-250MCM, tap = #6-#2
   2. Or equal

2.3 CONNECTOR – “C” TAP
A. Application: C-type copper thick wall compression tap, for making conductor–to–conductor (e.g., TBB-to-TBC) permanent connection (pigtailling, tapping, or splicing). Connectors shall be UL Listed.
B. Manufacturer:
   1. Panduit
      a. #CTAPF4-12-C; CTAP for #6 AWG run –to– #6 AWG tap
      b. #CTAPF2-12-C; CTAP for #2 AWG run –to– #6 AWG tap
      c. #CTAPF1/0-12-L; CTAP for 1/0 AWG run –to– #6 AWG tap
      d. #CTAPF2/0-12-Q; CTAP for 2/0 AWG run –to– #6 AWG tap
      e. #CTAPF3/0-12-Q; CTAP for 3/0 AWG run –to– #6 AWG tap

2. Or equal

2.4 GROUNDING BUSBAR

A. General: Busbar shall be UL listed.
B. Standards: Compliant to ANSI-J-607-A
C. Material: Solid copper
D. Holes: Predrilled, compatible with standard NEMA bolt hole sizing and spacing and with ANSI-J-607-A recommendations for 2-hole lugs.
E. Mounting: Wall-mounted with standoffs. Standoffs shall insulate busbar from the mounting substrate.
F. Manufacturer:
   1. Chatsworth Products Inc
      a. #13622-020; busbar, 20” L x 4” W x 1/4” T, TMGB hole pattern
      b. #40153-012; busbar, 12” L x 4” W x 1/4” T, TMGB hole pattern
      c. #13622-012; busbar, 12” L x 2” W x 1/4” T, TGB hole pattern
      d. #13622-010; busbar, 10” L x 2” W x 1/4” T, TGB hole pattern
   2. Or equal

2.5 CONNECTION TO STRUCTURAL STEEL

A. Application: Exothermic welds shall be used for cable to cable, cable to ground rod, and cable-to-structural steel.
B. Manufacturers:
   1. Cadweld
      a. Each particular type of weld shall use a kit unique to that type of weld
   2. Or equal

2.6 CONNECTOR – COMPRESSION LUG

A. Application: Conductor-to-busbar and/or –rack (or other flat surfaces) connection
B. Type: compression lug, standard or long barrel, two-hole (1/4 inch diameter 5/8 inch on center)

C. Manufacturers:
   1. Panduit
      a. #LCC6-14JAW-L; for 6 AWG conductor
      b. #LCC4-14ADW-L; for 4 AWG conductor
      c. #LCC2-14AW-Q; for 2 AWG conductor
      d. #LCC1-14AW-E; for 1 AWG conductor
      e. #LCC1/0-14AW-X; for 1/0 AWG conductor
      f. #LCC2/0-14AW-X; for 2/0 AWG conductor
   2. Or equal

2.7 CONNECTOR – SPLIT-BOLT, MECHANICAL TYPE

A. Application: Conductor-to-conductor (or other round component) connection

B. Type: split-bolt mechanical connector

C. Material: high-strength copper alloy

D. Manufacturers:
   1. Cooper B-Line
      a. #WB2GC; split bolt bonding clamp
   2. Panduit
      a. #SBC3-C; split bolt bonding clamp for #6 to #3 conductor
   3. Or equal

2.8 GROUND BUSHING

A. Plated malleable iron body with 150-degree Centigrade molded plastic insulating throat and lay in grounding lug.

B. Manufacturers:
   1. OZ/Gedney BLG
   2. Thomas & Betts #TIGB series
   3. Or equal.

2.9 BONDING STRAPS

A. Cable Runway Bonding Straps
   1. Application: makes multiple sections of cable tray conductively continuous
   2. Conductor: Flexible braided straps with factory terminated connectors.
3. Manufacturers:
   a. Chatsworth Products Inc
      1) #12061-001
   b. Cooper B-Line
      1) #SB6691x7¾
   c. OZ/Gedney
      1) Type BJ
   d. Thomas & Betts
      1) #3840 series
   e. Or equal

B. Cable Tray Bonding Straps
   1. Application: makes multiple sections of cable runway conductively continuous
   2. Conductor: Flexible braided straps with factory terminated connectors.
   3. Manufacturers:
      a. Cooper B-Line
         1) #99-N1
      b. Thomas & Betts
         1) #FB95
      c. Or equal.

2.10 LABELS

A. Labels for Busbars
   1. Labels shall be machine-printable (such as by a laser printer or hand-held printer)
   2. Printable area should be approximately 2-inch-wide x 0.5 inch high
   3. Printable area color shall be white
   4. Manufacturer:
      a. Panduit
         1) #C200X100FJJ; laser/ink jet labels, white – for busbars
      b. Or equal

B. Labels for Conductors
   1. Labels shall be machine-printable (such as by a laser printer or hand-held printer)
   2. Labels shall be adhesive-backed and have a self-laminating feature
   3. Printable area should be 1-inch wide x 0.5 inch high, or larger
4. Printable area color shall be white

5. Manufacturer:
   a. Panduit
      1) #S100X150YAJ; laser/ink jet labels, white – for #6 wires
      2) # S100X225YAJ; laser/ink jet labels, white – for #6 to #1/0 wires
   b. Or equal

2.11 2.14 MISCELLANEOUS

A. Wire Clamp
   1. Material: nylon, UV stabilized.
   2. Color: black
   3. Size: 0.25" holding diameter for 6 AWG; or size as required based on conductor size.
   4. Manufacturer:
      a. Richco Inc.
      1) #N4B-BLK
      b. Or equal

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

B. Work shall comply with the International Building Code, International Fire Code, National Electrical Code, UL 467, and ANSI-J-607-A standards, as well as local codes that may specify additional grounding and/or bonding requirements. If discrepancies between codes and/or standards arise, codes shall prevail, and then the more stringent requirement shall prevail, and as directed by the AHJ.

C. Install components to manufacturer’s instructions and recommendations and as required per UL listing.

D. Identify grounding and bonding conductors and components according to local codes.

E. Terminations must be accessible for inspection and maintenance during the life of the system.

3.2 EXAMINATION AND PREPARATION

A. Prior to the start of this section’s work, examine pathways and communications rooms for completeness, compatibility with the work of this section, and readiness for connections with the work of this section.

3.3 INSTALLATION

A. BCT, TBB, and GE Conductors
1. Install BCT, TBB, and GE conductors in conduit and in a manner to protect them from physical damage.

2. When routing BCT, TBB, or GE conductors through metallic conduit 3 feet or longer, bond the conductor to the conduit at both ends using a #6 AWG bonding conductor as a pigtail, an irreversible connection (preferably exothermic weld) for the conductor-to-pigtail connection, and insulated ground bushings at the conduit ends.

3. Install the BCT, TBB, or GE conductor without splices.
   a. In the event that a splice is necessary, notify the Engineer and/or Owner in writing. Do not proceed with splicing work until the Engineer and/or Owner has accepted in writing the installation of a splice.
   b. Locate the splice in a telecommunications space and ensure accessibility.
   c. Perform the splice using an exothermic weld and an irreversible compression-type connector.

4. Where shown on the drawings, connect grounding conductors to structural steel using exothermic welds. Each particular type of weld shall use a kit unique to that type of weld.

B. TMGB and TGB Busbars

1. Mount busbars as noted on Drawings and using insulating standoffs. If not noted on drawings, install busbars onto wall at 24 inches AFF located within 5 feet of backbone pathways or rack bay.

C. Panelboard Bonding

1. Where a panelboard is located in the same communications room as a TMGB/TGB and serves that room, provide TBC between busbar and that panelboard’s Alternating Current Equipment Ground (ACEG) bus (where equipped) or the enclosure.

D. Bonding

1. Provide TBC and appropriate grounding hardware between the nearest TMGB/TGB and the equipment racks / rack bay, overhead cable support, vertical cable support, telecommunication conduits, primary pathways that enter/exit the room (if applicable), and other metallic telecommunication infrastructure components. Refer to Drawings for additional information.

2. Minimum size: #6. If longer than 25 feet, size TBCs based on length using 2000 cmil per foot, up to 2/0 AWG.

3. Install TBCs in a manner that will protect them from physical and mechanical damage.

4. Routing:
   a. Route TBCs in the shortest possible path, using right angles for turns and routed parallel to building lines. Route on outside edges of wall plywood. Do not cut across the middle of the plywood taking space away from other equipment or components.
   b. Utilize a minimum 1-foot bend radius.

5. Connection to TMGB/TGBs:
   a. Thoroughly clean busbars prior to attaching connectors to the busbar.
b. Fasten connectors (e.g., lugs) to the busbar using matching size bolt, flat washer Belleville washer, and nut. Torque hardware set.

6. Rack Bay Bonding
   a. Refer to Drawings for detailed diagrammatic requirements for bonding the rack bay.
   b. Bond equipment racks, frames, frame bays, cabinets, server racks, and other similar support systems located within the same room or space as the TMGB/TGB to the busbar.
   c. Use approved connectors for TBC-to-rack, -frame, and -cabinet connections.
   d. Rack bays may be bonded in series using either of the following configurations:
      1) Series: Provide a TBC from the TGB to the rack closest to the busbar; then provide a TBC to the other racks in the rack bay in series using a common lug/connection per rack. The rack shall not be used as a ‘conductor’ in the series connection.
      2) String: Provide one ‘main’ TBC from the TGB along the length of the rack bay, and provide a pigtail from the ‘main’ TBC per rack. Use an irreversible connection (such as “C” tap) for the ‘main’-to-pigtail connection.

7. Overhead and Vertical Cable Support Bonding
   a. Bond overhead and vertical cable support located within the same room or space as the TMGB/TGB to the busbar.
   b. Provide either UL listed connectors and splice plates or UL Listed bonding strap to bond sections of overhead cable support for ground continuity. This requirement applies to runway sections and junctions within a single telecommunication room.

8. Termination Field Bonding
   a. Bond termination blocks to the TMGB/TGB within the same room or space. Termination blocks may be bonded in series, with the block closest to the TMGB/TGB bonded to the busbar. Refer to Drawings for detailed diagrammatic requirements for bonding the termination blocks.

9. Metallic Surface Raceway Bonding
   a. Bond metallic surface raceways for telecommunications cabling to approved electrical ground located within the same room or space as the surface raceway.

3.4 LABELING

A. General Requirements
   1. Labeling, identifier assignment, and label colors shall conform to TIA/EIA-606-A Administration Standard and as approved by the Engineer and/or Owner before installation.
   2. Permanently label TBCs. Affix label as close as practical to each end of the conductor.

B. Label Format
   1. Provide permanent labels with machine-generated text; hand written labels will not be accepted.
2. Labels on TBCs shall fully wrap around conductors with a self-laminating feature to provide permanent marking.

C. Identifier Assignment

1. Separate label fields of the identifier with a hyphen.

2. Assign identifiers according to current practice and as approved by the Engineer and/or Owner before installation.

3. BCT and TBB
   a. First field: “BCT” or “TBB” (the conductor type).
   b. Second field: a unique sequential number, for example, “01”.
   c. Example: “TBB-01”

4. Ground Busbars
   a. First field: “TMGB” or “TGB” (the busbar type)
   b. Second field: the room’s identity (TR identifier’s suffix) where the busbar is installed; for example, “3A2.1”.
   c. Example: “TGB-3A2.1”

5. TBC:
   a. First field: “TBC” (the bonding conductor type).
   b. Second field: The room identity where TBC exists; for example: “A1.1”.
   c. Third field: A unique sequential number; for example: “01”, “02”, etc.
   d. Fourth field: describe the device, equipment, component, or raceway being bonded.
   e. Example: “TBC-A1.1-01 (RACK BAY)”

3.5 GROUNDING BACKBONE RESISTIVITY MEASUREMENT

A. Measure ground resistance from <the furthest> <each> ground busbar to earth; record measurement. Provide additional grounding electrodes, bonding, and other elements as required to comply with resistance limits specified in this Section.

B. Submit computer-generated records of measured resistance values to Engineer and/or Owner for approval and for inclusion into the Operation and Maintenance Manual.

3.6 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00. Punching the Work of this Section may be combined with punching the rooms.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION
SECTION 27 05 28
COMMUNICATIONS BUILDING ISP PATHWAYS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Pathway systems within buildings to support low voltage systems - namely cable hangers and rated sleeves.

B. Related Sections

1. Comply with the Related Sections paragraph of Section 27 00 00.
2. Section 27 05 33, “Communications Conduits and Boxes”
3. Section 27 05 26, “Communication Grounding and Bonding”
4. Section 27 11 00, “Communication Rooms”

1.2 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In addition to those codes, standards, etc., listed in 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. Underwriters Laboratories (UL)
   a. UL 5, “Standard for Surface Metal Raceways and Fittings”
   b. UL 5A, “Nonmetallic Surface Raceways and Fittings”
   c. UL 5C, “Standard for Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits”

2. Underwriters Laboratories (UL)
   a. UL 467, “Grounding and Bonding Equipment”

1.3 DEFINITIONS

A. Definitions of Section 27 00 00 apply to this Section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this Section defined as follows:

1. “Cable Hanger”: A cable support component often shaped (section view) similar to the letter J (thus gaining the nickname “J hanger”), metallic (most often steel) or non-metallic (most often thermoplastic); available in different sizes (to support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).

2. “Cable Strap”: A flexible cable support that generally ‘wraps’ around cables and ‘latches’ into a fixed position, most often textile, available in different sizes (to support different quantities of cables) and with different attachment hardware suiting multiple installation methods (e.g., wire support, beam flange clip, etc.).
3. “Enclosure”: The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage.

4. “J Hanger” and “J Hook”: nickname for cable hanger

5. “NEC”: National Electrical Code (NFPA 70)


7. “UL”: Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. Base Bid Work:

1. The Work of this section includes planning and coordination with General Contractor (and other trades) of inside plant pathway systems and components, furnishing necessary materials, and labor and associated services required to install pathways.

B. Cable Hanger Systems

1. Provide a complete cable hanger system compliant with requirements of the CEC (in particular, compliant with the requirements of Article 300.11), in accordance with NECA’s “Standards of Installation” (pertaining to general electrical installation practices), compliant with applicable portions of NFPA 70B, in accordance with manufacturer’s instructions, and in accordance with recognized industry practices. A “complete system” shall include cable hangers, supports, anchors, fasteners, and other required accessories.

2. Provide cable hangers between primary pathways (or telecommunications rooms) and work area pathways and/or outlet locations at intervals up to 48 inches on center per a given route, at transitions downward/upward, and within 24 inches of an outlet stub/outlet location.

3. Supports:

   a. Provide dedicated supports for cable hangers. Do not support cable hangers on ceiling grid support wires. Do not share supports with other trades. Do not support hangers from ductwork, piping, or other equipment hangers.

   b. Support Wires:

      1) Support wires shall consist of #12 drop wire (or as approved) with integral clip and fastener (such as power-actuated deck pin, beam flange, or other fastener appropriate for the use).

      2) Secure support wires at both ends in accordance with CEC.

   c. Support Rods:

      1) Support rods shall consist of 1/4 inch (6.3mm) or 3/8 inch (9.5mm) threaded or smooth rod and concrete anchor or beam flange clip or angled flange clip (as required for attachment to the building structure).

4. Clearances (minimum):

   a. From fluorescent light fixtures, or other EMI sources = 6 inches

   b. From any motor = 48 inches
c. From flue, hot water, steam line or other non-insulated heat sources = 12 inches

C. Fire Rated Sleeves

1. Provide complete fire rated sleeve systems where shown on the drawings and where cables penetrate rated walls, in accordance with ASTM E814 (UL1479). Complete shall include sleeves, brackets, frames, plates, etc, and other required accessories necessary for a complete installation according to UL System drawings.

2. Provide complete fire rated sleeve systems equal to (or greater than) the F rating of the barrier in which the device is installed.

3. Provide a system label at each penetration instance.

D. Surface Raceway

1. Provide a complete surface raceway system in accordance with NEC Article 386 and NEC Article 388 where required by manufacturer's installations. Complete shall include base and cover straight sections, couplers, corners, 'T' junctions, feed connectors, compartment dividers, end caps, and hardware required for a fully enclosed pathway system that fully houses and conceals cables and wires. Refer to Drawings for locations and routes.

2. Surface raceway shall be mechanically and electrically continuous. Bond surface raceway system to approved electrical ground in accordance with NEC Article 250 and ANSI-J-STD-607-A. Provide bonding straps where necessary to assure electrical continuity.

3. Surface raceway shall have a minimum two-inch radius control at all bend points.

4. Coordinate raceway lengths with building walls, counter, and other actual field conditions. Raceways mounted above benches and counters shall align with each end of bench or counter, within 1/16-inch tolerance.

5. Finish:
   a. Paint surface raceway system to match existing walls.
   b. Touch-up any marks, blemishes or other finish damage suffered during installation.

E. Spiral Wrap

1. Provide spiral wrap to support and dress cables from feed pathways to the point where the cables enter the furniture system.

1.5 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements Prior to the Start of Construction:

1. Product Data Submittal, showing product dimensions, fabrications materials, fabrication details, knockout sizes and locations, capacities, finishes, and accessories

2. Shop Drawings Submittal, consisting of proposed changes to pathways (routes, types, sizes, etc.) compared to the contract documents
3. Seismic Calculations for Anchoring and Bracing: Submit seismic calculations for support systems in conformance Section 27 00 00. Calculations shall be prepared and signed by a Structural Engineer registered in the state of California. If used, specify proof loads for drilled-in anchors.

D. Submittal Requirements at Close Out:

1. As-Built Drawings, showing the routes/locations, dimensions, types, sizes, quantities, etc., of pathways/pathway devices.

2. O&M Manual, including as-builds, a parts list, repair information, and detailing ongoing maintenance requirements

E. Substitutions

1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 27 00 00.

1.8 WARRANTY

A. Comply with Warranty requirements of section 27 00 00.

PART 2 PRODUCTS

2.1 HANGERS AND STRAPS

A. Application: Suitable for indoor installation within ceiling space for the support of communications cables.

B. Hanger shall be rated for use in air handling space.

C. Hangers shall contain a closing loop, retainer, or latch to prevent cables from falling off the hanger.

D. Manufacturer:

1. CEAS “Stiffy” low voltage supports (such as Figure 200 series)

2. Eaton B-Line
   a. #BCH21-W2; for drop wire installation
   b. #BCH32-W2; for drop wire installation
   c. #BCH21; for wall installation
   d. #BCH32; for wall installation

3. Erico
   a. #CAT12 (or variation per installation method); cable hanger
   b. #CAT21 (or variation per installation method); cable hanger
c. #CAT32 (or variation per installation method); cable hanger
d. #CAT425 (or variation per installation method); cable strap

4. Panduit
   a. #JMJH2-X20

5. Or equal

2.2 DROP WIRE

A. Application: Suitable for indoor installation within ceiling space into structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.

B. Listings: UL 2043, for use in air handling spaces

C. Drop wire shall be equipped with pre-mounted ceiling clip, fastening pin, and pre-tied wire. Pin shall be 7/8”. Wire shall be 12 gauge.

D. Manufacturers:
   1. Hilti #CC27 X-AL-H22P8T x ft. PT (100); drop wire assembly, “x” for length
   2. Armstrong #7891
   3. Dottie #CWC
   4. Garvin Industries
   5. Oregon Wire Products
   6. Or Equal

2.3 DROP ROD

A. Application: Suitable for indoor installation within ceiling space into building structure above (e.g., deck or slab) for the support of cable supports such as cable hangers.

   a. Listings: UL 2043, for use in air handling spaces

B. Zinc plated for corrosion resistance

C. Manufacturers:
   1. CEAS #01014801; “Stiffy” straight rod, 1-1/4” power-actuated pin, 48 inches (or configured as required per instance)
   2. Or equal

2.4 FIRE RATED SLEEVE

A. Application: Suitable as a sleeve for cables to pass through a full-height partition or floor, and as a through-penetration fire stop system maintaining the fire rating of the penetrated partition.

B. Sleeve system shall be tested in accordance with ASTM E 814 (ANSI/UL1479).

C. Sleeve system shall be UL Listed and shall bear a UL Classification marking.

D. Sleeve system shall match (or exceed) the partition’s/floor’s F and T rating.
E. Manufacturers:

1. Specified Technologies Inc (STI)
   a. #EZD22; “EZ Path Series 22”, 2-inch square sleeve kit includes wall plates, gaskets, labels, required set screws and allen key
   b. #EZDP33FWS; “EZ Path Series 33” 3-inch square sleeve kit includes 1 sleeve, 1 pr wall plates
   c. #EZDP44; “EZ Path Series 44” 4-inch square sleeve kit includes 1 sleeve, 1 pr wall plates

2.5 SURFACE RACEWAY – SINGLE CHANNEL

A. Application: Pathway system specifically designed and intended for surface-mounting to walls that house, route, and protect communications (and other signal) wiring and, as applicable, power wiring, and present communications (and other signal) and power services via standard receptacles.

B. Material: Raceway’s base, cover, couplers, and end plates shall be fabricated from cold rolled steel, 0.094 inch thickness minimum.

C. Size: Raceway size and length as shown on Drawings or, if not expressly shown, as required for the intended use.

D. Fittings: Boxes, extension rings, couplings, elbows, and connectors shall be designed for use with raceway system.

E. Finish: Primed and finished with power coated or similar ‘paintable’ finish.

F. Raceway shall be UL listed and labeled as such.

G. Assembly: Installed and fully assembled raceway shall fully house and conceal cables and wires, shall hold cables and wires securely in place (such as wire retention clips), shall accept the communications connectors as specified in Section 271513, shall accept wiring devices (e.g., NEMA 5-20R or similar) as specified in Division 26.

H. Double compartment / Two-channel raceway shall come factory pre-assembled, pre-cut and complete, including bases, covers, end plates, compartment dividers, wiring, receptacles, fittings and connections as required. U.L. labeled.

2.6 SPIRAL WRAP

A. Application: Suitable for an indoor installation for the support of telecommunications cables from a feed pathway to furniture systems, or similar.

B. Material shall be flame retardant polyethylene (UL94V-0), or equivalent.

C. Color: Black.

D. Size: As required to support the given cable bundle size (e.g., 3/4” minimum).

E. Manufacturers:
   1. Panduit
   2. Or equal
PART 3 \ EXECUTION

3.1 \ GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.2 \ EXAMINATION AND PREPARATION

A. Prior to starting the work of this section, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the Owner’s Representative in writing of conditions that would adversely affect the installation, or subsequent utilization, of the system. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Prior to installation, plan routes and locations of pathway systems and coordinate with other trades (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade’s work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with other trades.

3.3 \ INSTALLATION

A. Hangers and Straps

1. Install hangers so they are accessible through the ceiling grid and are not blocked by other building infrastructure.

2. Install hangers above ceiling grid to result in cables sag 6 to 12 inches (150 to 300 mm), minimum, above ceiling grid. Cables shall not rest on the ceiling grid and/or ceiling tiles.

3. Where hangers have loops/retainers, close loop/retainer (latch after cable installation).

B. Fire Rated Sleeve

1. Install the sleeves in strict accordance with the UL System drawing, with the approved shop drawings, and with the equipment manufacturer’s instructions.

2. Framed Walls – Pre-Framed and Cut-In

a. Coordinate location of penetration with other trades such as framing (wall studs), electrical (lighting), mechanical (ducts), and other trades.

b. For cut-in instances, cut wallboard to fit rated sleeve system – no more wallboard than is necessary to fit the system.

c. Apply the factory-supplied gasket prior to the installation of the wall plates.

d. Secure wall plates to sleeves per the equipment manufacturer’s recommendations.

3. Affix a label at each fire sleeve location onto the wall or floor – within 2 to 3 feet. Place label in a location that will not be obscured after cables get installed through the sleeve. Label shall describe the system’s applicable ratings, such as F, T, and L ratings.

C. Surface Raceways

1. Install surface raceway in accordance with CEC Article 352 and in accordance with ANSI/TIA-569-B.
2. Install surface raceway systems free from dents, bruises or deformations. Remove and replace any damaged products with new undamaged material.

3. Securely support surface raceway straight sections at intervals not exceeding 10 feet (3m) or in accordance with manufacturer's installation sheets. Securely fasten together straight sections and fittings using manufacturers' instructions and approved couplings and/or fasteners.

4. Install surface raceway level, plumb, and parallel/perpendicular to surfaces or exposed structural members. Follow surface contours where possible.

5. Use flat-head screws to fasten base to surfaces/substrate.

6. Close unused raceway openings.

7. Vacuum clean surface raceway after installation.

3.4 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. Section Includes: Pathway systems within buildings consisting of conduit and boxes (outlet, device, pull, and other boxes) to support low voltage systems

B. Related Sections
1. Comply with the Related Sections paragraph of Section 27 00 00.
2. Section 27 05 26, “Communications Grounding and Bonding”
3. Section 27 11 00, “Communication Rooms”

1.2 REFERENCES
A. Comply with the References requirements of Section 270000.

B. In addition to those codes, standards, etc., listed in 270000, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
1. American National Standards Institute (ANSI)
   a. ANSI C80.3, “Specifications for Electrical Metallic Tubing”

2. ASTM International
   b. ASTM A653, “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”

3. International Electronic Committee (IEC)
   a. ANSI/IEC 60529, “Degrees of Protection Provided by Enclosures (IP Code)”

4. National Electrical Manufacturer Association (NEMA)
   a. NEMA 250, “Enclosures for Electrical Equipment (1000 volts maximum)”
   b. NEMA FB 1, “Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable”
   c. NEMA OS 1, “Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports”
   d. NEMA OS 2, “Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports”
   e. NEMA OS 3, “Selection and Installation Guidelines for Electrical Outlet Boxes”
   f. NEMA TC 2, “Electrical Polyvinyl Chloride (PVC) Conduit”
g. NEMA TC 3, “Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing”

h. NEMA TC 7, “Smooth-Wall Coilable Electrical Polyethylene Conduit”

5. Underwriters Laboratories (UL)
   a. UL 1, “Flexible Metal Conduit”
   b. UL 6, “Electrical Rigid Metal Conduit -Steel”
   c. UL 50, “Enclosures for Electrical Equipment, Non-Environmental Considerations”
   d. UL 360, “Liquid-Tight Flexible Steel Conduit”
   e. UL 467, “Grounding and Bonding Equipment”
   f. UL 514A, “Metal Outlet Boxes”
   g. UL 514B, “Conduit, Tubing, and Cable Fittings”
   h. UL 514C, “Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers”
   i. UL 651, “Schedule 40 and 80 Rigid PVC Conduit”
   j. UL 797, “Electrical Metallic Tubing - Steel”
   k. UL 1242, “Electrical Intermediate Metal Conduit - Steel”
   l. UL 2024, “Signaling, Optical Fiber and Communications Raceways and Cable Routing Assemblies”

1.3 DEFINITIONS

A. Definitions of Section 27 00 00 apply to this Section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this Section defined as follows:

1. “Backbox”: A box [see “Box”] used to house cable terminations, to house devices, and to interface with cords/equipment; a backbox is installed with walls (such as within the cavities of framed walls and/or cast-in-place within concrete walls) such that the outlet/device finish (e.g., the coverplate/faceplate) is flush with the wall finish

2. “Box”: A box (often 5-sided with 1 side open) manufactured of sheet metal with welded corners, drawn metal, cast metal, or nonmetallic material (thermoplastic) in accordance with NEMA OS 1 or NEMA OS 2 and installed in accordance with NFPA 70 Article 314; available in different sizes (volumes) and modular design configurations (gangable) that may be field assembled, one to another, to accommodate multiple devices; boxes may be used as outlet boxes, device boxes, backboxes, junction boxes, or pull boxes, depending on their intended use, and handhole enclosures.

3. “CEC”: California Electrical Code (California Code of Regulations, Title 24 Part 3)

4. “Device Box”: A box [see “Box”] with provisions for attaching and housing electrical devices (switches, receptacles, or similar wiring devices) manufactured in accordance with NEMA OS 1 and NEMA OS 2 and installed in accordance with NFPA 70 Article 314; available in different sizes (volumes) and modular design configurations (gangable) that may be field assembled, one to another, to accommodate multiple devices
5. “EIMC”: Electrical Intermediate Metal Conduit – see “IMC”

6. “EMT”: Electrical Metallic Tubing type conduit, as defined in ANSI C80.3 and NFPA 70 Article 358; An unthreaded thinwall raceway, generally made of steel (ferrous) with protective coatings or aluminum (nonferrous), of circular cross section designed for the physical protection and routing of conductors and cables and for use as an equipment grounding conductor when installed utilizing appropriate fittings (per NEC Article 358)

7. “FMT: Flexible Metal Tubing type conduit, as defined in NFPA 70 Article 360

8. “Floor Box”: A box [see “Box”] used to house cable terminations, to house wiring devices, and to interface with cords/equipment; a floor box is a special purpose box installed with floors (such as cast-in-place within concrete) such that the box finish (e.g., the coverplate) is flush with the floor finish

9. “HDPE: High Density Polyethylene type conduit, as defined in NFPA 70 Article 353

10. “Innerduct”: A continuous cylindrical pipe fabricated of extruded thermoplastic, available in corrugated, smooth, or other wall types and in different sizes (to support different quantities of cables), generally to provide a separate pulling channel and physical protection for fiber, coaxial, and metallic cables in telecommunications and other networks, and used in multiple applications such as the following:
   a. within conduit to compartmentalize or create ‘sub-ducts’
   b. in cable tray to create an isolated pathway
   c. by itself as a pathway system

11. “IMC”: Intermediate Metal Conduit type conduit, as defined in ANSI C80.6 and NFPA 70 Article 342; a threadable steel raceway of circular cross section designed for the physical protection and routing of cables and for use as an equipment grounding conductor

12. “Junction Box”: A box used to join different runs of raceway (such as conduit) or cables, or both, and to provide space for the connection and branching of the enclosed conductors; most boxes can be used solely as junction boxes as long as they are used with an appropriate cover and with appropriate (code-required) access

13. “LFMC”: Liquidtight Flexible Metal Conduit type conduit, as defined in NFPA 70 Article 353

14. “Outlet Box”: A box [see “Box”] used to house cable terminations (connectors, modular jacks, receptacles, or similar wiring interfaces) and to interface with cords/equipment

15. “NEC”: National Electrical Code (NFPA 70)

16. “NEMA”: National Electrical Manufacturers Association

17. “NFPA”: National Fire Protection Agency

18. “Pull Box”: A box used in a conduit-based pathway system to allow access to and enclose conduit ends for placing cables and to house the interface between duct banks segments

19. “RMC”: Rigid Metal Conduit type conduit, as defined in NFPA 70 Article 344 and ANSI C80.1

20. “RNC”: Rigid Nonmetallic Conduit type conduit, as defined in NFPA 70 Article 352 and as manufactured to NEMA TC 2 specifications
21. “Textile Subduct”: A continuous enclosed assembly fabricated of polymer-coated nylon fabric used in conduit to compartmentalize or create ‘sub-ducts’, available in different sizes and ‘cell’ counts (to support different quantities of cables); an example of textile subduct includes “Maxcell”

22. “UL”: Underwriters Laboratories

1.4 SYSTEM DESCRIPTION

A. The scope of work of this section includes planning and coordination with General Contractor and other trades of inside plant conduit pathway systems, furnishing necessary materials, and labor and associated services required to install these pathway systems. The scope of work includes innerduct/subducting within conduit.

B. The drawings do not explicitly show on plans each and every conduit run needed for the project. Apply the guidelines described in this section and on the drawings to support the cabling described in Division 27 and shown on the low voltage drawings, and provide reasonably inferred standard conduits, fittings, and products required to complete the conduit installation to meet the design intent.

C. The scope of work includes conduit, boxes, and related construction materials that may not be expressly specified herein or expressly called out on the drawings, such as: 1- and 2-hole straps, nail straps, clamps and clamp backs, strut clamps, U-bolts, pipe hangers, clip-in and bolted hangers, bushings, ground bushings, service entrance cap/weatherhead, pull rope/tape, etc.

D. The scope of work includes basic construction materials that may not be explicitly specified herein or called out on the drawings, such as: concrete anchors, inserts, and/or expansion bolts; concrete fasteners; powder-actuated pins; construction channel/strut; threaded rod; wood fasteners (lag screws); beam clamps; purlin clips; stud box supports/brackets; floor-mount box supports; T-bar ceiling box support bar; channel-mount box supports; bonding pigtails; drywall ring (for ring & string); etc.

E. Conduit Systems, including Pull Boxes

1. Provide conduit systems in accordance with CEC (Chapter 3 and Article 250), UL listing information, manufacturer’s instructions, and compliant to local inspections and seismic restraint requirements. Conduit systems shall conform to ANSI/TIA-569-B standard and BICSI TDMM guidelines. Complete shall include all reasonably inferred conduits, fittings, connectors, couplers, straps, pull boxes, supports, etc., necessary for a complete installation to meet the intended application whether noted, indicated or specified in the Contract Documents or not. Duct bank routes and pull and junction box locations and elevations shown on the Drawings are diagrammatic in nature. Field verify route prior to installation.

2. Provide pull boxes as necessary to facilitate proper cable placement, including the following:

   a. no more than 180 degrees bend between placement points

   b. no more than 150-200 feet conduit length (depending on the total bend between end points)

   c. to meet AHJ requirements
3. Seismic Bracing: Provide seismic bracing to conduit system (duct banks, pull boxes, etc). Seismic bracing shall be approved by a structural engineer licensed in the state of California.

4. Seismic Joints: Provide seismic joints to conduit at building seismic joints. Seismic joint configurations shall be approved by a structural engineer licensed in the state of California.

5. Expansion Joints/Fittings: Provide expansion joints and/or fittings to conduit where necessary. Expansion joints/fittings shall be approved by a structural engineer licensed in the state of California.

6. Conduit systems shall be mechanically and electrically continuous throughout. Where EMT and associated fittings are used as part of equipment grounding system, provide a bonding type locknut where hub type fitting terminates into a threadless opening and provide compression ring type fittings for terminating and coupling.

7. Minimum Conduit Size: Refer to drawings.

8. When cast in concrete floors and/or walls, adhere to structural design requirements. Unless otherwise noted on the drawings, the largest trade size conduits shall not exceed 1/3 the floor or wall thickness, and conduits shall be spaced a minimum of three conduit diameters apart.

9. Bend radii for conduit trade sizes 63.5 mm (2-1/2") and larger shall be 10 times the conduit outside diameter (OD) and bend radii for conduit trade sizes 51 mm (2") and smaller shall be 8 times the conduit OD.

10. Provide transition couplings where dissimilar conduit types are joined.

11. Conduit bodies or ‘condulets’ (LBs, etc.) are prohibited for telecommunications and audiovisual cables.

12. For type EMT conduits:
   a. Provide steel (preferred) zinc plated or die cast set screw (or compression fittings). For set screw fittings, provide single screw fittings (e.g., 1-screw connectors and 2-screw couplers) for 37mm (1.5") and smaller conduits and provide double screw fittings (e.g., 2-screw connectors and 4-screw couplers) for 51mm (2") and larger conduits.
   b. When cast in concrete, embedded masonry, or installed in dry locations (as defined by CEC), provide compression fittings and couplings.
   c. When installed in damp locations (as defined by CEC), provide rain-tight type fittings and couplings.

13. When attaching to concrete ceilings, provide vibration and shock resistant bases.

14. Conduit Straps: Provide steel straps – for interior applications, provide straps without spacers.

15. At conduits entering into building from outside, provide duct plugs per duct.

16. For unused conduits, provide a mechanical-type seal/cap for protection and to keep the conduit free from debris.

17. Provide a pull tape into each conduit/duct between pull points.
a. Where boxes are exposed in damp or wet locations or located in hazardous areas, provide cast metal boxes with gasketed cast metal cover plates.

b. Provide supports for pull (and junction) boxes independently of conduit system and directly to the structure above. Provide seismic bracing for pull boxes.

18. Labeling:

a. Provide permanent labels on conduit ends and pull box lids.

19. Conduit Application

a. At interior concealed or exposed applications, 4” and smaller, provide EMT type conduit, unless otherwise note. EMT is the preferred conduit type.

b. In cast-in-place concrete, RNC and EMT types will be allowed for telecommunications and other low voltage systems.

c. IMC and RMC will be allowed for telecommunications and other low voltage systems with written approval from the Engineer.

d. LFMC is allowed for telecommunications (and other low voltage systems) only for short spans requiring flexible connections. When used, upsize LFMC 1 full trade size (to allow for a derating of the fill capacity).

e. FMC is not allowed for telecommunications (and other low voltage systems) without written approval from the Engineer.

F. Clearances (minimum):

1. From fluorescent light fixtures, or other EMI sources = 6 inches (150 mm)

2. From any motor, transformer = 48 inches (1,220mm)

3. From flue, hot water, steam line or other non-insulated heat sources = 12 inches (300 mm)

4. No conduit and/or supports shall encroach into ceiling height, head room of walkways, and/or doorways.

G. Penetrations:

1. When penetrating partitions and other construction assemblies, use approved methods.

2. When penetrating concrete walls (including shear walls) and/or floors, scan the area to be penetrated and core openings using methods approved by the structural engineer and by the AHJ. Obtain written approval for locations and means when not using methods included in the contract documents.

3. When penetrating fire rated assemblies, provide UL Classified and FM Approved fire rated systems in accordance with ASTM E814 (UL1479). Provide labels at both sides of the penetration. Refer to drawings for approved systems per application.

4. When penetrating acoustic rated assemblies, provide sealant to fill gaps, cavities, etc, to fully seal penetration.

H. Innerduct / Subducting

1. Provide innerduct/subducting within backbone conduits in accordance with CEC and the UL listing information.
2. Refer to drawings for routes requiring innerduct/subducting and innerduct/subducting sizes and types.

I. Outlet Boxes

1. Provide outlet boxes and covers/rings (raised and/or flat) in accordance with CEC Article 314 and NEMA OS 3. Ground and bond metal outlet boxes in accordance with NEC Article 250, Parts I, IV, V, VI, VII, and X.

2. Provide support for outlet boxes. Outlet boxes for telecommunications and audiovisual may share a support bracket (such as a stud span bracket) with electrical outlet boxes.

J. Floor Boxes

1. Provide floor boxes, covers, and related products in accordance with CEC Article 314 and NEMA OS 3. Bond metal boxes to ground in accordance with applicable portions of CEC Article 250 (such as Parts I, IV, V, VI, VII, and X).

2. At floor boxes shared with power service, provide separation means in accordance with CEC.

1.5 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements Prior to the Start of Construction:

1. Product Data: Submit product data showing manufacturer, part numbers, listings, fabrication materials, dimensions, capacities, finishes, knockout sizes and configuration, accessories, etc.

2. Shop Drawings: Submit shop drawings consisting of the following:
   a. Conduit layout/routes, supports locations, support details
   b. Highlight proposed changes to pathways (routes, types, sizes, etc.) compared to the contract documents
   c. Clearance variations and/or requests for exceptions
   d. Seismic bracing details (also see “Seismic Calculations” below)
   e. Instances of penetrations through fire and smoke rated barriers, including calling out firestopping type/UL System, size, quantity, and other relevant information

3. Seismic Calculations: Submit seismic calculations for support systems in conformance Section 270000. Structural Calculations shall be prepared and signed by a California Registered Structural Engineer. If used, specify proof loads for drilled-in anchors.

D. Submittal Requirements at Close Out:

1. As-Built Drawings, showing the routes, types, sizes, quantities, dimensions, etc., of pathways (backbone pathways, primary pathways, conduit – required; secondary such as hangers – not necessary)

2. O&M Manual, including as-built drawings, parts list (essentially final approved product data submittal), repair information, and maintenance requirements
E. Substitutions

1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of section 27 00 00.

B. NEC Compliance: Comply with NEC, as applicable to construction and installation of conduit and boxes.

C. NFPA Compliance: Comply with NFPA 70B, “Recommended Practice for Electrical Equipment Maintenance” pertaining to conduit and boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of section 27 00 00.

1.8 WARRANTY

A. Comply with Warranty requirements of section 27 00 00.

PART 2 PRODUCTS

2.1 ELECTRICAL METALLIC TUBING (TYPE EMT) CONDUIT AND FITTINGS

A. Application: Products and assembled system shall be suitable for indoor applications, in accordance with the NEC Article 358

B. Type EMT Conduit:

1. Type EMT conduit shall be formed of cold rolled strip steel, electrical-resistance welded continuously along the longitudinal seam, and zinc coated after welding. Type EMT conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar cables.

2. Type EMT conduit shall be listed by a nationally recognized testing laboratory to UL 797, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent. Type EMT conduit shall meet ANSI C80.3 specifications.

3. Type EMT conduit shall be recognized as a bonding conductor per NEC Article 250.118

4. Factory elbows and bends minimum bend radius shall be 48”.

5. Manufacturers – Type EMT Conduit:

   a. Allied Tube and Conduit Co (Electrical Group) “E-Z Pull” EMT conduit (Kwik-Fit EMT also acceptable)

   b. Cal Conduit Products “CalBrite” EMT conduit

   c. Republic Conduit

   d. Western Tube and Conduit Corp

   e. Or equal

C. Fittings for EMT:
1. Fittings (connectors, couplers, straps, accessories, etc.) shall be listed by a nationally recognized testing laboratory to UL 514B, and shall bear the UL label (stamped or molded - such markings shall be permanent).

2. Fittings shall be manufactured compliant to ANSI/NEMA FB 1.

3. Standard Set-Screw Fittings: fabricated of steel with zinc electro-plated finish. Die cast zinc / cast malleable iron fittings not acceptable. Set-screws shall be case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.

4. Compression Fittings: gland and ring compression type construction; fabricated of steel zinc plated or cast malleable iron; UL Listed as raintight and suitable for concrete

5. Manufacturers – Fittings for EMT
   a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
   b. Thomas & Betts Corp
   c. Or equal

D. Deflection/Expansion Sleeve:
   1. Application: Deflection/expansion sleeve shall compensate for movement in any direction between two conduit ends and shall withstand occasional vibration transmitted to conduit by rotating equipment or vehicular traffic.
   2. Deflection/expansion sleeve shall be listed by a nationally recognized testing laboratory to UL 514B and UL 467, and shall bear the UL label (stamped or molded - such markings shall be permanent).
   3. Deflection/expansion sleeve shall be fabricated of an inner sleeve, bonding braid, a neoprene outer sleeve with internal flexible stainless steel braid and outer stainless steel bands, ended with couplings (for connection to conduits).
   4. Deflection/expansion sleeve shall accommodate 0.75 inch (19mm) deflection, expansion, contraction, or parallel misalignment in any direction, shall allow up to 30 degree angular deflections, and shall be raintight.

5. Manufacturer – EMT Expansion/Deflection Sleeve:
   a. Cooper Crouse-Hinds XD series
   b. O-Z Gedney (Emerson Electric Co) DX series
   c. Or equal

E. Expansion Sleeve:
   1. Application: Expansion sleeve shall compensate for parallel movement between two conduits.
   2. Expansion sleeve shall comply with UL514.B and NEMA FB-1.
   3. Expansion sleeve shall be fabricated of an inner steel sleeve with an oversized outer sleeve sealed with slip bushings, configured such that the outer sleeve can move over the inner sleeve. Sleeve shall come equipped with internal or external bonding braid and be ended with couplers suitable to connect to conduit ends.

4. Manufacturers – EMT Expansion Sleeve:
a. Cooper Crouse-Hinds XJG-EMT series
b. O-Z Gedney (Emerson Electric Co) TX series
c. Or equal

2.2 LIQUID-TIGHT FLEXIBLE METAL CONDUIT (TYPE LFMC) AND FITTINGS

A. Application: Products and assembled system shall be suitable for indoor applications, in accordance with the NEC Article 350

B. Type LFMC Conduit:

1. Type LFMC conduit shall be fabricated in continuous lengths from of single strip, flexible continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC).

2. Type LFMC conduit shall be listed by a nationally recognized testing laboratory to UL 360, and shall bear (stamped or molded on conduit and fittings) the UL label. Markings shall be permanent.

3. Manufacturers:
   a. AFC Cable Systems, Inc. (a part of Atkore International)
   b. ANAMET Electrical (a.k.a., Anaconda Sealtite)
   c. Electri-Flex Company
   d. Southwire Company
   e. Or equal

C. Fittings for LFMC:

1. Connector body and gland nut shall be of cadmium plated steel or cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push in ferrule.

2. Manufacturers – Fittings for LFMC
   a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
   b. Cooper Industries
   c. Thomas & Betts Corp
   d. Or equal

2.3 PULL STRING

A. Application: For use with manual or power fishing systems for light duty cable or tape pulling applications

B. Description: round, woven, polypropylene line

1. Packaged in storage container with easy, quick, and tangle-free dispensing

2. UV resistant, and resistant to rot and mildew
3. Low elongation

C. Manufacturers:

1. Ideal Industries Inc Powr-Fish® or Valu-Line™ poly pull line
2. Klein Tools #56110 poly pull line
3. Or equal

2.4 PULL BOXES

A. Application: For use indoors as cable placement point (pull box) for low voltage cabling and wiring within a conduit raceway system.

B. Compliances:

1. Pull boxes shall meet the requirements of UL 50 and NEMA Type 1.
2. Pull boxes shall be listed by a nationally recognized testing laboratory for the purpose.

C. Material and Finish:

1. Thickness: 16 gauge, minimum
2. Material: the following materials are acceptable for pull boxes
   a. Pre-galvanized steel (ASTM A653), then formed
   b. Mild steel formed, then hot-dipped galvanized (per ASTM A123)
   c. Mild steel formed, then painted (polyester or epoxy powder coat, meeting ASTM D1654)

D. Size: pull box size shall comply with CEC 314.28

E. Configuration: pull boxes shall --- Covers shall be secured by machine screws at 6 inches intervals.

F. Manufacturers:

1. Cooper B-Line (Eaton)
2. Hoffman (Pentair)
3. Hubbell Wiegmann (SC Series enclosures, as an example)
4. Or equal

2.5 STEEL OUTLET BOXES AND COVERS

A. Application: For use indoors as outlet box, backbox, and/or junction box of low voltage systems to house wiring, cabling, terminations, and connectors; may also house and support components.

1. Outlet boxes shall permit access to conductors for maintenance
2. Outlet boxes shall come with knock-outs or punch-outs for easy creation of holes to accept conduit connectors.

B. Compliances:
1. Outlet boxes shall meet the requirements of CEC Article 314.

2. Outlet boxes shall be listed by a nationally recognized testing laboratory to UL 514A for Class 2 and Class 3 power-limited circuits (such as data and signal) providing bonding without the use of bonding jumpers, for remote control circuits, and for telecommunications circuits in accordance with NEC Article 314.

3. Outlet boxes shall be manufactured compliant to NEMA: FB-1 and OS-1.


C. Material and Finish:

1. Material: AISI/SAE 1008 Steel

2. Thickness: CEC 314.40(B) / 1.59 mm (0.0625in), minimum

3. Finish: G60 hot dip zinc galvanized (0.60 oz/sq ft), meeting ASTM A123, or pre-galvanized (continuous sheet galvanizing) meeting per ASTM A653

4. Finish Thickness: ~0.0005 inches

D. Square Box and Covers/Rings – 5"

1. Dimensions: 5 in square x 2.875 in deep

2. Volume: 64 in³

3. Outlet box shall come equipped with integrated cable management/slack support.

4. Manufacturers:

   a. Randl Industries

   1) #T-55017; “5 Square” outlet box, knockouts: one 1” + one 1-1/4” per side, one 1/2” per back

   2) #T-55018; “5 Square” outlet box, knockouts: one 1/2”, + one 3/4” + one 1” per side, one 1/2” per back

   3) #T-55019; “5 Square” outlet box, knockouts: one 1/2”, + two 1” per side, one 1/2” per back

   4) #T-55057; “5 Square” outlet box with side mounting bracket, knockouts: one 1” + one 1-1/4” on 3 sides, one 1/2” per back

   5) #T-55058; “5 Square” outlet box with side mounting bracket, knockouts: one 1/2”, + one 3/4” + one 1” on 3 sides, one 1/2” per back

   6) #T-55059; “5 Square” outlet box with side mounting bracket, knockouts: one 1/2”, + two 1” on 3 sides, one 1/2” per back

   7) #R-55000; blank cover for “5 Square” outlet box

   8) #N-54000; 4”-sq cover for “5 Square” outlet box, flat

   9) #N-54012; 4”-sq cover for “5 Square” outlet box, 1/2” raised

   10) #N-54058; 4”-sq cover for “5 Square” outlet box, 5/8” raised
11) #N-54034; 4”-sq cover for “5 Square” outlet box, 3/4” raised
12) #N-54010; 4”-sq cover for “5 Square” outlet box, 1” raised
13) #N-54114; 4”-sq cover for “5 Square” outlet box, 1-1/4” raised
14) #N-54112; 4”-sq cover for “5 Square” outlet box, 1-1/2” raised
15) #D-51G000; one gang cover for “5 Square” outlet box, flat
16) #D-51G012; one gang cover for “5 Square” outlet box, 1/2” raised
17) #D-51G058; one gang cover for “5 Square” outlet box, 5/8” raised
18) #D-51G034; one gang cover for “5 Square” outlet box, 3/4” raised
19) #D-51G010; one gang cover for “5 Square” outlet box, 1” raised
20) #D-51G114; one gang cover for “5 Square” outlet box, 1-1/4” raised
21) #D-52G000; two gang cover for “5 Square” outlet box, flat
22) #D-52G012; two gang cover for “5 Square” outlet box, 1/2” raised
23) #D-52G058; two gang cover for “5 Square” outlet box, 5/8” raised
24) #D-52G034; two gang cover for “5 Square” outlet box, 3/4” raised
25) #D-52G010; two gang cover for “5 Square” outlet box, 1” raised
26) #D-52G114; two gang cover for “5 Square” outlet box, 1-1/4” raised

b. Or equal

E. Square Box – 4-11/16”, Extra Deep

1. Dimensions: 4-11/16 in square x 3 (or 3-1/4) in deep
2. Volume: 66.7 in³
3. Box shall have standard 4-11/16 screw pattern (accept standard 4-11/16” covers/mud rings/tile covers/etc).
4. Knock-outs: top, bottom: 3/4 in to 2 in; sides: 3/4” to 1-1/4”
5. Manufacturers:
   a. Gavin Industries
      1) #72181-1-1/4; 4-11/16” square x 3” deep box, welded
   b. RACO (Hubbell Electrical Products)
      1) #260; 4-11/16” square x 3-1/4” deep box, welded
      2) #981; Partition for 4-11/16” square x 3-1/4” deep box, and 1/2", 3/4" & 1-1/4” raised covers
   c. Or equal

F. Square Box – 4-11/16”, Deep

1. Dimensions: 4-11/16 in square x 2-1/8 in deep
2. Volume: 42 in³
3. Box shall have standard 4-11/16 screw pattern (accept standard 4-11/16” covers/mud rings/tile covers/etc).

4. Manufacturers:
   a. Appleton Electric Co and/or O-Z Gedney (Emerson Electric Co)
   b. Garvin Industries #72171-1-1/4 drawn 4-11/16”S x 2-1/8”D box, (4) 1-1/4” KOs
   c. RACO (Hubbell Electrical Products)
   d. Steel City (Thomas & Betts)
   e. Or equal

2.6 BOX SUPPORT ACCESSORIES

A. Box accessories shall comply with UL standards and shall be listed by a nationally recognized testing laboratory.

B. Stud-Mount Single-Box Bracket
   1. Erico #SGBS16A; stud-mount bracket, for 1-1/2” or 2-1/8”D box, fits 16” stud spacing
   2. Erico #SGBS24A; stud-mount bracket, for 1-1/2” or 2-1/8”D box, fits 24” stud spacing
   3. Garvin #BMB16218; stud-mount bracket, for 2-1/8”D box, fits 16” stud spacing
   4. Garvin #BMB16350; stud-mount bracket, for 3-1/2”D box, fits 16” stud spacing
   5. Garvin #BMB24218; stud-mount bracket, for 2-1/8”D box, fits 24” stud spacing
   6. Garvin #BMB24350; stud-mount bracket, for 3-1/2”D box, fits 24” stud spacing
   7. Garvin #BMB16SL; stud-mount bracket, ‘sliding’ position for 1-1/2” or 2-1/8” D box, fits 16” stud spacing
   8. Garvin #BMB24SL; stud-mount bracket, ‘sliding’ position for 1-1/2” or 2-1/8” D box, fits 24” stud spacing
   9. Raco #9004; fixed stud-mount bracket, for 2-1/8”D box, fits 16” stud spacing
   10. Raco #9006; fixed stud-mount bracket, for 2-1/8”D box, fits 24” stud spacing
   11. Raco #9013; adjustable stud-mount bracket, for 2-1/8”D box, fits 10-3/8” to 18” stud spacing
   12. Raco #9015; adjustable stud-mount bracket, for 2-1/8”D box, fits 15” to 26” stud spacing

C. Stud-Mount Multi-Box Bracket
   1. Erico #RBS16; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
   2. Erico #RBS24; stud-mount bracket, 4 positions for 4S and/or 4-11/16”S box, fits 24” stud spacing
   3. Garvin #BMB4S3P; stud-mount bracket, 3 positions for 4S and/or 4-11/16”S box, fits 16” stud spacing
4. Raco #9002; stud-mount bracket, 3 positions for 4S and/or 4-11/16"S box, fits 16" stud spacing
5. Raco #9002; stud-mount bracket, 4 positions for 4S and/or 4-11/16"S box, fits 24" stud spacing

D. Floor-Mount Box Mounting Bracket
1. Erico #FMBS18; floor mount support bracket for box, puts box at 18.5" above wall footer
2. Garvin #KP4-12; floor mount support bracket for 4S and/or 4-11/16"S box, puts box at 12" above wall footer
3. Garvin #KP4-18; floor mount support bracket for 4S and/or 4-11/16"S box, puts box at 18" above wall footer
4. Garvin #KP4-24; floor mount support bracket for 4S and/or 4-11/16"S box, puts box at 24" above wall footer
5. Raco #9009; floor mount support bracket for 4S and/or 4-11/16"S box, puts box at 12" above wall footer
6. Raco #9010; floor mount support bracket for 4S and/or 4-11/16"S box, puts box at 18" above wall footer

E. T-Bar Bracket
1. Erico #510HD; bracket for outlet box, attaches to T-bar ceiling grid

F. T-Bar Support
1. Erico #4ACS; adapter/support for outlet box, attaches to T-bar ceiling grid

2.7 MULTI-SERVICE FLOOR BOXES COMBO - AV / TEL / POWER

A. Application: For use indoors as a multi-service (telecommunications, audiovisual, power) outlet box to house wiring, cabling, termination, connectors, and receptacles installed within a cast concrete floor

B. Box Construction: Seam welded 14 gauge steel

C. Compliances:
1. Floor boxes shall be listed by a nationally recognized testing laboratory to UL 514A for Class 2 and Class 3 power-limited circuits (such as data and signal) providing bonding without the use of bonding jumpers, and remote control) circuits and for telecommunications circuits in accordance with NFPA 70 Article 314 for use in tile, terrazzo, carpet, and wood covered floors.
2. Floor box assemblies shall meet the scrub water exclusions requirements of UL 514A for use in tile, terrazzo, carpet, and wood covered floors.

D. Load Capacity: Floor box assembly (back box, cover, etc) shall be rated to 300 lbs (minimum) static load.

E. Features:
1. Suitable for cast-in-place concrete applications
2. 8 gangs, minimum
3. Knock-outs (or punch-outs) for easy creation of holes to accept conduit connectors
4. Permit access to conductors behind terminations (for maintenance)

F. Cover Finish: Coordinate with Architect

G. Manufacturers:

1. FSR Inc.
   a. #FL-500P-2.25; c-i-p floor box, 2.25-in depth
   b. #FL-500P-3; c-i-p floor box, 3-in depth
   c. #FL-500P-4; c-i-p floor box, 4-in depth
   d. #FL-500P-6; c-i-p floor box, 6-in depth
   e. #FL-500P-8; c-i-p floor box, 8-in depth
   f. #FL-500P-10; c-i-p floor box, 10-in depth

2. FSR Inc.
   a. #SF-PB; 'SmartFit' c-i-p floor box (round), 4-in diameter x 5.9-in depth
   b. #SF-DDP; sub-plate for 4” box – two decora openings
   c. #SF-2SDP; sub-plate for 4” box – one decora, one 5-20R electrical outlet, and two keystone ports
   d. #SF-IPSPS; sub-plate for 4” box – IPS interface (3 position) and one 5-20R electrical outlet
   e. #SF-BC-CV; type/finish? cover for 4” box, carpet applications
   f. #SF-BLKC-CV; type/finish? cover for 4” box, carpet applications
   g. #SF-SC-CV; type/finish? cover for 4” box, carpet applications
   h. #SF-BT-CV; type/finish? cover for 4” box, tile applications
   i. #SF-BLKT-CV; type/finish? cover for 4” box, tile applications
   j. #SF-ST-CV; type/finish? cover for 4” box, tile applications

3. Or equal

2.8 MULTI-SERVICE WALL BOXES FOR FLAT PANEL DISPLAYS

A. Application: indoor use as a multi-service (telecommunications, audiovisual, power) outlet box to house wiring, cabling, termination, connectors, and receptacles and serve a flat panel display

B. Listings: Wall boxes shall be listed by a nationally recognized testing laboratory to UL 514A.

C. Fabrication Material: Backbox: Seam welded 14 gauge steel; Cover: 1/16” steel, electro-painted

D. Outlet box shall feature capacity for the following:

   1. Power: 1 duplex receptacle, duplex or decora style
2. Telecom/Network: 2 network jacks (refer to section 27 15 13 for jack information)

3. AV: 1 position for AAP (or equivalent) modules

4. Conduit Connections: 1 position for 1.25-inch conduits at top, 1 position for 1.25-inch conduits at bottom, 1 position for 1.25-inch conduits at each side,

E. Manufacturers:

   1. FSR
      a. #PWB-100; in-wall multi-service box for flat panel display
      b. #PWB-200; in-wall multi-service box for flat panel display
      c. #PWB-250; in-wall multi-service box for flat panel display
      d. Refer to 274116 for AV accessories
      e. Refer to 271513 for telecom accessories

2. Or equal

2.9 WEATHERPROOF (OUTDOOR) OUTLET BOXES AND COVERS

   A. Application: For use outdoors (generally wet, damp, and/or dry locations) as an outlet box, and/or back box of low voltage systems to house wiring, cabling, termination, and connectors; may also house and support components.

      1. Outlet boxes shall permit access to conductors for maintenance

      B. Outlet boxes shall be listed by a nationally recognized testing laboratory to UL 514A for Class 2 and Class 3 power-limited circuits (such as data and signal) providing bonding without the use of bonding jumpers, for remote control circuits, and for telecommunications circuits in accordance with NEC Article 314.

      C. Outlet boxes shall be die cast.

      D. Outlet boxes shall come with manufactured threaded openings for connection connections

      E. Outlet boxes (box, including conduit connections, plus cover assembly) shall be NEMA 3R rated.

      F. Manufacturers:

         1. Bell (Hubbell Electrical Products)
            a. #5387-0; one-gang box, 4-1/2"H x 2-3/4"W x 2-5/8"D, 3 1” threaded ports
            b. #5386-0; one-gang box, 4-1/2"H x 2-3/4"W x 2-5/8"D, 3 3/4" threaded ports
            c. #5406-0; one-gang extension, 4-1/2"H x 2-3/4"W x 1"D
            d. #5730-0; one-gang in-use cover, vertical, 2-7/8"D closed
            e. #5735-0; one-gang in-use cover, vertical, 4-7/8"D closed
            f. #5740-0; one-gang in-use cover, horizontal, 2-7/8"D closed
            g. #5389-0; two-gang box, 4-1/2"H x 4-1/2"W x 2-5/8"D, 5 1” threaded ports
h. #5387-0; two-gang box, 4-1/2"H x 4-1/2"W x 2-5/8"D, 5 3/4" threaded ports
i. #5407-0; two-gang extension, 4-1/2"H x 4-1/2"W x 1"D
j. #5775-0; two-gang in-use cover, 2-7/8"D closed
k. #5790-0; two-gang in-use cover, 4-7/8"D closed

2. Or equal

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.2 EXAMINATION AND PREPARATION

A. Prior to installation, plan routes and locations of pathway systems and coordinate with other trades and building systems (ductwork, plumbing, electrical raceways, wall construction, ceilings, etc.). Pathway systems shall not unnecessarily cross other trade’s work, shall not prevent removal of ceiling tiles or panels, and shall not block access to mechanical or electrical equipment. Provide offsets as required to avoid obstruction of pathway systems with other trades/systems.

B. Prior to installation, examine areas to receive pathways systems to verify conditions are ready for work and to verify conformance with manufacturer and specification tolerances. Notify the Owner’s Representative in writing of conditions that would adversely affect the installation, or subsequent

3.3 INSTALLATION

A. Secure raceway/pathway systems to building structures using approved support methods and components (fasteners, anchors, clamps, hangers, etc) and complaint to the CEC.

B. Conduit Systems, including Pull Boxes

1. Run conduit in groups/banks in the most direct route possible, parallel to building lines, and at elevations that avoid unnecessary offsets. Do not route conduit through areas in which flammable material may be stored, or over or adjacent to boilers, incinerators, hot water lines, or steam lines. Completed conduit systems installation shall not encroach into the ceiling height headroom of walkways or doorways.

2. Trapeze Supported Conduit Runs

a. Support conduit runs using "trapeze" hangers fabricated from construction channel and threaded steel rods anchored to building structures. Fasten conduit to construction channel using standard conduit clamps or equivalent.

b. Seismically brace trapeze supports compliant to applicable codes.

3. Surface-Mounted Conduit Runs

a. Single Conduit Runs: Support single conduit runs to building structure using construction channel with approved anchors and hardware or using 2-hole (preferred) or 1-hole conduit straps (or similar support apparatus). Where installed in damp or wet locations, support conduit to building structure using conduit clamp such that clamp backs add space between conduit and mounting substrate.
b. Multiple Conduit Runs: Support multi-conduit runs to building structure using construction channel with approved anchors and hardware. Select anchors based on installation substrate. Fasten conduit to construction channel using standard conduit clamps or equivalent.

c. Install vibration control apparatus as required to meet isolation requirements.

4. Install conduit free from dents, bruises or deformations. Remove and replace damaged conduits with new undamaged material.

5. Install metallic conduit so as to not be in contact with other dissimilar metal pipes (e.g., plumbing) to minimize galvanic corrosion.

6. Make bends and offsets using standard conduit bending hand tool and/or machines or use factory fittings. The use of any item not specifically designed for bending conduit is strictly prohibited.

7. When routing conduit within concrete:
   a. Place conduits at a depth as required by the project’s structural engineer. In lieu of no direction, place conduits in the middle of the concrete’s depth.
   b. Do not place conduits between reinforcing steel and the bottom of floor slabs.
   c. Space conduits a minimum of three conduit diameters apart unless otherwise noted on the drawings.
   d. Avoid crossing conduits (to minimize displacement of concrete). Obtain written approval/detail from structural engineer for crossing and for instances not adhering to general structural details.
   e. Only use compression fittings. Fully wrap fittings with duct tape.

8. For conduits that turn up and protrude from finished concrete, extend conduits 25mm – 75mm (1” to 3”) above the surface of the floor, unless conditions require other extension lengths.

9. Pull Boxes: Install pull boxes and junction boxes at locations that are accessible. Install pull boxes and junction boxes at locations that are concealed, unless as noted on drawings; pull boxes and junction boxes may be exposed in electrical rooms, utility rooms, storage areas, or when installed in ‘open’ spaces (such as no ceilings). Adjust locations and installation as coordinated with construction conditions and as required for seismic bracing. Within ceiling space (e.g., above ceiling grid), do not install higher than 1m (~3’) above grid.

10. Ream conduit ends cut in the field (non-factory) to eliminate sharp edges, burrs, etc.

11. Clean completed conduits of foreign matter and/or moisture (e.g., pull a bristle mandrel through).

12. Secure pull strings/mule tapes at conduit ends or within boxes to prevent recoiling back into duct.

13. After installation of conduit system and during ongoing general construction, protect conduits and tightly cover/seal open ends.

14. Leave no unused openings in any pull or junction box. Install close-up plugs as required to seal openings.
15. Label each conduit end in a clear manner by designating the location of the other conduit end (i.e. room name, junction box number, etc.). Indicate conduit length on the label.

16. For connections to equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission, use short length (maximum of 6ft) of the FMC or LFMC conduit. For installation in exterior locations, or humidity-laden atmosphere, corrosive atmosphere, water hose or spray wash down operations, and locations subject to seepage or dripping of oil, grease or water, use LFMC. Provide a green ground wire with FMC or LFMC conduit.

17. Terminations, Connections and Joints
   a. Securely connect conduits to boxes, cabinets, wireways, etc., using conduit connectors suitable for the application and one (or two) locknuts and, where required, an insulating bushing or insulated connectors. Torque threaded items to proper tightness.
   b. Where conduits are bonded to ground, securely attach grounding bushings and route bonding jumpers in as short of a path as possible to grounding point.
   c. Where joints and/or connections cannot be made tight, use a bonding jumper to maintain electrical continuity through the connection.
   d. Where terminations are subject to vibration, use a bonding bushing or wedge to maintain electrical continuity through the connection. Where subject to vibration or dampness, use insulating bushings to protect conductors.
   e. Vibration/Movement Isolation: At connections/terminations subject to vibration, movement, misalignment, and/or noise transmission, transition duct bank conduit to a short length (maximum of 2-3 feet) of LFMC. Secure conduit to structure immediately prior to the transition.

C. Outlet Boxes / Back Boxes
   1. Install boxes plumb and square. Match heights of surrounding outlets (e.g., an adjacent electrical receptacle). Adjust locations and heights as required to suit coordination requirements of construction conditions.
   2. Install boxes flush with walls, ceilings and floors except where exposed work is called for on the drawings, required, or appropriate.
   3. Do not make unused openings in boxes (such as knocking out fabricated knock-outs without using the opening for a conduit connector). Replace boxes containing inadvertent or unused openings.
   4. Framed Walls, both Fire Rated and Non-Rated
      a. Install outlet boxes and covers/raised rings during rough-in such that the finished condition is flush with wall finishes.
      b. Do not install outlet boxes back-to-back (outlet boxes facing opposite sides of a wall). At framed walls not fire rated, install boxes with at least 6" separation. At fire rated framed walls, install boxes with at least 24" and 1 framing stud separation.
      c. Patch/repair openings in wall (plaster, drywall, and/or plasterboard) around boxes and/or raised rings to eliminate visible gaps after outlet gets finished, in accordance with CEC 314.21.

5. Ceilings
a. At ceilings, install boxes, supports (such as T-bar support bracket), and cover/ring such that the finished condition is flush with ceiling finishes, except where noted otherwise and where conditions prevent a flush installation

b. At non-accessible ceilings, install service conduit continuous to an accessible location

6. Concrete Cast-In-Place Walls and Floors

   a. Set boxes in place within forms (for walls) and casting volume (for floors) such that the finished condition is flush with wall and floor finishes. Ensure proper concrete cover, according to structural requirements.

D. Wall Boxes for Flat Panel Displays

   1. Install boxes plumb and square. Install boxes and covers/raised rings during rough-in such that the finished condition is flush with wall finishes. Patch openings around covers/raised rings to eliminate visible gaps after outlet gets finished.

   2. Confirm heights of each box. Coordinate with heights of associated services (e.g., electrical receptacle). Adjust locations and heights as required to coordinate with construction conditions.

   3. Do not make unused openings in boxes (such as knocking out fabricated knock-outs without using the opening for a conduit connector). Replace boxes containing inadvertent or unused openings.

   4. Do not install boxes back-to-back in a framed wall (boxes facing opposite sides of a wall), unless noted so on the drawings. At framed walls not fire rated, install boxes with at least 6" separation. At fire rated framed walls, install boxes with at least 24" and 1 framing stud separation.

E. Floor Boxes

   1. Install floor boxes square, plumb, level, and flush with structural floor. Align box with adjacent surfaces.

      a. Tolerance: 1/16"

   2. For floor boxes with combined power and communications circuits, install metal dividers for separation of circuits.

   3. Install covers to suit finish conditions. Coordinate floor finishes (such as carpet) with other trades.

3.4 PROTECTION

   A. Protect installed products until completion of project.

   B. Touch-up, repair or replace damaged products before Substantial Completion.

3.5 FINAL INSPECTION AND CERTIFICATION

   A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

   B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION
PART 1   GENERAL

1.1 SUMMARY
A. Section Includes: Testing of Communications Twisted Pair Cabling (both Backbone and Horizontal Cabling subsystems).

B. Related Sections
1. Comply with the Related Sections paragraph of Section 27 00 00.
2. Section 27 13 14 - Communication Backbone OSP Twisted Pair Cabling
3. Section 27 15 13 - Communication Horizontal Twisted Pair Cabling

1.2 REFERENCES
A. Comply with the References requirements of Section 27 00 00.

B. In addition to the References of Section 27 00 00, the following references apply to this specification:
1. ANSI/TIA-1152, “Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling”

1.3 DEFINITIONS
A. Refer to Definitions of Section 27 00 00, Section 27 13 14, and Section 27 15 13.

B. In addition to those Definitions of Section 270000, the following list of terms as used in this specification defined as follows:
1. “CAT3”: Shall mean Category 3 cabling, per ANSI/TIA-568-C.2
2. “CAT6A”: Shall mean Augmented Category 6 cabling, per ANSI/TIA-568-C.2
3. “Channel”: Shall mean a testing configuration which includes the Permanent Link and the line cord (at the workstation), the equipment cord, and, if a full crossconnection is implemented, a patch cord and the crossconnect termination/connecting apparatus.
4. “Connect”: Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
5. “Cord”: Shall mean a length of cordage having connectors at each end. The term “Cord” is synonymous with the term “Jumper” and “Lead”.
6. “Permanent Link”: Shall mean the ‘permanent’ portion of the Horizontal cabling to each outlet with the test cords de-embedded from the measurements; this includes cable, consolidation point (if used), termination/connecting apparatus in the IDF and the connector at the outlet.
7. “System Cord”: Shall mean the cord used in the operating transmission circuit.
8. “Test Cord”: Shall mean the cord certified for use in testing, as described in this section.

1.4 SYSTEM DESCRIPTION
A. Refer to Section 27 00 00, Section 27 13 14, and Section 27 15 13 for addition system description information.

B. Work Provided Under Other Sections
   1. Backbone twisted pair cabling
   2. Horizontal twisted pair cabling

C. Base Bid Work
   1. Testing of a completed communication infrastructure cabling system, which includes:
      a. Submittals
      b. Testing of the twisted pair cabling as follows:

      | Subsystem   | Type  | Test         | Configuration     | Notes              |
      |-------------|-------|--------------|-------------------|-------------------|
      | Horizontal  | CAT6A | Category 6A  | Permanent Link    | Per TIA-568-C.2, 6.3 |
      | Horizontal  | CAT6A | Category 6A  | Channel           | Per TIA-568-C.2, 6.2 |

c. Record Documents, including test results.

1.5 SUBMITTALS

A. Comply with the Submittal requirements of Section 27 00 00.

B. Submittal Requirements at Start Of Construction:
   2. Product Submittal, including cut sheets of testing equipment to be used (note all software/firmware versions as applicable).
   3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27.

C. Submittal Requirements at Closeout:
   1. Record Documents:
      a. Submit one hard copy and one soft copy of test reports, including all tested parameters. This may be combined with the reports of Section 27 08 21.
      b. Submit one hard copy of warranty certificate.
   2. Format – Hard Copy:
      a. Prints of test reports, on 8.5”x 11” paper, color or black & white, one cabling link per page
      b. Assemble prints into a 3-ring binder
c. Clearly label the cover of each test reports binder with the following information:
   1) Client Name
   2) Project Name and Address
   3) Binder Name (e.g., “Test Reports for Horizontal Cabling System”)
   4) Date of Submittal – date format: <month> <day>, <year> (e.g., “January 1, 2019”)
   5) Contractor Name

d. Include a Table Of Contents at the beginning that lists the contents

e. Organize the test reports by Backbone Cabling / Horizontal Cabling, by building, by floor, and by IDF.

f. Sort reports in ascending cable ID order

g. Include tabbed separators for improved navigation through the manual

3. Format – Soft Copy:

a. “Burn” onto one CD-ROM test report files as native data format (for example, an *.FLW file from a Fluke tester); if not possible to submit in native format, then issue test results as an exported Microsoft Excel compatible format.

b. Include onto CD-ROM ‘Viewer’ software necessary to view, sort, filter, and print individual and summary test results from test results native format.

c. Clearly label the CD-ROM with the following information:
   1) Client Name
   2) Project Name and Address
   3) CD-ROM Name (e.g., “Test Reports for Horizontal Cabling System”)
   4) Date of Submittal – date format: <month> <day>, <year> (e.g., “January 1, 2019”)
   5) Contractor Name

1.6 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 27 00 00.

B. Under no circumstances shall any cable’s and/or conductor’s test results be substituted for another’s. If an instance of falsification is confirmed, the Contractor is liable for a complete retest of the cabling system at no additional cost to the Owner. This includes the retaining the services of a neutral party to observe all retesting.

1.7 WARRANTY

A. Warrant the validity of the test results.

PART 2 PRODUCTS

2.1 BACKBONE TWISTED PAIR CABLING TESTER

A. Areas of Test Measurement (minimum): Wire Map (continuity, opens, shorts, crossed pairs, split pairs): Siemon #MT-5000 test unit, with 25-pair adapter, or equal.
2.2 CATEGORY 6A HORIZONTAL CABLE TESTER

A. Equipment shall be independently verified to meet ANSI/TIA-1152 requirements, including Level IIIe minimum accuracy. Equipment shall meet ISO/IEC Class C, D, E, and F.

B. Test Standards (minimum): ANSI/TIA-568-C.2 Category 6A; ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-T, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5

C. Areas of Test Measurement (minimum): test areas listed under ANSI/TIA568-C.2, 6.3

D. Equipment:
   1. Fluke Networks
      a. #DTX-1800; “CableAnalyzer” test kit (main unit, remote unit, CAT6A permanent link adapters, CAT6A channel adapters, accessories), loaded with the latest firmware version.
      b. “LinkWare” reporting and latest version of documentation software

PART 3 EXECUTION

3.1 SCHEDULING

A. Prepare a construction schedule based on the schedule developed in sections 271513 and 27 15 23 for the testing activities. Update testing schedule when changes in the cabling schedules occur.

3.2 FIELD QUALITY CONTROL

A. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day’s testing and after each battery charge. Fully charge the test sets prior to each day’s testing to ensure proper operation.

B. Ensure test equipment and test cords are clean and undamaged during testing activities. Per the Engineer’s discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.

3.3 BACKBONE TWISTED PAIR CABLING TESTING REQUIREMENTS AND PROCEDURES

A. Precautions
   1. Adhere to the equipment manufacturer’s instructions during all testing.
   2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
   3. Fully charge power sources before each day’s testing activity

B. Testing Requirements
   1. Test backbone multipair cabling per “Base Bid Requirements” in Part 1 of this Section.
   2. The installation will be accepted when testing has indicated availability of 100% terminated pairs.
C. Testing Procedures
   1. Test continuity and wire map for all pairs.
   2. Test length for 2% of pairs of each cable. Pairs shall be from different 25-pair binder groups.

D. Acceptable Test Result Measurements
   1. Overall:
      a. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.
      b. Any reconfiguration of a link components required as a result of a test Fail, must be re-tested for conformance.
      c. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
   2. Length
   3. Wire Map: Provide continuous cable link and terminate all pairs correctly at both ends. No exceptions accepted.
   4. Attenuation: The acceptable attenuation measurements for any CAT3 cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3 and as adjusted to length measurement.
   5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss no greater than that listed in ANSI/EIA-568-C.2, 6.3 for CAT3 cabling.

E. Record Documents:
   1. Permanently record test results.
   2. Cable and pair identifiers of the test reports shall match the identifiers as labeled in the field – i.e., use the same ID on the cable label/termination label as what appears on the test reports.
   3. Measurements shall carry a precision through no significant decimal place.
   4. Each test report shall contain the following information (not necessarily in this order):
      a. Project name
      b. Cable identifier, pair number(s)
      c. Date measurement were obtained
      d. Operator (company and name)
      e. Test equipment model and serial number(s)
      f. Measurement results

3.4 HORIZONTAL CATEGORY 6A TESTING PROCEDURES

A. Precautions
1. Adhere to the equipment manufacturer’s instructions during all testing.

2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).

3. Fully charge power sources before each day’s testing activity

B. Test Equipment Set Up

1. Set up the tester to perform a full CAT6A test, as a Permanent Link configuration.

2. If the tester has cable-specific test parameters pre-loaded, set up the tester as product-specific setting. If not, set as generic CAT6A.

3. Set the tester to save the full test results (all test points, graphs, etc.).

4. Save the test results with the associated cable link identifier.

5. Calibrate the test set per the manufacturer’s instructions.

C. Acceptable Test Result Measurements

1. Overall Test Results:
   a. The Owner shall accept only individual test results that result in a Pass.
   b. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail.
   c. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
   d. Remove and replace any cabling links failing to meet the criteria described in this specification, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.

2. Wire Map: Correctly terminate all pairs of the cabling link at both ends. Provide only continuous pairs. No exceptions.

3. Length: Ninety-four meters is the maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration, including test cords.

4. Insertion Loss: The acceptable insertion loss measurements for any CAT6A cabling link is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

5. Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss: The acceptable worst pair-to-pair NEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

6. Power Sum NEXT Loss: The acceptable power sum PS-NEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

7. Worst Pair-to-Pair ELFEXT and FEXT Loss: The acceptable worst pair-to-pair ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

8. Power Sum ELFEXT and FEXT Loss: The acceptable PS-ELFEXT and loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.
9. Alien Near End CrossTalk (ANEXT) Loss: The acceptable ANEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

10. Alien Far End CrossTalk (AFEXT) Loss: The acceptable AFEXT loss for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

11. Return Loss: The acceptable return loss measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

12. Propagation Delay and Delay Skew: The acceptable propagation delay and delay skew measurements for any CAT6A cable is that which is no greater than that listed in ANSI/EIA-568-C.2, 6.3.

D. Record Documents:

1. Permanently record test results.

2. Export all of the numerical test results to a single spreadsheet in Microsoft Excel® 2003 (*.xls) or 2007 (*.xlsx) file format.

3. Submit test results at the conclusion of the testing to the Engineer for approval. Engineer will check these test reports for a format acceptable to the Owner, or Owner’s Representative.

4. For each Horizontal CAT6A test, record the following information:
   a. Project name and address
   b. Testing Company’s and Operator’s name
   c. Date of measurement
   d. Test equipment, including the following:
      1) Manufacturer, model, and serial number
      2) Date and time of last calibration
   e. Identification number of cable
   f. Overall test result

END OF SECTION
SECTION 27 08 21
COMMUNICATIONS FIBER OPTIC TESTING

PART 1 GENERAL

1.1 SUMMARY
A. Section Includes: Testing of Telecommunications Backbone Fiber Optic Cabling.
B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00.
   2. Section 27 13 24 - Communication Backbone OSP Fiber Optic Cabling

1.2 REFERENCES
A. Comply with the References requirements of Section 27 00 00.
B. In addition, the following standards are referenced to this Section:
   1. TIA/EIA-526-14A (OFSTP-14), “Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant”
   3. EIA/TIA-455-77 (FOTP-77), “Procedures To Qualify A Higher-Order Mode Filter For Measurements On Singlemode Fibers”
   5. EIA-455-95 (FOTP-95), “Absolute Optical Power Test for Optical Fibers and Cables”
   8. BICSI Telecommunication Distribution Methods Manual (TDMM)

1.3 DEFINITIONS
A. Refer to Definitions of Section 27 00 00 and Section 27 13 24.
B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:
   1. “Adapter” (associated with fiber connectivity): Shall mean a connecting device that joins 2 fiber connectors, either like or unlike
   2. “Connect”: Shall mean install all required test cords, patch cords, system cords, etc. to complete an optical circuit
   3. “CPR”: Coupled Power Ratio (according to TIA/EIA-526-14A Annex A
4. “Cord”: Shall mean a length of cordage having connectors at each end; the term “Cord” is synonymous with the term “Jumper”

5. “Jumper”: See “Cord”

6. “OTDR”: Shall mean Optical Time Domain Reflectometer

7. “Passive Link Segment”: Shall mean the cable, connectors, couplings, and splices between two fiber optic termination units

8. “System Cord”: Shall mean the cord used in the operating electrical or optical circuit.

9. “Test Cord”: Shall mean the cord certified for use in testing, as described in this section

1.4 SYSTEM DESCRIPTION

A. Refer to Section 27 00 00 and Section 27 13 24 for additional system description information.

B. Work Provided Under Other Sections

1. Backbone fiber optic cabling

C. Base Bid Work

1. Submittals: pre-testing and post-testing

2. Testing of completed fiber optic passive link segment(s) per the following table:

<table>
<thead>
<tr>
<th>Subsystem</th>
<th>Type</th>
<th>Test</th>
<th>Direction</th>
<th>Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backbone</td>
<td>Singlemode</td>
<td>Optical Power Loss</td>
<td>Both</td>
<td>1310nm and 1550nm</td>
</tr>
<tr>
<td>Backbone</td>
<td>Singlemode</td>
<td>Characterization</td>
<td>Both</td>
<td>1310nm and 1550nm</td>
</tr>
</tbody>
</table>

3. Record Documents, including test results

1.5 SUBMITTALS

A. Comply with the Submittal requirements of Section 27 00 00.

B. Submittal Requirements at Start Of Construction:


2. Pre-Testing Loss Calculations Submittal: Calculate the loss of each segment. The cable length may be based on the footage markings printed on the cable jacket. Include a brief description of each segment.

3. Product Submittal, including cut sheets of testing equipment and the following information (this data must match the test reports):
   a. Manufacturer and model number
   b. Serial number
c. Date of last factory calibration
d. Software/ firmware versions (as applicable)

4. Schedule Submittal, consisting of proposed schedule of work (this schedule may be combined with the schedule developed for Division 27)

C. Submittal Requirements at Closeout:

1. Submit test results and reports in a format acceptable to the Owner, or Owner’s Representative, or Engineer before system acceptance.

2. Submit one soft copy and one hard copy of test reports, including all tested parameters. This may be combined with the reports of Section 270811.

3. Submit one hard copy of warranty certificate from the manufacturer and the Contractor

4. Each test report (per strand per cable link) shall include the following information:
   a. Project/Client name, and project address
   b. Date of test
   c. Contractor (Company) and Technician’s name
   d. Test equipment, including Serial Numbers (must match pre-testing submittal)
   e. Test procedure (e.g., OFSTP-14A) and method (e.g., Method B)
   f. Light source’s launch category (including CPR) and spectral width
   g. Wavelength
   h. Cable identifier, fiber number, and fiber type (e.g., “multimode”)
   i. Measurement direction, including end locations
   j. Optical loss measurement

5. Cable and fiber identifiers of the test reports shall match the identifiers as labeled in the field – i.e., the ID stored with the test result shall be the same ID as on the cable label/fiber port label.

6. Format – Soft Copy:
   a. “Burn” onto one CD-ROM test report files as native data format (for example, an *.FLW file from a Fluke tester). If not possible to submit in native format, then issue test results as an exported Microsoft Excel compatible format.
   b. Include onto CD-ROM (or separate CD-ROM) ‘Viewer’ software necessary to view, sort, filter, and print individual and summary test results from test results native format.
   c. Clearly label the CD-ROM with the following information:
      1) Owner Name
      2) Project Name and Address
      3) CD-ROM Name (e.g., “Test Reports for Backbone Cabling System”)
      4) Date of Submittal – date format: <month> <day>, <year> (e.g., “January 1, 2010”)

5) Contractor Name

7. Format – Hard Copy of Optical Loss Testing:
   a. Prints of test reports, on 8.5”x 11” paper, color or black & white, one cabling link per page
   b. Assemble prints into a 3-ring binder
   c. Clearly label the cover of each test reports binder with the following information:
      1) Owner Name
      2) Project Name and Address
      3) Binder Name (e.g., “Test Reports for Backbone Cabling System”)
      4) Date of Submittal – date format: <month> <day>, <year> (e.g., “January 1, 2010”)
      5) Contractor Name
   d. Include a Table Of Contents at the beginning that lists the contents
   e. Organize the test reports by Backbone Cabling / Horizontal Cabling, by building, by floor, and by IDF.
   f. Sort reports in ascending cable ID order
   g. Include tabbed separators for improved navigation through the manual

8. Format – Hard Copy of Characterization:
   a. Use feet for the units for distance measurements (i.e., the “X” axis of the graph) shown on the print of the test measurements.
   b. Print reports such that strands of a given cabling link have matching axis scales; the x-axis shall be the same report-to-report and as well as the y-axis shall match report-to-report.
   c. The trace of the printed test report shall show the launch cord.
   d. Each test report shall contain the following information (not necessarily in this order):
      1) Owner Name
      2) Project Name and Address
      3) Cable identifier, fiber/strand number, and fiber type (e.g., “multimode”)
      4) Operator (company and name)
      5) Date measurements were obtained
      6) Measurement direction
      7) Set up parameters (such as wavelength, pulse width, refractive index, event threshold)
      8) Test equipment model and serial number(s)
      9) OTDR trace
     10) Length of fiber
11) Overall link loss
12) Contractor Name
e. For each cabling link, include either a schematic graphic or a brief narrative accurately
describing the test set up. The description shall include test/launch cord (with length),
expected events (connectors, slices, etc.) with expected distances, etc. This
information will eliminate many questions the Engineer will have while reviewing the
reports.

1.6 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 270000.

B. Testing equipment shall be fully functional and in proper working order. Testing equipment
shall be factory calibrated within the manufacturer’s published calibration period. Testing
equipment must have loaded the latest firmware / operating software.

C. Under no circumstances shall any cable’s and/or optical conductor’s test results be
substituted for another’s. If an instance of falsification is confirmed, the Contractor will be
liable for a complete retest of the cabling system at no additional cost to the Owner. This
includes the retaining the services of a neutral party to observe all retesting.

1.7 WARRANTY

A. Warrant the validity of the test results. Issue such warranty in writing.

PART 2 PRODUCTS

2.1 FIBER OPTIC LIGHT SOURCE

A. Light source used for testing multimode fibers shall confirm to TIA/EIA-526-14A, 3.1. Light
source used for testing singlemode fibers shall confirm to TIA-526-7, 3.1.1.

B. Light source’s modal launch condition shall be Category 1.

C. Light source’s connection interfaces shall be factory installed. Field-configurable connection
interface will not be allowed.

D. Light source’s output wavelength and power shall be constant/unchanged after setting.

E. Light source shall be factory calibrated (date of last factory calibration must be documented).

F. Equipment:
   1. Corning Cable Systems
      a. #OS-404RXD; dual wavelength (1310 / 1550) light source for singlemode

2.2 FIBER OPTIC POWER METER

A. Power meters used for testing multimode fibers shall conform to TIA/EIA-526-14A, 3.2.
Power meters used for testing singlemode fibers shall conform to TIA/EIA-526-7, 3.1.2.

B. Power meter shall be capable of measuring both relative and absolute power, and shall
feature data storage (of measurements).

C. Power meter used shall have the following performance:
1. Dynamic range of 0dBm to -50dBm, minimum

2. Accuracy of ±0.2dB

D. Power meter shall be factory calibrated (date of last factory calibration must be documented).

E. Equipment:

1. Corning Cable Systems
   a. #OTS-610; power meter with data storage
   b. #OTS-400 series power meter (legacy product series)

2.3 FIBER OPTIC OTDR

A. Singlemode Source Module:

<table>
<thead>
<tr>
<th>Wavelength</th>
<th>Dynamic Range</th>
<th>Attenuation Deadzone</th>
<th>Reflective Deadzone</th>
<th>Loss Resolution</th>
<th>Distance Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1310nm</td>
<td>40dB</td>
<td>6.0mt</td>
<td>3.5mt</td>
<td>0.001dB</td>
<td>0.1mt</td>
</tr>
<tr>
<td>1550nm</td>
<td>28dB</td>
<td>12.0mt</td>
<td>3.5mt</td>
<td>0.001dB</td>
<td>0.1mt</td>
</tr>
</tbody>
</table>

B. Equipment:

1. Corning Cable Systems
   a. #OV-1000; OTDR 'mainframe'
   b. #400-SD34; singlemode module for OV-1000 OTDR

C. Reader Software: Windows-based software capable of reading stored traces and is fully functional with the testing equipment.

2.4 FIBER OPTIC TEST CORDS

A. Singlemode Fiber Optic Test Cord

1. Singlemode test cords shall comply to 526-14A, 3.1.3.

2. The fiber of the singlemode test cord(s) shall have the mode field diameter nominally equal to that of the singlemode fiber optic passive link.

3. Connectors of the test cords shall be compatible (the same type) with the connector types of the light source and the power meter, and with the cabling plant.

4. The connectors shall exhibit ≤ 0.5dB loss per connection @ both 1310nm and 1550nm, as measured per FOTP-171 D3. The connectors shall inhibit Fresnel reflections (i.e., have a “PC” finish).

5. Test cord length for Optical Power Loss testing: 1m - 5m.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL
A. Prior to the start of testing, set up a meeting with the Engineer to witness testing procedures. The Engineer will, at their discretion, come to the site and witness the technician’s actual testing procedures. The Engineer may give verbal comments to correct the technician’s procedures to meet these requirements, followed up with a written observation report.

B. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day’s testing and after each battery charge. Fully charge the test sets prior to each day’s testing to ensure proper operation.

C. Use undamaged test equipment and test cords. Clean connectors and adapters (with a lint-free wipe and 90% (or higher) isopropyl alcohol) prior to and during testing activities. Per the Engineer’s discretion, halt testing activity and clean testing equipment, test cords, and related apparatus.

D. Permanently record test results.

3.2 OPTICAL POWER LOSS TESTING REQUIREMENTS AND PROCEDURES

A. Safety: Use test equipment containing a laser or LED in accordance with ANSI Z136.2.

B. Test fiber optic passive links per “Base Bid Work” under System Description in Part 1 of this Section. Follow the procedures in the following order.

C. Precautions

1. Adhere to the precautions described in TIA-526-14A, 5.1.

2. Adhere to the equipment manufacturer’s instructions during all testing.

3. Prior to any testing activity or any measurements taken:
   a. Ensure test equipment is at room temperature – approximately 72 degrees F (if necessary, bring the test equipment in from outdoors and let it set until the test equipment reaches room temp).
   b. Power on the light source and power meter for at least 5 minutes prior to obtaining measurements.
   c. Clean connectors and adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.

4. Do not power off the light source or the power meter during testing activity.

5. Do not remove Test Cord #1 from the light source at any time (unless the testing is complete or the equipment is being put away for the evening).

6. Do not bend the test cords smaller than 20 times the cord diameter (this may induce loss into the cord reducing the accuracy of the measurement).

D. Test Cord Performance Verification

1. Connect Test Cord #1 to the light source and to the power meter.

2. Set this value into the power meter as the reference power ($P_{ref}$).

3. Disconnect Test Cord #1 from the power meter. Do not disconnect Test Cord #1 from the light source.
4. Connect the ‘open’ end of Test Cord #1 to an adapter (of matching connector type). Connect one end of Test Cord #2 to that adapter and the other end of Test Cord #2 to the power meter.

5. The value displayed on the power meter represents the test cord #2 connection loss.

6. Flip the ends of Test Cord #2 so that the end connected to the power meter is now connected to the adapter (attached to test cord #1), and the end connected to the adapter is now connected to the power meter.

7. The value displayed on the power meter represents the test cord #2 connection loss on the opposite end.

8. Both connection loss measurements must be less than or equal to the value found in Table 27 08 12-3.1 (below). Replace cord if measure losses exceed table values.

<table>
<thead>
<tr>
<th>Table 27 08 21-3.1: Acceptable Test Cord Connection Attenuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST or SC Connection</td>
</tr>
<tr>
<td>Singlemode</td>
</tr>
</tbody>
</table>

9. Repeat this test procedure from the beginning reversing the test cords in order to verify the performance of test cord #1.

E. Test Equipment Set Up

1. Follow the test equipment manufacturer’s initial adjustment and set up instructions.

2. Set the power meter to Relative Power Measurement Mode

3. Set the meter to display power levels in dBm.

4. Set the light source and power meter to the same wavelength.

F. Singlemode Passive Link Insertion Loss Testing Procedures

1. Only use test jumpers that comply with the requirements TIA-526-7, 3.1.3.

2. Test Method:
   a. For ‘permanent’ links, perform the optical power loss testing of singlemode fibers according to TIA-526-7 test method A.1 “One Jumper-Cable Measurement”.
   b. For ‘channel’ links, perform optical power loss testing of singlemode fibers according to TIA-526-7 test method A.3 “Three Jumper-Cable Measurement” and include the system cords as part of the cable plant.

G. Acceptable Measurement Values

1. The measured loss shall not exceed the calculated loss of the pre-testing submittals.

H. Record Test Measurements:

1. Permanently record all test data per strand, including the following (minimum):
   a. Project name
   b. Cable identifier, fiber number, and fiber type (e.g., “multimode”)
c. Testing company name

d. Testing technician’s name

e. Date measurements were obtained

f. Measurement direction

g. Wavelength

h. Loss measurement

i. Test equipment model and serial number(s)

2. If the test set (light source and power meter) does not have data storage capability, then utilize the forms provided in Part 4 of this Section (or similar) as test reports.

3. Measurements shall carry a precision through one significant decimal place, minimum.

3.3 CHARACTERIZATION TESTING REQUIREMENTS AND PROCEDURES

A. Safety: Use test equipment containing a laser or LED in accordance with ANSI Z136.2.

B. Test fiber optic passive links per “Base Bid Work” in Part 1 of this Section.

C. Precautions

1. Adhere to the equipment manufacturer’s instructions during testing.

2. Prior to testing activity or measurements taken, complete the following activities:

a. Ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).

b. Turn the light source and power meter power on for at least 5 minutes.

c. Clean test/launch cords’ and system cords’ connectors and the cabling system adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.

3. Do not power off OTDR’s light source during testing activity.

4. Do not remove launch cord from the OTDR’s light source at any time (unless the testing is complete or the equipment is being put away for the evening, or during trouble shooting).

5. Do not bend the launch cord smaller than 20 times the cord diameter during testing activities (this may induce loss into the cord reducing the accuracy of the measurement).

D. Characterization Testing Procedures

1. Equipment settings / measurement parameters:

a. Index of Refraction: match cable-under-test fiber parameters; default settings as follows:

<table>
<thead>
<tr>
<th>Singlemode</th>
<th>Corning SMF-28e+</th>
<th>1.4670</th>
<th>@ 1.4677</th>
<th>@ 1550nm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1310nm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Pulse Width: multimode: 20ns; singlemode: 50 ns
Singlemode 10 ns for cable lengths up to 2,000 meters
50 ns for cable lengths between 2,000 meters and 10,000 meters

c. Backscatter: multimode: -67dB @ 850nm, -74dB @ 1300nm; singlemode: -74dB @ 1310nm and 1550nm.
d. Event Threshold: 0.05dB.
e. Reflection Threshold: multimode: -45dB, singlemode: -60dB.
f. Fiber Break/End-Of-Fiber: 3dB.

2. Set the distance units (i.e., the “X” axis of the graph) to feet.

3. Waveform: The waveform shall be real-time and normal density.

4. Obtain measurements using a ‘launch’ cord connected to the test instrument and the cable-under-test.
   a. The fiber of the launch cord shall match the fiber of the cable-under-test in physical and performance parameters (such as type, core/cladding size, index of refraction, refractive profile). The fiber of the launch cord should match the fiber of the cable-under-test in manufacturer and product.
   b. The launch cord length shall be between 25 and 100 meters.

E. Record Test Measurements:

1. Permanently record all test data per strand, including the following (minimum):
   a. Project name
   b. Contractor name
   c. Testing technician’s name
   d. Date measurements were obtained
   e. Cable identifier, strand number, and fiber type (e.g., “multimode”)
   f. Wavelength
   g. Measurement direction
   h. Full data set
   i. Curve
   j. Test equipment model and serial number(s)

2. Measurements shall carry a precision through one significant decimal place, minimum.

PART 4 TESTING FORMS

4.1 SUMMARY OF FORMS

A. Fiber Optic Test Instrument Data Sheet

B. Fiber Optic Reference Power Measurement Method Form
C. Fiber Optic Relative Power Measurement Method Form

END OF SECTION
# Fiber Optic Test Instrument Data Sheet

<table>
<thead>
<tr>
<th><strong>LIGHT SOURCE</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturer:</strong></td>
<td>Serial Number:</td>
</tr>
<tr>
<td>Model:</td>
<td>Last Calibration:</td>
</tr>
<tr>
<td>Spectral Width:</td>
<td>Coupled Power Ratio (Category):</td>
</tr>
</tbody>
</table>

| 850-nm: | 850-nm: |
| 1300-nm: | 1300-nm: |
| 1310-nm: | 1310-nm: |
| 1550-nm: | 1550-nm: |

<table>
<thead>
<tr>
<th><strong>POWER METER</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manufacturer:</strong></td>
<td>Serial Number:</td>
</tr>
<tr>
<td>Model:</td>
<td>Last Calibration:</td>
</tr>
</tbody>
</table>

Note: Submit a separate data sheet for each test set being used.
# Fiber Optic Reference Power Measurement Method Form

## TEST SUMMARY INFORMATION

<table>
<thead>
<tr>
<th>Test Personnel:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Source Location:</td>
<td>Power Meter Location:</td>
</tr>
<tr>
<td>Wavelength:</td>
<td>Reference Power Measurement ($P_{\text{ref}}$):</td>
</tr>
<tr>
<td>Method:</td>
<td></td>
</tr>
<tr>
<td>Page _____ of _____</td>
<td></td>
</tr>
</tbody>
</table>

## TEST RESULTS

<table>
<thead>
<tr>
<th>Stranded #</th>
<th>Cable ID</th>
<th>Power ($P_{\text{sum}}$) (dB)</th>
<th>Link Seg Attn (dB)</th>
<th>Accep pAttn (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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Fiber Optic Relative Power Measurement Method Form

### TEST SUMMARY INFORMATION

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SECTION 27 11 00
COMMUNICATIONS EQUIPMENT ROOMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Buildout / fit-up of communications equipment rooms.

B. Related Divisions and Sections

1. Comply with the Related Sections paragraph of Section 27 00 00.

2. Review Seismic Calculation requirements, specifically in Section 27 00 00, Article 1.05.

3. Drawings, general provisions of the Agreement, and Division 01 apply to this Section.

4. Consult other Divisions, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.

1.2 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., list in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. EIA/ECA-310-E, “Cabinets, Racks, Panels, and Associated Equipment”

2. NFPA National Fire Protection Association (NFPA) 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials


1.3 DEFINITIONS

A. Definitions as described in Section 27 00 00 shall apply to this section.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:

1. “UPS”: Uninterruptible Power Supply – a system that provides conditioned power with batteries acting as a continuous power source for equipment during a utility power interruption

2. “XLBET”: Extra Large Building Entrance Terminal; a specific type of termination frame for large twisted pair crossconnect fields.

1.4 SYSTEM DESCRIPTION

A. General: Communications rooms shall fall into one of the following space titles:

1. Building Distribution Facility
B. Room Functions:

1. Building Distribution Facility (BDF) will serve the following functions:
   a. House interbuilding twisted pair and fiber optic backbone cabling.
   b. House voice backbone crossconnect field and data backbone crossconnect field
   c. House network equipment (i.e. distribution switches) serving the same building
   d. Houses horizontal termination field, both voice and data, of devices served from this room (refer to floor plans for area served)
   e. House network equipment (i.e. access switch) serving users of the room’s service area

C. Work Covered Under Other Sections

1. Plywood backboards
2. Bonding
3. Grounding busbars
4. Power and cooling
5. Conduit, device boxes, and sleeves

D. Base Bid Work

1. The Work under this section includes materials, accessories, fasteners, etc., and the labor and associated services required for the buildout / fit-up of telecommunications equipment rooms, and includes coordination through the General Contractor with other trades

2. In general, the Work includes the following:
   a. Submittals
   b. Plywood backboards
   c. Rack bays (equipment racks, vertical management sections, anchoring)
   d. Cable, wire and patch cord management
   e. Overhead and vertical cable support
   f. IT Cabinets
   g. UPSs
   h. Seismic bracing
   i. Identification tags and labeling
   j. Record Documents
   k. Warranty

E. Coordination Requirements
1. Electrical: Coordinate layout with electrical contractor to ensure proper placement of lighting, sequencing of power service to rack bay, and other issues related to electrical trade.

2. Owner: Coordinate room-ready requirements and schedule with Owner (to allow Owner to plan and execute installation of OFOI telecommunications/network equipment).

1.5 SUBMITTALS

A. Comply with the Submittal requirements of Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements at Start of Construction:
   1. Product Data Submittal
   2. Shop Drawings Submittal: Consisting of any proposed changes to room plans.
   3. Sample Submittal: Submit sample of equipment rack label.
   4. Seismic Calculations: Rack anchorage into concrete flooring with overall rack bracing, based on maximum rated load capacity.
   5. Schedule Submittal: Submit proposed schedule of work (this schedule may be combined with the schedule developed for Division 27).

D. Submittal Requirements at Close Out:
   1. As-Built Drawings Submittal

E. Substitutions
   1. Requests for substitutions shall conform to the general requirements and procedure outlined in Section 27 00 00.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.8 WARRANTY

A. Warrant Work to perform as described within this Section for a period of 1 year. Correct deficiencies within 24 hours of notification.

PART 2 PRODUCTS

2.1 SHEET HARDWOOD / PLYWOOD (AS BACKBOARD)

A. A HP Grade A Type II (graded in accordance with AWI Premium)

B. Materials shall comply with performance requirements in AWPA C27.

C. The backboard must be 8’ x 4’ virgin plywood sheets, free from defects, and be fire rated.
D. Fire-Retardant Treatment Processes: Plywood shall be chemically treated and pressure
impregnated, capable of providing a maximum flame spread classification of 26-75 and a
smoke density no greater than 450, in accordance with ASTM E 84.

2.2 FASTENERS, FOR PLYWOOD

A. Bolts:

1. Bolts shall be steel and shall comply with ASTM A 307, Grade A (ASTM F 568M, Property
Class 4.6).

2. Hex nuts and flat washers shall comply with ASTM A 563 (ASTM F 563M).

B. Concrete Anchors:

1. Expansion anchor bolt and sleeve assemblies shall have a capability to sustain, without
failure, a load equal to 6 times the load imposed when installed in concrete as determined
by testing per ASTM E 488 conducted by a qualified independent testing inspecting
agency.

2. Materials:
   a. Carbon-steel components, zinc plated to comply with ASTM B 633 Class Fe/Zn 5
   b. Galvanized machine screws or bolts with standard expansion-shield type concrete
      anchors

3. Manufacturers:
   a. Phillips Drill Co. “Red Head” masonry anchors
   b. Wej-It Expansion Products Inc. “Wej-It” concrete anchors
   c. Or equal

2.3 EQUIPMENT RACK – 4-CHANNEL TYPE

A. Application: Suitable for the support of termination apparatus, cable and cord management
apparatus, network equipment, and other similar equipment, within a telecommunications
room.

B. Material: High strength, lightweight 6061-T6 aluminum, extrusion construction.

C. Channel:

1. Size: 3” deep, with flanges on each side (“double sided”)

2. Flange: 1.265” wide by 0.25” thick, with mounting holes


4. Threading: #12-24 rolled, compatible with EIA-310

5. RMU Markings: The RMU markings shall be permanently stamped on the ‘outside’ of
both flanges on both channels.
D. Assembled Rack: Rack shall be complete with four mounting channels, two base angles (3.5” high by 6” deep by .375” thick), two top angles (1.5” high by 1.5” deep by .375” thick), a bottom ‘center pan’, and a top ‘center pan’. Assembled rack shall be 7’-0” high (overall by 19” mounting width (20.25” wide overall), 28” from front mounting plane to back mounting plane, and shall contain 45 EIA mounting spaces (1.75”).

E. Load Rating: 1,000 lbs, when evenly distributed for the height of the rack.

F. Finish: Black, powder coat

G. Manufacturer:
   1. CPI
      a. #50120-703; 7’-0”H x 19” x 29” D 4-channel rack, 45 RMU, black
   2. Cooper B-Line
      a. #SB8301908424FB; 7’-0”H x 19” x 24” D 4-channel rack, 45 RMU, black
      b. #SB8301908430FB; 7’-0”H x 19” x 30” D 4-channel rack, 45 RMU, black
   3. Or equal

2.4 EQUIPMENT RACK – 2-CHANNEL TYPE

A. Application: Suitable for the support of termination apparatus, cable and cord management apparatus, network equipment, and other similar equipment, within a telecommunications room.

B. Material: High strength, lightweight 6061-T6 aluminum, extrusion construction.

C. Channel:
   1. Size: 3” deep, with flanges on each side (“double sided”)
   2. Flange: 1.265” wide by 0.25” thick, with mounting holes
   4. Threading: #12-24 rolled, compatible with EIA-310
   5. RMU Markings: The RMU markings shall be permanently stamped on the ‘outside’ of both flanges on both channels.

D. Assembled Rack: Rack shall be complete with two mounting channels, two base angles (3.5” high by 6” deep by .375” thick), two top angles (1.5” high by 1.5” deep by .375” thick), and hardware. Assembled rack shall be 7’-0” high (overall) by 19” mounting width (20.25” wide overall), and shall contain 45 EIA mounting spaces (1.75”).

E. Load Rating: 1,000 lbs, when evenly distributed for the height of the rack.

F. Finish: Black, powder coat

G. Manufacturer:
   1. CPI
      a. #46353-703; 7’-0”H x 19” 2-channel equipment rack, 45 RMU, black
b. #46383-703; 7'-0"H x 23" 2-channel equipment rack, 45 RMU, black
c. #55053-703; 7'-0"H x 19" equipment rack, black

2. Cooper B-Line
   a. #SB556072XUFB; 6'-0"H x 19" equipment rack, black
   b. #SB556084XUFB; 7'-0"H x 19" equipment rack, black
   c. #SB556096XUFB; 8'-0"H x 19" equipment rack, black
d. #SB556108XUFB; 9'-0"H x 19" equipment rack, black

3. Or equal

2.5 SEISMIC GUSSET, FOR 2-CHANNEL EQUIPMENT RACK

A. Application: Seismic gusset kit for stiffening and stabilization of critical joints in equipment racks.
B. Manufacturer:
   1. CPI
      a. #11592-701; gusset kit, black
   2. Cooper B-Line
      a. #SB556 GUSSET KIT FB; gusset kit, black
   3. Or equal

2.6 VERTICAL MANAGEMENT SECTIONS

A. Application: Suitable for cable routing, cord routing, and cord slack storage vertically (between the top and bottom) within a rack bay.
B. The vertical management section shall be <single-sided> <double-sided> (i.e., the management section having covered cable guides on the front and flip-retainers on the rear).
C. Size & Capacity: Refer to the Drawings for sizes and configurations.
D. Mounting: The vertical management section having matching bolt holes for attachment to the rack.
E. Color: black (guides and cover).
F. Manufacturer:
   1. CPI
      a. #11729-703; vertical management section, 7'-0" x 6", double sided, black
      b. #30162-703; 7'-0"H x 6"W, “CCS” double sided, black
c. #30163-703; 7'-0"H x 10"W, “CCS” double sided, black
d. #40095-703; 7'-0"H x 6"W, “MCS-EFX” double sided, extended depth, black
e. #40096-703; 7'-0"H x 10"W, “MCS-EFX” double sided, extended depth, black
2. Safety Center

2. Cooper / B-Line
   a. #SB57163D084FB; 7'-0"H x 3.675"W, double sided, black
   b. #SB57166D084FB; 7'-0"H x 6"W, double sided, black
   c. #SB86083D084FB; 7'-0"H x 3.675"W, double sided, black
   d. #SB86086D084FB; 7'-0"H x 6"W, double sided, black
   e. #SB860810D084FB; 7'-0"H x 10"W, double sided, black
   f. #SB860812D084FB; 7'-0"H x 12"W, double sided, black

3. Panduit
   a. #WMPVHC45E; vertical manager, 7’ x 6.7”W x 13.8”D, double sided, black
   b. #WMPV45E; vertical manager, 7’ x 4.9”W x 11.8”D, double sided, black

4. Or equal

2.7 HORIZONTAL MANAGEMENT PANEL

A. Application: Suitable for installation into equipment rack for horizontal cord management. The horizontal management panel shall match (and fully integrate with) the vertical management sections.

B. The horizontal management panel shall be single-sided.

C. Size: 1U or 2U high (refer to Drawings) by 19” mounting wide.

D. Color: black (guides and cover).

E. Manufacturer:
   1. CPI
      a. #30139-719; horizontal management panel, single sided, 1U, black
      b. #30130-719; horizontal management panel, single sided, 2U, black
      c. #11564-719; horizontal cable manager with ‘extra large’ rings, black
      d. #11564-519; horizontal cable manager with ‘extra large’ rings, clear
   2. Cooper / B-Line
      a. #SB87019S1FB; horizontal management panel, single sided, 1U, black
      b. #SB87019S2FB; horizontal management panel, single sided, 2U, black
      c. #SB814192X6FB; horizontal cable manager with ‘extra large’ rings, 2U, black
   3. Panduit
      a. #NCMH2; horizontal cable manager with removable hinged front cover, double sided, 2U
b. #NCMHF2; horizontal cable manager with removable hinged front cover, front only, 2U

c. #NCMHF1; horizontal cable manager with removable hinged front cover, front only, 1U

4. Or equal

2.8 CABLE RUNWAY

A. Cable Runway Straight Sections

1. Application: Suitable for the support & management of telecommunications (and other low voltage) cables, either overhead or mounted vertically on a wall, within Telecommunications Room. Also overhead equipment rack bracing.


3. Material (both stringer and rung): Steel tube, rectangular, 1-1/2” by 3/8” by 0.65” wall thickness.

4. Size: 9' 11-1/2” straight sections; width: refer to Drawings.

5. Manufacturers:

   a. CPI

      1) #10250-709; 9"W cable runway, black
      2) #10250-712; 12"W cable runway, black
      3) #10250-718; 18"W cable runway, black
      4) #10250-724; 24"W cable runway, black

   b. Cooper / B-Line

      1) #SB17U04BFB; 4"W cable runway, black
      2) #SB17U06BFB; 6"W cable runway, black
      3) #SB17U09BFB; 9"W cable runway, black
      4) #SB17U12BFB; 12"W cable runway, black
      5) #SB17U15BFB; 15"W cable runway, black
      6) #SB17U18BFB; 18"W cable runway, black
      7) #SB17U24BFB; 24"W cable runway, black
      8) #SB17U30BFB; 30"W cable runway, black
      9) #SB17U36BFB; 36"W cable runway, black

   c. Or equal

B. Cable Runway Sweep Fittings
1. Application: Suitable for the support & management of telecommunications cables, overhead.

2. Material (both stringer and rung): Steel tube, rectangular, 1-1/2" by 3/8" by 0.65" wall thickness.

3. Manufacturer:
   a. CPI
      1) #10822-709; horizontal sweep fitting for 9" wide cable runway, black
      2) #10822-712; horizontal sweep fitting for 12" wide cable runway, black
      3) #10822-718; horizontal sweep fitting for 18" wide cable runway, black
      4) #10723-709; vertical outside sweep fitting for 9" wide cable runway, black
      5) #10723-712; vertical outside sweep fitting for 12" wide cable runway, black
      6) #10723-718; vertical outside sweep fitting for 18" wide cable runway, black
      7) #10724-709; vertical inside sweep fitting for 9" wide cable runway, black
      8) #10724-712; vertical inside sweep fitting for 12" wide cable runway, black
      9) #10724-718; vertical inside sweep fitting for 18" wide cable runway, black
   
   b. Cooper / B-Line
      1) #SB130490HB12FB; horizontal sweep fitting for 4" wide cable runway, black
      2) #SB130690HB12FB; horizontal sweep fitting for 6" wide cable runway, black
      3) #SB130990HB12FB; horizontal sweep fitting for 9" wide cable runway, black
      4) #SB131290HB12FB; horizontal sweep fitting for 12" wide cable runway, black
      5) #SB131590HB12FB; horizontal sweep fitting for 15" wide cable runway, black
      6) #SB131890HB12FB; horizontal sweep fitting for 18" wide cable runway, black
      7) #SB130490VO12FB; vertical outside sweep fitting for 4" wide cable runway, black
      8) #SB130690VO12FB; vertical outside sweep fitting for 6" wide cable runway, black
      9) #SB130990VO12FB; vertical outside sweep fitting for 9" wide cable runway, black
      10) #SB131290VO12FB; vertical outside sweep fitting for 12" wide cable runway, black
      11) #SB131590VO12FB; vertical outside sweep fitting for 15" wide cable runway, black
      12) #SB131890VO12FB; vertical outside sweep fitting for 18" wide cable runway, black
      13) #SB130490VI12FB; vertical inside sweep fitting for 4" wide cable runway, black
      14) #SB130690VI12FB; vertical inside sweep fitting for 6" wide cable runway, black
      15) #SB130990VI12FB; vertical inside sweep fitting for 9" wide cable runway, black
16) #SB131290VI12FB; vertical inside sweep fitting for 12” wide cable runway, black
17) #SB131590VI12FB; vertical inside sweep fitting for 15” wide cable runway, black
18) #SB131890VI12FB; vertical inside sweep fitting for 18” wide cable runway, black
19) #SB132490VI12FB; vertical inside sweep fitting for 24” wide cable runway, black

c. Or equal

C. Cable Runway Installation Accessories

1. Application: Installation accessories for use with cable runway.
2. Refer to Drawings for additional information and instances for installation.
3. Manufacturer:
   a. CPI
      1) #11301-001; butt splice kit
      2) #10487-001; swivel butt splice kit
      3) #11313-001; 45-degree junction kit
      4) #11314-001; 90-degree junction kit
      5) #11302-001; junction splice (“T”) kit
      6) #10488-001; swivel junction splice (“T”) kit
      7) #10608-001; vertical wall bracket kit
      8) #10642-001; end caps
      9) #11421-709; wall angle support kit for 9” wide cable runway, black
     10) #11421-712; wall angle support kit for 12” wide cable runway, black
     11) #11421-718; wall angle support kit for 18” wide cable runway, black
     12) #11421-724; wall angle support kit for 24” wide cable runway, black
     13) #11312-712; triangle support kit for 9” and 12” wide cable runway, black
     14) #11312-718; triangle support kit for 12” and 18” wide cable runway, black
     15) #11770-709; end closing kit for 9” wide cable runway, black
     16) #11770-712; end closing kit for 12” wide cable runway, black
     17) #11770-718; end closing kit for 18” wide cable runway, black
     18) #11770-724; end closing kit for 24” wide cable runway, black
     19) #10595-712; rack-to-runway attachment kit, for 9” or 12” wide runway, black
     20) #10595-718; rack-to-runway attachment kit, for 18” wide runway, black
   b. Cooper / B-Line
      1) #SB6699¾x10½; grounding strap
2) # SB2107BZ; butt splice kit, black
3) #SB2110ABZ; adjustable butt splice kit, black
4) #SB2101ABZ; 90-degree junction splice kit, black
5) #SB2103ABZ; adjustable junction splice kit, black
6) #SB2116ABZ; support kit (for threaded rod), black
7) #SB2114AFB; vertical wall bracket kit, black
8) #SB2106AFB; vertical floor bracket (“foot”) kit, black
9) #SB21306KFB; triangle support kit for 4” - 6” wide cable runway, black
10) SB21312KFB; triangle support kit for 9” - 12” wide cable runway, black
11) #SB21318KFB; triangle support kit for 15” - 18” wide cable runway, black
12) #SB2127S06FB; center hung support kit for 4” - 6” wide cable runway, black
13) #SB2127S09FB; center hung support kit for 9” wide cable runway, black
14) #SB2127S15FB; center hung support kit for 12” - 15” wide cable runway, black
15) #SB2127S20FB; center hung support kit for 18” - 20” wide cable runway, black
16) #SB2127S24FB; center hung support kit for 24” wide cable runway, black
17) #SB213309FB; rack-to-runway attachment kit, for 6” - 9” wide runway, black
18) #SB213312FB; rack-to-runway attachment kit, for 9” - 12” wide runway, black
19) #SB213318FB; rack-to-runway attachment kit, for 15” or 18” wide runway, black
20) #SB21B; end cap
21) #SB210506FB; end closing kit for 6” wide cable runway, black
22) #SB210509FB; end closing kit for 9” wide cable runway, black
23) #SB210512FB; end closing kit for 12” wide cable runway, black
24) #SB210515FB; end closing kit for 15” wide cable runway, black
25) #SB210518FB; end closing kit for 18” wide cable runway, black
26) #SB210524FB; end closing kit for 24” wide cable runway, black
27) #SB212906FB; drop out kit for 6” wide cable runway, black
28) #SB212909FB; drop out kit for 9” wide cable runway, black
29) #SB212912FB; drop out kit for 12” wide cable runway, black
30) #SB212915FB; drop out kit for 15” wide cable runway, black
31) #SB212918FB; drop out kit for 18” wide cable runway, black
32) #SB212924FB; drop out kit for 24” wide cable runway, black

c. Or equal
2.9 POWER STRIPS

A. Vertical Power Strip

1. Application: Suitable for installation into equipment rack and/or cabinet for power distribution, and oriented vertically for a “0U” installation.

2. Input: 120V 20A, with a 6’ (minimum) long cord. Output: 12 NEMA 5-20R outlets (6” center-to-center spaced).

3. Metered


5. Manufacturer:
   a. Wiremold
      1) #V24GB606; Power strip, 20A, 12 outlet.
      2) #7712ULBC20R; 77” long, 12-plugs, non-switched power strip, 15’ cord with twistlock plug
   b. Cooper B-Line
      1) #VPS24602012S; vertical power strip, 20A, 15-foot input cord, 5-foot strip with 12 NEMA 5-20R outlets
   c. Or equal

2.10 UNINTERRUPTABLE POWER SUPPLY (UPS)

A. Application: Suitable for installation within an IT room (e.g., IDF), and for a 19” rack mounted installation.

B. UPS shall have 2,000 volt-amperes (2kVA) capacity.

C. Manufacturer:

   1. APC
      a. #SURTA2000RMXL; “SmartUPS RT” 2kVA

2.11 LABEL PLATES, FOR EQUIPMENT RACKS

A. Label plate shall be suitable to affix onto top angle of equipment rack or onto the top front of a frame/cabinet.

B. Label plate shall be 'engrave-able' stock melamine plastic laminate substrate.

C. Size (minimum): 1/2-inch high by 6 inches long by 1/16-inch thick.

D. Color: Black.

E. Lettering shall be white, engraved, 1/8-inch high.

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.
3.2 EXAMINATION AND PREPARATION

A. Prior to installation, verify equipment rooms are suitable for the construction scope of this section. Schedule work to prevent damage caused by other trades during the course of that other construction.

B. Prepare surfaces, such as floors, for permanent installation of products, such as racks.

3.3 INSTALLATION

A. Plywood Backboards

1. General
   a. Complete installation work in a neat, high quality manner and conform to all applicable federal, state and local codes, and all telephone standards.
   b. Replace or repair work completed by others that is defaced or destroyed by Work associated with installation of the plywood backboards. Contractor shall pay for the full cost of this repair/replacement.

2. Preparation
   a. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.
   b. Discard all units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

3. Plywood
   a. Install plywood in accordance with WIC Custom or Premium Quality Standard, as scheduled. Ensure work complies with applicable codes and recognized standards.
   b. Install plywood as indicated on Drawings to the dimensions shown. In lieu of no dimensions, install plywood from +0'-6" to +8'-6" above the finished floor.
   c. Install plywood plumb, level, true, and straight with no distortions. Shim as required using concealed shims.
   d. Trim plywood around electrical and telecommunications outlets.
   e. Install plywood such that the fire rating stamp is visible.
   f. Install plywood to a tolerance of 1/8 inch in 8 feet for plumb and level; and with 1/16 inch maximum offset in flush adjoining, 1/8 inch maximum offsets in revealed adjoining surfaces.

4. Fasteners
   a. Install plywood using bolts, concrete anchors, or other fasteners suitable for the purpose.
   b. Provide nails, screws, anchors and other anchoring devices of the type, size, material, and finish required for application/mounting substrate.
   c. Do not use aluminum fasteners.
   d. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
5. Painting
   a. Paint plywood backboards with a low-gloss, white (or similar bright color) paint.
   b. Mask the plywood’s fire rated symbol/stamp from the paint such that the symbol/stamp is still visible after painting.

6. Cleaning, Finishing, and Protection
   a. Cleaning: Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.
   b. Protection: Protect and maintain protection to ensure work will be without damage or deteriorating at time of acceptance.

B. Rack Bays

1. Equipment Racks
   a. Provide parts and accessories required to complete each rack. Completely assemble racks, according to manufacturer’s instructions.
   b. Anchoring/Bracing
      1) Use concrete anchors approved by structural engineer.
      2) Anchor racks to the structural floor at four points.
      3) Brace racks overhead to overhead cable support where shown on the Drawings.
      4) If required for seismic bracing, provide bracing devices (e.g., brackets, threaded rod with strut, etc.) attached to the wall or structure above using appropriate fasteners.

2. Vertical Management Sections
   a. Provide vertical management sections as shown on Drawings. If not shown, provide a default of one vertical management section between each rack and at either end of the bay.
   b. Bolt vertical management sections to the equipment racks at the points designed by the manufacturer and per the manufacturer’s installation instructions.

3. Tolerances:
   a. Equipment Rack: Verify dimensions to establish proper clearances as follows:
      1) Front: 40” clearance from channel’s front mounting flange.
      2) Back: 57” clearance from channel’s back mounting flange.
   b. Provide the correct amount of space between each rack for proper installation (according to manufacturer’s written instructions) of the vertical management sections.

4. Horizontal Management Panels
   a. Provide horizontal management panels as shown on Drawings. If not shown, provide one management panel above each patch panel and on below the bottom patch panel in each rack bay where patch panels occur.
   b. Provide fasteners and parts required to complete the installation.
5. **Accessories**
   a. Provide rack mounting screws – 1 bag of screws per rack, as come packaged with the rack product. Attach the screws directly to the rack (visible for the punch walk). This shall constitute turn-over to the Owner.

C. **Overhead Cable Support**
   1. Provide support devices (e.g., brackets and threaded rod with strut) for overhead cable management system; install per the manufacturer’s instructions and fastened to the wall or ceiling using appropriate fasteners.
   2. Provide parts required for complete installation (e.g., mounting brackets, splice kits, hardware, etc.).
   3. **Tolerances**
      a. Install overhead cable support centered over the equipment rack, or as shown on the Drawings.
   4. Interface with Other Work: Coordinate the installation of the overhead cable support with other trades. Trapeze supports and ‘hanger rods’ (“all-thread”), for example, may be shared to lower overall construction cost.

D. **Vertical Cable Support**
   1. Provide cable runway installed vertically at the locations as shown on the Drawings for use to support cables routing vertically within telecommunications rooms.
   2. Provide parts required for complete installation (e.g., vertical mounting brackets, bolts, etc.).
   3. When using cable runway, install the runway such that the rungs are facing outward (the greater distance from the rung to the stringer edge is facing inward).

E. **Vertical Power Strips in Cabinets/Frames**
   1. Provide two vertical power strips per equipment rack. Install the power strips at the back of the rack, one on each side. Provide fasteners and parts required to complete the installation.
   2. Route the input cords within designated cable management and provide cord fasteners to prevent movement of the input cord. Plug the input cord into the receptacle designated by the Owner / Owner’s Representative.

F. **UPSs in IDFs**
   1. Provide one UPS per IDF. Install the UPS at the bottom of the left-most rack. Provide fasteners and parts required to complete the installation.

3.4 **LABELING**

A. **General Requirements:** Labeling and identifier assignment shall conform to ANSI/TIA-606-B and as approved by Owner before installation.

B. **Equipment Rack Label Requirements:** Provide one label plate per rack and IT cabinet. Permanently affix label plate and position as shown on the Drawings; if not shown on the Drawings, center the label plate on the rack’s front top angle or the cabinet’s top front frame.
C. Identifier Assignment

1. Equipment Racks and IT Cabinets

   a. Prefix: “RACK” or “CABINET”

   b. First field: the room’s identifier; for example: “TR2.1”.

   c. Second field: the rack number (sequential numeral); for example: “01”.

   d. Example: “RACK TR2.1-01”

3.5 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION
SECTION 27 13 14
COMMUNICATIONS BACKBONE OSP TWISTED PAIR CABLING

PART 1 GENERAL

1.1 SUMMARY
A. Section Includes: Backbone OSP (outside plant) twisted pair cabling.

B. Related Sections
1. Comply with the Related Sections requirements of Section 27 00 00.
2. Section 27 08 11, “Communications Twisted Pair Testing”

1.2 REFERENCES
A. Comply with References requirements of Section 27 00 00.

B. In addition to the codes and standards listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
   a. UL 497, “Protectors for Paired-Conductor Communication Circuits”
   b. UL 497A, “Secondary Protectors for Communications Circuits”
   c. UL 497B, “Protectors for Data Communications and Fire-Alarm Circuits”
   d. UL 497C, “Protectors for Coaxial Communications Circuits”
   e. UL 1863, “Communications-Circuit Accessories”
   f. UL 1863, “Communications-Circuit Accessories”

2. Insulated Cable Engineers Association (ICEA)

3. Telcordia
   a. GR-421-CORE Issue 2, “Generic Requirements for Metallic Telecommunications Cables”

1.3 DEFINITIONS
A. Refer to Section 27 00 00 for Definitions.

B. In addition, define the following list of terms as used in this specification as follows:
1. “BEP”: Building Entrance Protection [systems]
2. “CMP”: Communications Media Plenum [NEC plenum rating]
3. “CMR”: Communications Media Riser [NEC riser/non-plenum rating]
4. “HDPE”: High Density Polyethylene
5. “ISP”: Inside Plant [cabling]
6. “LDPE”: Light Density Polyethylene
7. “OSP”: Outside Plant [cabling]
8. “PE”: Polyethylene
9. “PIC”: Plastic Insulated Conductor
10. “PVC”: Polyvinyl Chloride

1.4 SYSTEM DESCRIPTION

A. Work Provided Under Other Sections

1. Telecommunications Pathways
   a. Pathways (underground conduits, maintenance holes, pull boxes, pull ropes, etc.) will be provided under other Sections.
   b. Refer to the Drawings for size/capacity and route information.

2. Telecommunications Rooms
   a. Buildout (e.g., backboards, overhead and vertical cable runway, etc.) of the telecommunications rooms (MDF, BDFs, IDF) work will be covered under another Section.
   b. Refer to the Drawings for buildout information.

B. Base Bid Work

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications backbone twisted pair cabling system installation described in these specifications and shown on related Drawings.

2. The Drawings are diagrammatic in nature, and require shop drawings to complete the detailed design of the communications infrastructure.

3. Consider Backbone cabling as shown on Drawings as base bid work, unless otherwise noted. This includes terminations at both ends.

4. In general, the base bid work includes:
   a. Submittals
   b. Backbone outside plant (interbuilding) twisted pair (copper) cables and terminations
   c. Building entrance protection and terminal
   d. Splicing apparatus
   e. Cable management
f. Crossconnects

g. Cable identification tags and system labeling

h. Record Documents

i. Warranty

1.5 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 27 00 00.

B. Submittal Requirements Prior To Start Of Construction:

1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.

2. Sample Submittal, consisting of the following components:

   a. <sample products>.

3. Schedule Submittal, consisting of proposed schedule of Work. This schedule may be combined with the schedule developed for other Sections within Division 27.

4. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.

C. Submittal Requirements at Closeout:

   1. As-Built Drawings.

   2. Crossconnection records/cut sheets.

   3. O & M Manuals.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications

   1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be manufacturer certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 270000.

1.8 WARRANTY

A. The communications cabling system, as specified in this Section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA-568-C performance criteria for backbone cabling.
2.1 UNDERGROUND CABLES – DUCT/CONDUIT

A. Application:
   1. Cable shall be suitable for underground conduit installations.
   2. Each and every cable run shall be a continuous single cable, homogenous in nature. Splices are not permitted anywhere.
   3. Cable type shall be PIC twisted pair, filled core, with an “ALPETH” sheath and compatible with Bell System type “ANAA” or RDUP type “PE89-AL”.

B. Conductors:
   1. Solid, annealed copper, 22 AWG
   2. Fully insulated conductors consisting of an inner layer of expanded polyolefin, covered with an outer layer (skin) of solid polyolefin
   3. Conductors twisted into pairs. Twisted pairs are stranded into 25-pair bundles and into units (and super units, if required by pair count)
   4. Color Coding: Twisted pairs and units (supper units, if necessary) individually color-coded to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230)

C. Core & Sheath:
   1. Cable core shall have a tape applied longitudinally (wrapped around its entirety)
      a. Tape Material: non-hydroscopic dielectric (polypropylene) film, or equivalent
   2. Cable core and sheath flooded (interstices between the pairs and under the core tape) with filling compound to protect against moisture penetration
      a. Filling compound: 80°C ETPR compound, or equivalent
   3. Sheath Type: “ALPETH”. Sheath consists of a shield and an outer jacket
      a. Shield: Corrugated bare 8 mil aluminum tape applied longitudinally over the core wrap
      b. Outer Jacket: PE, black, with UV inhibitors, bonded to shield

D. Standards Compliance:
   1. Telcordia GR-421-CORE Issue 2
   2. RoHS-compliant

E. Manufacturers:
   1. General Cable
      a. #2036307; 25 pair, 22 AWG, filled core, ALPETH/ANAA
   2. Superior Essex
      a. #09-062-77; 25 pair, 22 AWG, filled core, ALPETH/ANAA

2.2 SPLICE CLOSURES AND ACCESSORIES

A. Splice Closure – Building Entrance Type
1. Application: Splice closure system shall be suitable for indoor installation within an entrance facility for splicing between OSP and ISP cable.

2. Closure:
   a. Re-enterable
   b. Through-splice or butt-splice configurations will be accepted.
   c. Solid sleeve, or slip sleeve acceptable.
   d. End caps shall accept eight single collared or having multiple holes.

3. Manufacturer:
   a. 3M Telecom Systems
      1) #5-26; solid closure, up to 600 pair,
      2) #5DS-26; split closure, up to 600 pair
      3) #C5-100-6; end caps (to be sized to cable entry and exits)
      4) #4460; shield bond connector for cables 100-pair or larger
      5) #4460-D; shield bond connector for cables 100-pair or smaller
      6) #25T ground braid or #25T ground braid with eyelets

B. Splice Closure – Underground Vault Type

1. Application: Splice closure system shall be suitable for outdoor installation within underground vault and/or maintenance hole.

2. Closure:
   a. Re-enterable
   b. Through-splice or butt-splice configurations will be accepted
   c. End caps that accept one cable per end / one incoming cable and two outgoing cables

3. Air and watertight closure system and RUS listed and UL approved

4. Manufacturer:
   a. 3M Telecom Systems
      1) “Better Buried” series gravity filled closures
      2) #4460; shield bond connector for cables 100-pair or larger
      3) #4460-D; shield bond connector for cables 100-pair or smaller
      4) #25T Ground Braid or #25T Ground Braid with Eyelets

C. Encapsulant

1. Application: Encapsulant shall be suitable for outdoor installation within underground splice closures (vault and/or maintenance hole).

2. Re-enterable encapsulant
3. Manufacturer:
   a. 3M Telcom Systems
      1) #4442; “High Gel” re-enterable encapsulant

2.3 SPLICE MODULES
A. Splice Module – 710 Dry Straight Type
   1. Application: Cable transition (OSP to ISP) in telecom rooms.
   2. Modules shall accept mixed solid wire gauges (26 AWG – 19 AWG) and mixed insulation types (PIC, PVC, pulp or paper) up to maximum insulation outside diameter of (.70).
   3. Manufacturer:
      a. 3M Telcom Systems
         1) #3M710-SD1-25; 25-pair 710 dry straight splicing module

B. Splice Module – 710 Filled Straight Type
   1. Application: In-line or branch splicing of OSP cables in underground vaults or manholes.
   2. Modules shall accept mixed solid wire gauges (26 AWG – 19 AWG) and mixed insulation types (PIC or PVC) up to maximum insulation outside diameter of (.70).
   3. Modules shall be ‘filled’ with water resistant compound.
   4. Manufacturer:
      a. 3M Telcom Systems
         1) #3M710-SC1-25; 25-pair 710 filled straight splicing module

2.4 BUILDING ENTRANCE PROTECTION
A. BEP Terminal – Swivel Stub Input, Swivel Stub Output
   1. Application: BEP terminal shall be suitable for indoor installation, within a telecom room (such as an Entrance Facility or ‘MPOE’). BEP terminals shall provide termination of the backbone twisted pair cables specified within this Section, shall protect premises equipment against induced voltages and stray currents, and shall accept ‘5-pin’ protector modules specified within this Section.
   2. Configuration: BEP terminal shall be designed for a wall-mounted configuration, and shall have the capacity to accept 100-pair incoming and outgoing pairs.
   4. Manufacturer:
      a. Circa
         1) #1900A1-100; 100-pair BEP terminal with swivel stub input and output

b. Or equal

2.5 LABELS
A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Cables
   1. Labels shall be adhesive-backed and have a self-laminating feature
   2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable’s jacket).
   3. Printable area should be 1 inch wide x 0.5 inch high, or larger
   4. Printable area color shall be white
   5. Manufacturer:
      a. Panduit
         1) #S200X400YAJ; labels for 25 to 100 pair cables [0.32” (8.09mm) - 0.95” (24.26mm) dia.]
         2) #S200X650YAJ; labels for 100 to 400 pair cables [0.48” (12.13mm) – 1.59” (40.43mm) dia.]
      b. Or equal

2.6 DUCT PLUGS
A. Plug shall create a watertight seal.
B. Manufacturer:
   1. Tyco
      a. #40S136S; simplex plug for 4-inch conduit, cable OD 1.19-1.36
      b. #40S196SB; simplex plug for 4-inch conduit, cable OD 1.38-1.96
      c. #40S256SB; simplex plug for 4-inch conduit, cable OD 1.92-2.56
      d. #40S291SB; simplex plug for 4-inch conduit, cable OD 2.56-2.91
      e. #40S327SB; simplex plug for 4-inch conduit, cable OD 2.91-3.27
      f. #40B167S; “triplex” plug for 4-inch conduit, with 3 ports
      g. #40Q136S; “quadplex” plug for 4-inch conduit with 4 ports
   2. Carlon
      a. #MATPG3; “triplex” duct plug for 4-inch conduit, with 3 ports (1.53”-1.67”)
   3. Or equal

PART 3 EXECUTION
3.1 GENERAL
A. Comply with the Execution requirements of Section 27 00 00.

3.2 EXAMINATION AND PREPARATION
A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the backbone twisted pair cables and terminations.

B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, “True Tape” the conduits).

C. Cable Integrity: Prior to installation, verify the twisted pair cable is fully operational – both cable sheath and twisted pair conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.3 INSTALLATION

A. OSP Interbuilding Backbone Cable

1. Cable runs shall have continuous sheath continuity, homogenous in nature, between either termination points or designated splices points. Only splices as noted on the Construction Documents are permitted.

2. Maximum cable length of 1,500 meters between termination points.

3. Placement
   a. Place cables within designated pathways.
   b. Maintain a minimum bend radius of 6 times the cable diameter during installation.
   c. Maintain pulling tension within manufacturer's limits. Only use UL approved cable-pulling compounds when necessary to reduce pulling tensions.
   d. Protect cable during installation. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cable if damaged during installation.
   e. Neatly dress and organize cables in the cable routing facilities, and fastened to support devices via tie wraps.
   f. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.

4. Routing:
   a. When routing horizontally within telecommunications rooms, utilize the overhead cable support; route backbone cables to avoid crossing over horizontal cabling or horizontal cabling crossing backbone cabling. When routing vertically within telecommunications rooms, utilize the vertical cable support and provide cable ties every 24 inches on center using.
   
   b. Route cables a minimum of 6" away from power sources to reduce interference from EMI.

5. Duct Plugs
   a. Provide duct plugs into each duct port in maintenance holes/pullboxes and building entrances.

6. Termination
a. Provide 15 feet cable slack loop at each end of the run. Store slack in overhead cable support or as noted on Drawings.

b. Properly strain relieve cables at designated points per manufacturer’s instructions.

c. Terminate copper pairs at both ends on the specified termination apparatus. Perform terminations in accordance with manufacturer’s instructions and ANSI/TIA-568-C standard installation practices.

7. Labeling

a. Provide labels on each end of the cable, no more than 4” from where the cable enters the specified termination apparatus.

b. Place labels such that they are visible by a technician from a normal stance.

B. Building Entrance Splicing Systems

1. Provide entrance splice system as shown on the Drawings, including closure, end caps, splice modules, grounding components, and accessories required for a complete installation. Install splice closure and splice modules per manufacturer’s instructions using tools intended for the purpose.

2. Size enclosure based on splice bundle diameter, and size ends caps based on largest cable.

3. Include required accessories, such as collars, grommets, bushings, bonding connectors, etc. for a complete installation.

4. Thoroughly clean and separate binder groups prior to installing splice modules.

5. Apply sealant (such as B-sealant) to the end of the cable where the pairs exit the cable sheath – this to prevent water-blocking gel from leaking out the cable’s sheath.

6. Provide labels on each splice module and binder group in splice closure.

7. Grounding and Bonding

a. Bond splice enclosure and cable shield to closet busbar using bonding conductor per manufacturer’s instructions and/or TIA-607 requirements.

b. Provide 6 AWG bonding conductor up to 25 feet in length; if longer than 25 feet, size bonding conductor as 1000 circular mils per foot.

8. Fill unused end cap entry holes with appropriate plug (intended for purpose).

9. Attach splice enclosure to vertical cable runway on wall with metal straps

C. Building Entrance Protection

1. Provide BEP system as shown on the Drawings, including terminals, modules, and accessories required for a complete installation. Install BEP per manufacturer’s instructions.

2. Install BEP terminals plumb and square, and at height shown on Drawings. If no height is shown, install such that bottom row is at 24” AFF (+/- 3”).

3. Grounding and Bonding
4. Bond BEP terminal to TMGB in accordance with NEC Article 800, and follow the installation requirements described in Article 800.

5. Provide 6 AWG bonding conductor up to 25 feet in length; if longer than 25 feet, size bonding conductor as 1000 circular mils per foot.

6. Labeling
   a. Provide and permanently affix label on the terminal’s cover.
   b. Provide label in the label holder at the terminal’s “outgoing” connection.

7. Provide quantity of protector modules to completely populate terminals.

D. Termination Apparatus

1. Install the termination apparatus such that the bottom row of terminations is at a height as shown on the Drawings. If no height is shown, install bottom at 24” AFF (+/- 3”).

2. Provide accessories required for a complete installation.

3. Mount blocks plumb and square.

E. Crossconnects

1. In the MDF, provide one 1-pair crossconnect to length from the equipment field to the backbone field based on the records from the IDF crossconnections.

2. Utilize the horizontal and vertical management components to properly route the crossconnect wire.

3. Color:
   a. For digital handsets, provide: White-Blue / Blue-White
   b. For analog handsets, provide: White-Red / Red-White.

4. Splices in crossconnect wire are prohibited.

3.4 LABELING

A. General Requirements

1. Labeling and identifier assignment and the label colors shall conform to the TIA/EIA-606-A Administration Standard and as approved by Owner or Owner’s Representative before installation.

2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Cable Labels

1. Label Format:
   a. Label type shall be wrap-around self-laminating.
   b. Label color shall be white background with clear laminating window.
   c. Text color shall be black; text height shall be 1/8” high, minimum, or #12 font size.
2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Protection and Termination Apparatus Labels
   a. Use labels included in the product packaging. Request approval by the Engineer for substitutions.
   b. Label color shall be brown for respective field type, per TIA/EIA-606-A.
   c. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment
   1. General: Separate label fields of the identifier with a hyphen.
   2. Cables
      a. The first field shall identify the cable type: “CBT” (for Cable, Backbone, Twisted pair).
      b. The second field shall identify the originating termination room identifier as shown on the plans; e.g., “MDF1.1”.
      c. The third field shall identify the ending termination room identifier as shown on the plans; e.g., “BDF2.1”.
      d. The fourth field shall identify the beginning and ending pair counts.
      e. Identifier Example: “CBT-MDF1.1-BDF2.1-0401-0600”
   3. Termination Positions on the BEP Terminal Cover
      a. The first field shall identify the opposite end’s room; for example “TO BDF2.1”.
      b. The second field shall identify the pair count range; for example, “0401-0500”
      c. Identifier Example: “TO BDF2.1 0401 - 0500”

3.5 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Remove and replace with new, at no cost to the Owner, cables or conductors failing to meet the indicated standards and not passing the testing requirements of Section 27 08 11. The Owner, or Owner’s Representative, will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the Owner or Owner’s Representative has approved any deviation from this requirement.

C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION
SECTION 27 13 24
COMMUNICATIONS BACKBONE OSP FIBER OPTIC CABLING

PART 1  GENERAL

1.1  SUMMARY

A. Section Includes:
   1. Backbone outside plant (OSP) fiber optic cabling

B. Related Sections
   1. Comply with the Related Sections paragraph of Section 27 00 00
   2. Section 27 08 21, “Communication Fiber Optic Testing”

1.2  REFERENCES

A. Comply with References requirements of Section 27 00 00.

B. In addition to the codes and standards listed in Section 270000, comply with the latest edition
   of the following applicable specifications and standards except as otherwise shown or
   specified:

   1. National Fire Protection Agency (NFPA)
      a. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and
         Cables for Use in Air-Handling Spaces”, 2007
   2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to
      the following standards:
      a. UL 1569, “Metal-Clad Cables”
      b. UL 1651, “Optical Fiber Cable”
      c. UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables
         Installed Vertically in Shafts”
   3. Insulated Cable Engineers Association (ICEA)
      a. ANSI/ICEA S-87-640-1999, “Fiber Optic Outside Plant Communications Cable”
   4. Telcordia
      a. GR-20-CORE, Issue 3, “Generic Requirements for Optical Fiber and Optical Fiber
         Cable”

1.3  DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this
   specification defined as follows:

   1. “HDPE”: High Density Polyethylene
2. “LDPE”: Light Density Polyethylene
3. “MDPE”: Medium Density Polyethylene
4. “MM”: Multimode [fiber type]
5. “OSP”: Outside Plant [cabling]
6. “PE”: Polyethylene
7. “SM”: Singlemode [fiber type]

1.4 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections

1. Pathways: The communications pathways (underground conduits, maintenance holes, pull boxes, innerducts, pull ropes, etc.) work will be covered under another Section. Refer to the Drawings for size/capacity and route information.

2. Rooms: Build out (e.g., backboards, overhead and vertical cable support, etc.) of the rooms (MDF, BDFs, IDFs) will be covered under another Section. Refer to the Drawings for build out information.

B. Base Bid Work

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications backbone fiber optic cabling system installation described in this Section and shown on related Drawings.

2. The Drawings are diagrammatic in nature, and require shop drawings to complete the detailed design of the telecommunications infrastructure.

3. Consider Backbone cabling, as shown on Drawings, as base bid work, unless otherwise noted, including terminations at both ends.

4. In general, the base bid work includes:
   a. Submittals
   b. Backbone outside plant (OSP) fiber optic cables and terminations
   c. Bonding (cable armor, termination apparatus, etc)
   d. Innerduct
   e. Cable management
   f. Crossconnections / patching.
   g. Cable identification tags and system labeling
   h. Record Documents
   i. Warranty

1.5 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 27 00 00.

B. Submittal Requirements Prior To Start Of Construction:
1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.

2. Sample Submittal, consisting of the following components:
   a. <sample products>
   b. Cable label

3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for Division 27.

4. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.

C. Submittal Requirements at Closeout:

1. Copy of the manufacturer’s printed reel documentation, including the following.
   a. Manufacturer’s reel number
   b. Manufacturer’s traceable batch number
   c. Length of the fiber cable on the reel
   d. Maximum attenuation
   e. Minimum bandwidth

2. As-Built Drawings

3. Crossconnection records/cut sheets

4. O & M Manuals

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications

1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be manufacturer certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.8 WARRANTY

A. The communications cabling system, as specified in this Section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover optical performance of cabling system.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Corning Cable Systems
B. Or Equal.

2.2 **SUBSTITUTIONS**
A. Comply with the Substitutions requirements of Section 27 00 00.

2.3 **FIBER OPTIC CABLE – UNDERGROUND DIELECTRIC**
A. **Application:**
   1. Cable shall be suitable for outdoor installations within underground pathways system and/or within innerduct/sub-ducting.
   2. Optical transmission performance shall not be significantly affected by environmental fluctuations, installation, or aging.
   3. Materials shall not evolve hydrogen in quantities that will increase light attenuation.
B. Singlemode fiber strands shall meet or exceed the following geometry criteria:
   1. Core diameter = 8.3 $\mu$m.
   2. Mode field diameter = 8.8 $\mu$m, ±0.5 $\mu$m.
   3. Cladding diameter = 125 $\mu$m, ±1.0 $\mu$m.
   4. Core/Cladding Concentricity = $\leq$ 0.8 $\mu$m.
   5. Minimum Tensile Strength = 100,000 psi.
C. Singlemode fiber strands shall meet or exceed the following performance criteria:
   1. Attenuation = 0.4 dB/km at 1310 nm and 0.3 dB/km at 1550 nm wavelengths, maximum.
   2. Cutoff wavelength = 1260 nm.
   3. Dispersion = 3.5 ps/nm•km at 1285-1330 nm.
   4. Singlemode fiber shall meet the specifications of the following:
D. **Buffering:**
   1. Fibers shall be loosely buffered, either in a core tube or in multiple tubes around a central member.
   2. Buffer tube/tubes shall be filled with compound to protect against moisture penetration. Filling compound: “FLEXGEL”, or equivalent.
E. **Sheath:**
   1. Sheath shall consist of a strength member and an outer jacket, with non-metallic component dielectric sheath.
2. Strength Member: Aramid yarn (e.g., Kevlar®), or reinforced fiberglass rods.

3. Jacket: PE (MDPE or HDPE).

4. Rated tensile load: 600 lb. maximum rated load.

5. Operating Temperature Range: -40 to 158°F (-40 to 70°C)

F. Manufacturer:

1. Corning Cable Systems
   a. #012EW4-T4101D20; “ALTOS” gel-free sheath / outdoor cable, 12-strand singlemode
   2. Or equal.

2.4 FIBER OPTIC PATCH PANELS

A. Application:

1. Fiber optic patch panels shall be an enclosed housing for protecting, storing and organizing the termination of fiber cable(s) and fiber strands, shall provide means to strain relieve and support of the specified cables, shall contain facilities to store fiber slack, and shall provide patch cord management.

2. Fiber optic patch panels shall be passive physical equipment and apparatus used in terminating, interconnecting, and cross-connecting fiber optic cabling, shall possess a minimum fire resistant rating of UL94V-1, and shall conform to existing OSHA Health and Safety Laws.

3. Fiber optic patch panels shall be <rack-mountable><wall-mountable>.

B. Fiber optic patch panels shall come equipped with safety labels such as laser identification or warning labels as required by system considerations.

C. Manufacturer:

1. Corning Cable Systems
   a. #CCH-01U; “Connector Closet Housing” type patch panel, 1U, holds 2 adapter modules
   b. #CCH-CP12-A9; Adapter Module e/w 6 duplex SM LC blue adapters
   c. #CCH-CP06-59; Adapter Module e/w 6 SM SC blue adapters
   d. #CCH-CP06-19T; Adapter Module e/w 6 SM ST blue adapters
   2. Or equal.

2.5 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Cables

1. Labels shall be adhesive-backed and have a self-laminating feature

2. Labels shall fit the backbone cables listed above (i.e., shall fully wrap around the cable’s jacket).
3. Printable area should be 1 inch wide x 0.5 inch high, or larger
4. Printable area color shall be white
5. Manufacturer:
   a. Panduit
      1) #S200X225YAJ; labels cables 0.24” (6.06mm) - 0.48” (12.13mm) dia.
      2) #S200X400YAJ; labels for cables 0.32” (8.09mm) - 0.95” (24.26mm) dia.
      3) #S200X650YAJ; labels for cables 0.48” (12.13mm) - 1.59” (40.43mm) dia.
   b. Or equal

2.6 MISCELLANEOUS

A. Breakout Kits
   1. Application: for loose buffer cables, kit to furcate coated fibers from buffer tube in preparation for “direct connectorization” type termination.
   2. Manufacturer:
      a. Corning Cable Systems
         1) #FAN-BT25-12; “Buffer Tube Fan-Out Kit”, for 12 fibers/tube, 25” tubing
         2) #FAN-BT36-12; “Buffer Tube Fan-Out Kit”, for 12 fibers/tube, 36” tubing
         3) #FAN-BT47-12; “Buffer Tube Fan-Out Kit”, for 12 fibers/tube, 47” tubing
      b. Or equal

B. Fiber Slack Storage Reel: Leviton #48900-OFR, or equal

C. Velcro Cable Ties
   1. Width: .75”.
   2. Color: Velcro cable ties, same color as the cable to which it is being applied.
   3. Manufacturers:
      a. Panduit
         1) #HLS-15R-0 Black, 15’ roll, cut to length
      b. Or equal

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.2 EXAMINATION AND PREPARATION
A. Pathways: Prior to installation verify that duct banks, ducts, maintenance holes, pullboxes, and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, “True Tape” the conduits).

B. Rooms: Prior to installation, verify equipment rooms are ready for cables and terminations.

C. Prior to installation, verify cables and conductors are fully operational – both cable sheath and fiber strands. Pre-installation testing is the responsibility of the Contractor, though documentation of pre-installation testing is not a close out requirement.

3.3 INSTALLATION

A. Backbone Cable Installation and Routing

1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere, unless expressly shown on the Drawings or approved in writing by the Engineer prior to installation.

2. Placement

   a. Install cables within designated pathways. Place OSP cables in innerduct between points of termination throughout entire length (except at the fiber take up reel).

   b. Maintain a minimum bend radius of 20 times the cable diameter during installation, and a minimum bend radius of 10 times the cable diameter after installation.

   c. Maintain pulling tension within manufacturer's limits. Use a pulling tension meter when using mechanical assistance during installation. Record maximum pulling tension for each cable run, and submit to the Engineer for review if requested. Replace runs when manufacturer's maximum pulling tension is exceeded.

   d. Place and suspend cables in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation.

   e. Only use UL approved cable-pulling compounds when necessary to reduce pulling tensions.

   f. Provide 20 to 30 feet (minimum) cable slack at each end within the Telecommunications Rooms; store slack in fiber slack storage reel mounted on the wall.

   g. Place a pull rope along with cables where run in pathways (e.g., conduit) and spare capacity in the pathway remains. Tie off ends of the pull rope.

3. Routing

   a. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via tie wraps or Velcro-type straps.

   b. Within Telecommunications Rooms, neatly dress and organize cables on designated cable support apparatus (for example, overhead cable tray or vertical cable runway), and fasten cables to cable support apparatus via tie wraps or Velcro-type straps.

4. Termination

   a. Properly relieve strain from cables at termination points (at/within the fiber optic termination panels) per manufacturer’s instructions.
b. Bond cable armor to grounding point (busbar) – refer to section 270526 for additional information.

c. Provide breakout kits to furcate fibers from buffer tubes.

d. Terminate/connectorize fiber strands at both ends using the specified fiber optic connectors appropriate for the mode type of the fiber. Perform terminations in accordance with manufacturer’s instructions.

e. Provide required accessories and consumables for complete termination of fiber strands.

f. Provide 3 feet of unsheathed fiber (including buffer tube and broken out from the buffer tube) slack within the patch panel/termination enclosure at each end of the link. Properly store fiber slack in rear of patch panel into the ‘routing rings’, per manufacturer’s instructions. Include ‘extension’ slack loop/fold in the rear of the shelf to allow for the drawer to be pulled out without putting tension on the fibers.

B. Fiber Optic Cable Termination Panel

1. Provide fully assembled termination panel in designated equipment rack; locate per Drawings (if not shown, locate at the top). “Fully assembled” includes installation and mounting components and accessories such as adapter panels, coupling adapters, etc. required for operation.

2. Provide accessories required for proper installation of each termination panel, including connector panels and adapters.

3. Bond termination apparatus to grounding point (busbar) – refer to section 270526 for additional information.

3.4 LABELING

A. General Requirements

1. Labeling, identifier assignment, and the label colors shall conform to the TIA/EIA-606-A Administration Standard and as approved by Owner or Owner’s Representative before installation.

2. Provide permanent and machine generated labels; hand written labels will not be accepted.

B. Cable Labels

1. Label Format:

   a. Label type shall be wrap-around self-laminating.

   b. Label color shall be white background with clear laminating window.

   c. Text color shall be black; text height shall be 1/8” high, minimum, or #12 font size.

2. Provide labels on both ends of cables. Fully wrap label around the cable jacket. Install labels no more than 4 inches from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

C. Termination Apparatus Labels
1. Use labels included in the product packaging. For substitutions, request approval by the Engineer.

2. Label color shall be brown for respective field type, per TIA/EIA-606-A.

3. Text color shall be black, 3/32" high, minimum, or #10 font size.

D. Identifier Assignment

1. General: Separate all label fields of the identifier with a hyphen.

2. Backbone OSP Fiber Optic Cables
   a. The first field shall identify the cable type: “CBF” (for Cable, Backbone, Fiber optic).
   b. The second field shall identify the originating termination room identifier as shown on the plans; e.g., “MDFA.1”.
   c. The third field shall identify the ending termination room identifier as shown on the plans; e.g., “BDF1.1”.
   d. The fourth field shall identify the type and number of strands; for example, “Mxxx” where “M” stands for multimode and xxx stands for the ending fiber strand sequential count.
   e. Identifier Example: “CBF-MDFA.1-BDF1.1-M145-M192”

3. Termination Positions at the Termination Panels
   a. Make the first field of the identifier the destination room; for example “TO IDF2.2”.
   b. Make the second field of the identifier the strand count range; for example, “M025-M048”
   c. Identifier Example: “TO BDF1.1 M145-M192”.

3.5 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Remove and replace with new, at no cost to the Owner, cables or conductors failing to meet the indicated standards and not passing the testing requirements of Section 27 08 21. The Owner, or Owner’s Representative, will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the Owner or Owner’s Representative has approved any deviation from this requirement.

C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION
SECTION 27 15 13
COMMUNICATIONS HORIZONTAL TWISTED PAIR CABLING

PART 1  GENERAL

1.1  SUMMARY

A. Section Includes: Horizontal Twisted Pair Cabling (subsystem of Telecommunications Cabling Infrastructure)

B. Related Sections

1. Comply with the Related Sections requirements of Section 27 00 00
2. Section 27 08 11, “Communication Twisted Pair Testing”
3. Section 27 13 13, “Communication Backbone Twisted Pair Cabling”

1.2  REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In addition to the codes and standards listed in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. National Fire Protection Agency (NFPA)

2. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
   a. UL 444, “Communications Cables”
   b. UL 497, “Protectors for Paired-Conductor Communication Circuits”
   c. UL 1581, “Reference Standard for Electrical Wires, Cables, and Flexible Cords”
   d. UL 1666, “Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts”
   e. UL 1863, “Communications-Circuit Accessories”
   f. UL 2024A, “Optical Fiber Cable Routing Assemblies”

3. Insulated Cable Engineers Association (ICEA):
   a. ANSI/ICEA S-90-661-2008, “Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cable for Use in General Purpose and LAN Communication Wiring Systems”


4. Telcordia
   a. GR-111, “Generic Requirements for Thermoplastic Insulated Riser Cable”

1.3 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition, define the following list of terms as used in this specification as follows:

1. “CAT3”: Category 3 [UTP] performance grade


3. “Channel”: End to end transmission path; e.g., the entire portion of the horizontal cabling to each outlet consisting of the Permanent Link, line cord (at the workstation), patch cord, and, if a full crossconnection is implemented, the crossconnect termination/connecting apparatus and equipment cord.

4. “CMP”: Communications Media Plenum [NEC plenum rating]

5. “CMR”: Communications Media Riser [NEC riser {non-plenum} rating]

6. “FEP”: Fluorinated Ethylene Propylene

7. “FTP”: Foiled Twisted Pair

8. “PE”: Polyethylene

9. “Permanent Link”: Test configuration for a horizontal cabling link excluding patch cords, equipment cords, and line cords; e.g., the ‘permanent’ portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in the telecommunications and the connector at the outlet.

10. “PVC”: PolyVinyl Chloride

11. “UTP”: Unshielded Twisted Pair

1.4 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections

1. Pathways: The communications pathways (basketway, conduits, stubs, etc.) work will be covered under another Section. Refer to the contract drawings for size/capacity and route information.

2. Rooms: Build out (e.g., backboards, overhead and vertical cable runway, etc.) of the telecommunications rooms will be covered under another Section. Refer to the contract drawings for build out information.

3. Connecting Media: Patch cords in the IDFs between horizontal field and network equipment (e.g., access switch.), patch/line cords at the work areas between outlet and user equipment (e.g., phone, computer, etc)
B. Base Bid Work

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working communications Horizontal Twisted Pair Cabling System installation described in this Section and shown on related drawings. Consider Horizontal Cabling as shown on contract drawings as base bid work, unless otherwise noted. This includes terminations at both ends.

2. In general, the base bid work includes:
   a. Submittals
   b. Horizontal cables, terminations, and outlets
   c. Cable management
   d. Patch cords and crossconnections
   e. Cable identification tags and system labeling
   f. Record Documents
   g. Warranty

C. Jack Wiring: T568A.

1.5 SUBMITTALS

A. Comply with the Submittals article of Section 27 00 00 for procedural, quantity, content, and format requirements.

B. Substitutions

1. Conform to substitutions requirements and procedure in Section 27 00 00.

C. Submittal Requirements at Start Of Construction:

1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.

2. Sample Submittal, consisting of the following components:
   a. Type “A” Outlet Sample – one fully configured outlet including faceplate, modular jacks, and label
   b. Cable Label Sample

3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for 27xxxx series Sections

4. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations

D. Submittal Requirements at Closeout:

1. As-Built Drawings

2. Cable ID –to– Office Number Key: Submit a “cable ID-to-Office number key” as an electronic file in an MS-Excel spreadsheet file format containing a list of every cable identifier associated with the final office number
3. Crossconnection records/cut sheets

4. O & M Manuals

E. Posted Documentation

1. Post one full size plot of as-built drawings, specifically the floor plans and (as applicable) reflected ceiling plans, within IDF’s such that show the IDF’s serving area. Coordinate location with Owner.

1.6 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications

1. In addition to the Contractor Qualifications requirements of Section 270000, the Contractor shall be certified by the manufacturer to provide the cabling system (proposed, submitted, and approved) and to provide an extended warranty. Submit satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Delivery, Storage and Handling requirements of Section 270000.

1.8 WARRANTY

A. The horizontal cabling system, as specified in this section, shall carry a 15-year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA/EIA-568-C performance criteria for horizontal cabling.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. CommScope SYSTIMAX cabling system

B. Panduit cabling system

C. Berk-Tek (cable) and Leviton (connectivity) cabling system

2.2 SUBSTITUTIONS

A. Comply with the Substitutions requirements of Section 27 00 00.

2.3 HORIZONTAL CABLE – CAT6A PLENUM (CMP) RATED

A. Application: Suitable for indoor installation, within ceiling space in primary and secondary pathways, within access/raised floor space.

B. Conductors:

1. Insulated Conductors: 23 AWG solid copper, fully insulated with a flame retardant thermoplastic material (material = FEP, or equivalent).

C. Cable Sheath:

1. Outer Jacket: seamless outer jacket (material = LS-PVC, or similar) applied to and completely cover the internal components (twisted pairs).

2. Flame Rating: NEC (Article 800) rated as CMP, and UL listed as such.

D. Electrical Performance: Meet or exceed TIA/EIA-568-C.2, ISO 11801 Class E Edition 2.1, and IEEE Std. 802.3an channel requirements for supporting 10GBASE-T.

E. Manufacturer:

1. Belden
   a. #10GX33 D151000; CAT6A 4 pair UTP cable “10GX” bonded, CMP, blue

2. CommScope SYSTIMAX
   a. #2091 004 ABL 4/23 R1000; CAT6A 4 pair UTP cable “GigaSPEED X10D”, CMP, blue

3. Panduit
   a. #PUP6X04BU-U; CAT6A 4 pair UTP cable “10Gig”, CMP, blue

4. Superior Essex
   a. #6H-272-2B; CAT6A 4 pair UTP cable “10Gain XP”, CMP, blue

2.4 MODULAR PATCH CORDS – CAT6A RATED

A. Application: Suitable for indoor installation within a telecommunications room or workstation environment.

B. Cords shall be factory-assembled from a single, continuous length (no splices permitted) of cordage, homogenous in nature, and terminated at both ends via 8 position modular plugs.

C. Cordage

1. Insulated Conductors: 23 AWG stranded copper, fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).

2. Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair), and individually color coded.

3. Unshielded sheath and flame-retardant polyvinyl chloride (PVC) jacketed.

4. Flame Rating: NEC CM (or higher) rated, and UL listed as such.

D. Electrical Performance: Meet or exceed ANSI/TIA-568-C.2 and ISO/IEC 11801 requirements for CAT6A UTP cabling.

E. Length: Refer to Outlet Schedule for length requirements.

F. Manufacturer:

1. Belden
a. 10GX series patch cords, bonded 4-pair, 24 AWG solid

2. CommScope
   a. GS10E “SYSTIMAX X10D” series patch cords

3. CommScope SYSTIMAX
   a. #CPC7G1-02F005; “SYSTIMAX X10D” CAT6A modular patch cord (GS10E series), 5 feet, light blue
   b. #CPC7G1-02F007; “SYSTIMAX X10D” CAT6A modular patch cord (GS10E series), 7 feet, light blue
   c. #CPC7G1-02F010; “SYSTIMAX X10D” CAT6A modular patch cord (GS10E series), 10 feet, light blue

4. Panduit
   a. #UTP6X 7Y; CAT6A modular patch cord, 7 feet, off white
   b. #UTP6X 10Y; CAT6A modular patch cord, 10 feet, off white

2.5 TERMINATION APPARATUS – MODULAR PATCH PANEL, CAT6A RATED

A. Application: Panels shall be suitable for installation within a telecommunication room (IDF) for the termination of the horizontal cables specified herein. Panels shall be horizontally oriented for a rack-mounted configuration. Panels shall be capable of supporting, organizing, labeling and patching/ crossconnecting between the horizontal termination field and the equipment termination field.

B. Modular patch panel shall have 110-type termination, and shall be compatible with the specified horizontal cables both electrically and physically.

C. Mechanical Performance: Each port shall be an 8-position modular jack, compliant to ANSI/TIA-568-C.2 (2.5.7).

D. Electrical Performance: Each port shall meet or exceed TIA/EIA-568-C.2 6.8 and ISO/IEC 11801 requirements for CAT6A UTP cabling through the cable termination and patch cord connection.

E. Manufacturer:
   1. CommScope
      a. #1100AGS5-48; CAT6A modular patch panel “GigaSPEED X10D”, angled, 48 ports
   2. Leviton
      a. #6A587-U48; CAT6A modular patch panel “eXtreme 6A”, angled, 48 ports
   3. Ortronics
      a. #OR-PHA610U48; CAT6A modular patch panel “Clarity10G”, angled, 48 ports
   4. Panduit
      a. # DPA246X88TGY; CAT6A modular patch panel “DP6 10Gig”, angled, 48 ports
      b. # DPA486X88TGY; CAT6A modular patch panel “DP6 10Gig”, angled, 48 ports
2.6 MODULAR CONNECTOR / 8-POSITION JACK – CAT6A RATED

A. Application: Modular connectors (jacks) for termination of 4-pair UTP cables; modular connectors shall be compatible with the 4-pair cables specified herein this section both electrically and physically.

B. Mechanical Performance: Modular jacks shall be 8-position, compliant to ANSI/TIA-568-C.2.

C. Electrical Performance: Each jack shall meet or exceed TIA/EIA-568-C.2 and ISO/IEC 11801 requirements for CAT6A UTP cabling.

D. Manufacturer:
   1. CommScope
      a. #MGS500BH-318; CAT6A 8-position “GigaSpeed X10D” jack, blue
   2. Leviton
      a. #6A10G-RL6; CAT6A modular connector/jack, “eXtreme 6A”, blue
   3. Ortronics
      a. #OR-TJ610-36; CAT6A modular connector/jack, “TracJack” “Clarity10G”, flat, blue
   4. Panduit
      a. #CJ6X88TGBU; CAT6A 8-position jack “Mini-Com” series “TX6 10Gig”, Blue

2.7 WORK AREA OUTLETS

A. Faceplates for Standard Flush-Mount Outlets

   1. Application: Faceplates shall be suitable for indoor installation for standard 1-gang and 2-gang flush-mount devices.

   2. Faceplates shall have 2, 3, 4, or 6 ports, and shall include required accessories, such as icons, blank inserts, label windows and labels.

   3. Color: Refer to Telecommunications Device/Outlet Schedule.

   4. Manufacturer:
      a. Belden
         1) #AX102250; faceplate, 1-gang, 6 port, almond
         2) #AX102251; faceplate, 1-gang, 6 port, electrical white
         3) #AX102670; faceplate, 2-gang, 6 port, almond
         4) #AX102671; faceplate, 2-gang, 6 port, electrical white
      b. Belden
         1) #AX102010; faceplate, 1-gang, 6 port, stainless steel
         2) #AX102012; faceplate, 2-gang, 6 port, stainless steel
      c. CommScope
1) #M16LE-003; faceplate, 1-gang, 6 port, Black
2) #M16LE-215; faceplate, 1-gang, 6 port, Creme
3) #M16LE-246; faceplate, 1-gang, 6 port, Ivory
4) #M16LE-262; faceplate, 1-gang, 6 port, White
5) #M16LE-270; faceplate, 1-gang, 6 port, Gray
d. Ortronics Stainless steel “TracJack” series faceplates
   1) #OR-403STJ16; faceplate “TracJack” series, 1-gang, 6 positions, fog white

B. Faceplate for Wall Phone Outlets
   1. Application: Faceplates shall be suitable for indoor installation for standard 1-gang flushmount device equipped with 1 modular jack and two mounting studs for standard wall-mount telephones.
   2. Faceplates shall include required accessories, such as icons, blank inserts, label windows and labels.
   3. Color: Refer to Telecommunications Device/Outlet Schedule.
   4. Manufacturer:
      a. Belden
         1) #AX104126; wall phone faceplate, stainless steel
         2) #AX102902; wall phone faceplate, electrical white, recessed port
      b. CommScope SYSTIMAX
         1) #M10LW-148; wall phone faceplate, Almond
         2) #M10LW-246; wall phone faceplate, Ivory
         3) #M10LW-262; wall phone faceplate, White
      c. Panduit
         1) #KWP6P, wall phone faceplate, stainless steel, with CAT6 jack

C. Surface Outlets
   1. Application: Surface outlets shall be suitable for indoor installation for surface-mount device and shall be fully compatible with the specified modular connectors/jacks.
   2. Refer to Telecommunications Device/Outlet Schedule
   3. Manufacturer:
      a. CommScope
         1) #M101SMB-B-262; surface outlet box, 1 port, White
         2) #M102SMB-B-262; surface outlet box, 2 ports, White

2.8 LABELS
A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Labels for Horizontal Cables
   1. Adhesive backed labels and self-laminating feature.
   2. Fit the horizontal cables listed above (i.e., shall fully wrap around the cable’s jacket).
   3. Size: 2”x.05” printable area, minimum
   4. Color: white
   5. Manufacturer:
      a. Panduit
         1) #S100X150YAJ; labels for cable diameters 0.16”-0.32”, white, desktop printer (laser or ink jet)
      b. Or equal

2.9 MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties
   1. Width: .75”.
   2. Color: Velcro cable ties the same color as the cable to which it is being applied.
   3. Manufacturers:
      a. Panduit “Tak-Ty” series cable ties
      b. Panduit
         1) #HLS-15R-0; black, 15’ roll, cut to length.
      c. Or Equal

B. Plenum Cable Ties
   1. Application: for use in plenum or air handling spaces
   2. Color: maroon or other distinctive non-white color
   3. Manufacturer:
      a. Panduit
         1) #PLT1M-xxxx
         2) #PLT2S-xxxx
         3) #PLT3S-xxxx
      b. Or equal.

PART 3 EXECUTION

3.1 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.
3.2 EXAMINATION AND PREPARATION

A. Rooms: Prior to installation, verify equipment rooms are suitable to accept the horizontal cables and terminations.

B. Pathways: Prior to installation verify that pathways and supporting devices, provided under other sections, are properly installed, and that temporary supports, devices, etc., have been removed. Verify dimensions of pathways, including length (for example, “True Tape” the conduits).

C. Cable Integrity: Prior to installation, verify the cable’s integrity – both sheath and conductors. Documentation of pre-installation testing is not a close out requirement, and is the responsibility of the Contractor.

3.3 INSTALLATION

A. Cable Installation and Routing

1. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.

2. Place cables within designated pathways, such as cable tray, basketway, cable hangers, etc. Do no fasten (such as with cable ties) or attach cables to other building infrastructure (such as ducts, pipes, conduits, etc), other systems (such as ceiling support wires, wall studs, etc), or to the outside of conduits, cable trays, or other non-approved pathway systems.

3. Place and suspend cables and conductors during installation and termination in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.

4. Maintain minimum cable length of 15 meters from the termination in the IDF to the termination at the user’s faceplate (permanent link).

5. No cable length shall exceed 90 meters from the termination point in the IDF to the termination point at the work area (permanent link).

6. Route cables at 90-degree angles, allowing for bending radius, along corridors for ease of access.

7. Do not exceed manufacturer's limits for pulling tension.

8. Do not use cable-pulling compounds for indoor installations.

9. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.

10. Route cables under building infrastructure (such as ducts, pipes, conduits, etc); Do not route cables over building infrastructure. The installation shall result in easy accessibility to the cables in the future.

11. Place cables 6”, minimum, away from power sources to reduce interference from EMI.

12. Place a pull string along with cables where run in pathways and spare capacity in the pathway remains. Tie off ends of the pull string (to prevent the string from falling into the conduit).
13. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via approved ties.

14. When exiting the primary pathway (such as basketway or cable tray) to the work area, exit via the top of the pathway. Secure the cables to the pathway using an approved cable tie.

**B. Cable Routing and Dressing within the IDF**

1. Place cables within the overhead cable support and, when routing vertically, fasten the cables onto wall-mounted vertical cable support every 24 inches on-center using cable ties.

2. At the rack bay, route cables into the back of the vertical management sections (do not route cables into the front as this space is reserved for patch cords only). Divide the cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. Dress and cut cables to length required to reach the designated termination point with no excess cable and slack left in the horizontal cable manager, vertical cable manager, and overhead cable support.

3. Provide 10-15 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack in the overhead cable support.

**C. Termination in the IDF**

1. Provide termination apparatus and accessories required for a complete installation. Install and assemble termination apparatus, accessories and associated management apparatus according to the manufacturer’s instructions.

2. Properly strain relieve cables to and at termination points per manufacturer’s instructions.

3. Terminate cables and twisted pairs in accordance with manufacturer’s latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate cable pairs onto the termination apparatus. Terminate twisted pairs compliant to ANSI/TIA-568-C.0 and wired per 1.04 System Description.

4. **Modular Patch Panels and Horizontal Management Panels**
   a. Provide quantity of modular patch panels to support termination of cables served from respective IDF. Provide quantity of horizontal management panels based on the quantity of patch panels.
   
   b. Install and assemble modular patch panels and horizontal management panels according to the manufacturer’s instructions.
   
   c. Install the patch panels and the horizontal management panels as shown on the contract drawings. If configuration is not shown, install the patch panels in association with the horizontal management panels such that a management panel is mounted above and below given patch panel.

5. **Termination Sequence**
   a. Terminate the cables in sequential order using the link’s identifier starting at the top left and completing a panel before moving to the next panel below.

**D. Cable Routing and Dressing at the Work Areas**
1. Provide 2-4 feet, minimum, sheathed cable slack – length not to exceed permanent link maximum length requirement. Place the slack within ceiling space neatly on a cable hanger.

E. Termination at the Work Areas

1. Provide device components, connectors, and accessories required for a complete installation. Install and assemble connectors, jacks, adapters, termination apparatus, accessories and associated management apparatus according to the manufacturer’s instructions.

2. Provide six inches, minimum, sheathed cable slack behind each workstation outlet faceplate. Coil the slack cable inside the raceway, within the wall, or in the junction box (if used), per the cabling manufacturer's installation standards.

3. Type “A” Wall-Mount Faceplates
   a. Install devices at heights shown on the contract drawings. If no heights are shown, install at 24” AFF on center (+/- 3”).
   b. Mount faceplates plumb, square, and at the same level as adjacent device faceplates.
   c. Patch gaps around faceplates so that faceplate covers the entire opening.

4. Type “B” Furniture-Mount Faceplates
   a. Coordinate installation of faceplate adapters with the furniture contractor, including color.
   b. Mount faceplate adapters into the designated opening for telecommunications cabling.

5. Terminate cables and twisted pairs in accordance with manufacturer’s latest installation requirements and ANSI/TIA-568-C.0 standard installation practices. Terminate twisted pairs compliant to ANSI/TIA-568-C.0 and wired per 1.04 System Description.

F. Perform post-installation testing as described in the Telecommunication Testing specification (refer to Section 27 08 11). Replace terminations and connectors not passing the required media test.

G. Patching and Crossconnecting

1. In IDFs, provide modular patch cords as shown on contract drawings for network service. If not shown, provide one modular patch cord per complement/device; install between the network switch and the horizontal field. Neatly dress patch cords within the horizontal and vertical management components. Store cord slack within the vertical management section.

3.4 LABELING

A. General Requirements

1. Labeling, identifier assignment, and label colors shall conform to ANSI/TIA/EIA-606-A Administration Standard and as approved by the Owner before installation.

2. Permanent labels with machine-generated text (hand written labels will not be accepted).

B. Label Formats

1. Horizontal Cable Labels
a. **Text Attributes**: Black, 1/8" high, minimum, or #12 font size.

b. Install labels on both ends of cables no more than 4" from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.

2. **Patch Panel Labels**
   a. Use modular patch panel labels included in the product packaging. Request approval by the Engineer for other labels.
   b. Use a label color for the respective field type, per TIA/EIA-606.
   c. **Text Attributes**: Black, 3/32" high, minimum, or #10 font size.

3. **Termination Block Labels**
   a. Use labels included in the product packaging. Any deviation from this requirement must be approved in writing by the Owner.
   b. Use a label color for the respective field type, per TIA/EIA-606-A.
   c. **Text Attributes**: Black, 3/32" high, minimum, or #10 font size.

4. **Outlet Labels**
   a. Use outlet labels included in the product packaging. Any deviation from this requirement must be approved in writing by the Owner.
   b. **Label Background**: White.
   c. **Text Attributes**: Black, 1/8" high, minimum, or #12 font size.
   d. Install label in the top label window. Leave the bottom label window blank.

C. **Identifier Assignment**

1. **General**: Separate label fields of the identifier with a hyphen.

2. **Horizontal Cables**
   a. First field: the originating room identifier; for example: “A2.1”.
   b. Second field: the destination room number; for example: “207”.
   c. Third field: the cable’s intended service type followed by a unique sequential number; for example: “V1” (voice, cable #1) or “D2” (data, cable #2).
   d. Fourth field: the cable type; for example: “CAT3” or “CAT5E”.
   e. Example: “A2.1–207–D2–CAT5E”

3. **Outlets**
   a. First field: the originating room identifier; for example: “A2.1”.
   b. Second field: the destination room number; for example: “207”.
   c. Third field: a unique sequential number; for example: “01”.
   d. Example: “A2.1–207–01”

4. **Individual Ports at the Outlets**
a. The specified faceplate has individual port numbers molded into the product. However, if a substitution is accepted that does not have port numbers, provide port labels as follows.

b. First field: the cable’s intended service type followed by a unique sequential number; for example: “V1” (voice, cable #1) or “D2” (data, cable #2).

5. Individual Termination Positions at Termination Blocks
   a. First field: the destination room number; for example: “207”.
   b. Second field: the cable’s intended service type followed by a unique sequential number; for example: “V1” (voice, cable #1).
   c. Example: “207–V1”

6. Individual Ports at Patch Panels
   a. First field: the destination room number; for example: “207”.
   b. Second field: the cable’s intended service type – for example: “D” (data), and a unique sequential number – for example: “2”.
   c. Example: “207–D2”

3.5 FINAL INSPECTION AND CERTIFICATION

A. Punch the Work of this Section compliant to the requirements of Section 27 00 00.

B. Remove cables and replace with new those failing to meet the indicated standards and not passing the testing requirements of Section 270811 with no impact to cost and schedule. The Owner, will not accept the installation until testing has indicated a 100% availability of all cables and conductors. Any deviation from this requirement must be approved in writing by the Owner.

C. Comply with system acceptance and certification requirements of Section 27 00 00.

END OF SECTION
SECTION 28 00 00
BASIC SECURITY REQUIREMENTS

PART 1  GENERAL

1.1  SUMMARY

A. This section includes general administrative and procedural requirements for sections numbering 28 XX XX and is intended to supplement, not supersede, the requirements specified in Division 1.

B. The requirements described herein include the following:

1. References
2. Definitions
3. System Description and Existing Conditions
4. Submittals
5. Quality Assurance
6. Permits and Inspections
7. Coordination
8. Project Management and Coordination Services
9. Product Delivery, Storage, and Handling
10. Warranty
11. Maintenance

C. Products Supplied But Not Installed Under This Section:

1. None

D. Products Installed But Not Supplied Under This Section:

1. None

E. Products Specified But Not Installed Under This Section:

1. None

F. Products Furnished and Installed Under another Section:

1. 120V power
2. Conduit, junction boxes, device boxes (essentially rough-in)
3. Door hardware
4. Gate primary control system with vehicle detection loops
5. Network cabling and equipment

G. Related Sections:
1. Consult other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable installation.

2. Section 27 05 28, "Communications Building ISP Pathways"

3. Section 27 05 33, "Communications Building Pathways – Conduit and Boxes"

4. Section 28 05 13, "Security System Cabling"

5. Section 28 05 53, "Security System Labeling"

6. Section 28 08 00, "Security System Acceptance Testing"

7. Section 28 13 00, "Access Control and Alarm Monitoring System"

8. Section 28 16 00, "Intrusion Detection System"

9. Section 28 23 00, "Video Surveillance System"

10. Division 27

11. Earthwork: Include trenching, backfilling, boring and soil compaction as required for the installation of underground conduit, in-grade pull boxes, vaults, and bollard foundations.

12. Concrete Work: Include forming, steel bar reinforcing, cast-in-place concrete, finishing and grouting as required for underground conduit encasement, pedestal foundations, and curbs. [Also includes saw-cutting of existing slabs and grouting of conduits in saw-cut.]

13. Miscellaneous Metal Work: Include fittings, brackets, backing, supports, rods, welding and pipe as required for support and bracing of raceways, equipment enclosures, cameras, and similar devices.

14. Miscellaneous Lumber and Framing Work: Include wood grounds, nailers, blocking, fasteners, and anchorage for support of security materials and equipment. Refer to Division 6, Rough Carpentry.

15. Moisture Protection and Smoke Barrier Penetrations: Include membrane clamps, sheet metal flashing, counter flashing, caulking and sealant as required for waterproofing of conduit penetrations and sealing penetrations in or through fire walls, floors, ceiling slabs and foundation walls. Tape and make vapor tight penetrations through vapor barriers at slabs on grade.

16. Division 8 Locking Hardware: Include interface to electronic hardware and door controllers on security related doors.

17. Access Panels and Doors: Required in walls, ceilings, and floors to provide access to security devices and equipment.

18. Painting: Include surface preparation, priming and finish coating as required for security cabinets, exposed conduit, pull and junction boxes, and devices where indicated as field painted in this Division.

1.2 REFERENCES

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.
B. Codes: Perform Work executed under this Section in accordance with applicable
requirements of the latest edition of governing codes, rules and regulations including but not
limited to the following minimum standards, whether statutory or not:

1. California Code of Regulations (CCR):
   a. Title 8, “Industrial Relations”
      1) Chapter 3.22, “California Occupational Safety and Health Regulations
         (CAL/OSHA)”
   b. Title 24, “California Building Standards Code”
      2) Part 2, Volumes 1 and 2, “California Building Code” (CBC)
      3) Part 3, “California Electrical Code” (CEC)
      4) Part 11, “California Green Building Standards Code” (CALGeen)”

2. National Fire Protection Agency (NFPA)
   a. NFPA 70, “National Electrical Code” (NEC)
   b. NFPA 75, “Protection Of Information Technology Equipment”
   c. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and
      Cables for Use in Air-Handling Spaces”, 2007

   Communications Commission (FCC)”:
   b. Part 27, “Miscellaneous Wireless Communications Services”
   c. Part 68, “Connection of Terminal Equipment to the Telephone Network”

4. Other applicable national, state, and local binding building and fire codes

C. Standards: Perform Work and furnish materials and equipment in accordance with the latest
editions of the following standards as applicable:

   a. UL 294, “Access Control System Units”
   b. UL 1076, “Proprietary Burglar Alarm Units and Systems”
   c. UL 2044, “Commercial Closed-Circuit Television Equipment”

1.3 DEFINITIONS

A. The Definitions of Division 1 apply to the sections of Division 28.

B. In addition to those Definitions of Division 1, the following list of terms as used in this
specification defined as follows:

1. “ACAMS”: Access Control & Alarm Monitoring System

2. “As directed”: As directed or instructed by Owner, or their authorized representative
3. “Cabling”: A combination of cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling]

4. “Connect”: To install required patch cords, equipment cords, crossconnect wire, etc. to complete an electrical or optical circuit

5. “Engineer”: TEECOM

6. “Furnish”: To purchase, procure, acquire, and deliver complete with related accessories

7. “IDS”: intrusion detection system

8. “Install”: To set in place, join, unite, fasten, link, attach, set up or otherwise connect together and test before turning over to Owner, parts, items, or equipment supplied by Contractor or others. Complete installation and make ready for regular operation

9. “Owner”: Contra Costa Community College District

10. “Provide”: furnish and install

11. “Security System”: the ACAMS, IDS, VSS, and Intercom systems collectively and integrated


13. “VAC”: volts alternating current

14. “VDC”: volts direct current

15. “VSS”: video surveillance system

16. “VMS”: visitor management system

1.4 SYSTEM DESCRIPTION

A. Overview

1. Contra Costa Community College District is constructing Campus Safety Centers at Contra Costa College and Los Medanos College.

2. Security at the new facility consists of access control and alarm monitoring (ACAMS), video surveillance (VSS), intrusion detection (IDS), and intercom systems. The ACAMS will automate opening and closing the buildings, control access through designated doors, and will restrict after-hours access to authorized cardholders, and the IDS will monitor specific spaces for intrusion.

3. The new system will connect to Owner’s exiting head end located at the district office over the Owner’s LAN/WAN.

4. The System includes integration to the Fire/Life Safety system to disconnect power to magnetic door holders (where applicable) and automatically close doors after hours.

5. Refer to individual sections for detailed description of systems.

B. Custom Device Requirements
1. General: Provide a high level of coordination services to ensure the proper installation and functioning of the security system. Coordinate the installation of the security system with other trades. This may include: review of other trade’s shop drawings, attendance at meetings, providing samples for mockup, and preparation & distribution of written documentation.

1.5 SUBMITTALS

A. Submit required submittals in accordance with the requirements of section 01 33 00 “Submittal Procedures”.

B. Required submittals include the following:

1. Written detailed project description

2. Project schedule as referenced in this section

3. Product data sheets – clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories which are included and those which are excluded

4. Estimated delivery lead times for products

5. Voltage drop calculations demonstrating less than ten percent voltage loss to individual security devices

6. Battery calculations showing backup support of security equipment and locks (except egress hardware with local power supplies) for 25 lock activations or 4 hours, whichever is greater

C. Complete submittals are comprised of shop drawings and product data sheets as detailed below and related sections (covering specific security systems). Incomplete or partial submittals will be rejected.

D. Shop Drawings

1. Shop drawings shall document Contractor’s intent to execute the work and shall include the following:

   a. Title sheet and index

   b. Floor plans showing device locations, cable routing, and pathways

   c. System block diagrams

   d. Point-to-point wiring diagrams

   e. Specific wiring details and device mounting/installation details

   f. Schedules:

      1) Building/floor

      2) Unique device name/number

      3) Security controller/location

      4) Interfaces, interlocks

      5) IP address
2. Upon award of contract, request CAD release forms from TEECOM so that electronic files may be released for Contractor's use. TEECOM will release floor plans with devices; TEECOM will not installation details and block diagrams (Contractor shall develop their own diagrams and details for the shop drawings submittal package).

E. Format: Furnish submittal data in electronic copy including table of contents with each section bookmarked by specification section listing materials.

F. Label each submittal with the specification section number and provide a cover letter or stamp stating that the submittal has been thoroughly reviewed by Contractor and complies with the requirements of the contract documents. Failure to comply with this requirement will constitute grounds for rejection of the submittal.

G. Resubmittals: Provide a cover letter with the resubmittal that lists the action taken and revisions made to each product submittal in response to submittal review comments. Failure to include this cover letter will constitute rejection of the resubmittal package and no review will occur.

H. Drawings
   1. Prepare shop and as-built drawings using software compatible with AutoCAD and/or Revit per project standard.
   2. Drawing requirements:
      a. Sheet size: match the project’s contract drawings size and use the project’s title block
      b. Text size: minimum 3/32 inches high when plotted at full size
      c. Symbology: match the project’s contract drawings symbols
      d. Backgrounds: screen background information to allow pertinent drawing information to stand out.
      e. Line Weights: Use appropriate line weights for devices, raceways, and text to stand out against background information.
      f. Floor Plans: 1/8 inch scale floor and site plans showing the locations of devices and cable routing paths with cable types and quantity called out.

I. Contractor Qualifications: Submit the following for review and comment at the beginning of the project.
   1. Resumes of the project manager, general foreman, and lead technician(s) indicating role, years of experience, product certifications and training, listing of similar projects the individual performed the role proposed for this project along with client contact information for each.
   2. Certification letters from manufacturers of major system components stating Contractor is an authorized reseller, installer, and extended warranty provider for the specified security systems.

J. Samples
   1. Submit samples as required for proper coordination and installation of custom mounted equipment. Examples of samples that may be required include:
      a. Screen shots showing graphical floor plan maps indicating:
1) Active functional icons
2) Secure areas/zones
   b. Camera field of views

1.6 QUALITY ASSURANCE

A. General

1. Provide new and unused materials, equipment, and parts comprising the units specified herein of current manufacturer and of highest grade.

2. Only use products and applications listed in this Division on the project.

B. Bid Discrepancies

1. In the event of discrepancies within the contract documents, notify Engineer within 5 days prior to the bid opening to allow the issuance of an addendum.

2. If, in the event that time does not permit notification or clarification of discrepancies prior to the bid opening, the following applies: The drawings govern in matters of quantity, and the specifications govern in matters of quality. In the event of conflict within the drawings involving quantities, or within the specifications involving quantities, or within the specifications involving quality, the greater quantity and higher quality apply. Note such discrepancies and clarify in the bid. We will make no additional allowances because of errors, ambiguities, or omissions, which reasonably should have been discovered during the preparation of the bid.

C. Substitutions

1. Conform to the general requirements and procedure outlined in section 01 25 00 “Substitution Procedures”.

2. Where products are noted as "or equal", a product of equivalent design, construction, and performance is considered. Include in the product data submittal: catalog cuts, product information, and pertinent test data required to substantiate that the product is in fact equivalent to that specified.

3. Only one substitution allowed for each product specified. Do not provide substituted material, processes, or equipment without written authorization from Engineer. Assumptions on the acceptability of a proposed substitution, prior to acceptance by Engineer, are at the sole risk of Contractor.

4. The burden of proof rest with Contractor that the substituted product is equivalent or better than the specified product. When Engineer accepts a substitution in writing, it is with the understanding that Contractor guarantees the substituted product, component, article, or material to be equivalent to the one specified and dimensioned to fit within the construction according to contract documents. Approved substitutions do not relieve Contractor of responsibilities for the proper execution of the Work, or from provisions of the Specifications.

5. Manufacturers’ names and model numbers used in conjunction with materials, processes or equipment included in the contract documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of Engineer, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when “or equal” follows the manufacturers' names or model number(s).
6. Whenever material, process or equipment is specified in accordance with a Federal specification, an ASTM standard, an ANSI specification, UL rating or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by Engineer, submit support test data to substantiate compliance at no additional cost.

7. Pay expenses, without additional charge to Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, Subcontractor's or other Contractor's work.

D. Electronic Control Systems Contractor Qualifications

1. A current, active, and valid and C7 or C10 license registered with the Contractors State License Board (CSLB)

2. Minimum five years of experience in installation and service of access control, video surveillance, and intrusion detection systems

3. Minimum five completed projects similar to scope and cost

4. Evidence of technicians qualified for the work in the form of current manufacturer’s training certification

E. Materials

1. Provide new materials and equipment without defects.

2. Provide only specified products and equipment, or products and equipment that have been approved in writing.

F. Regulatory Requirements

1. Work and materials to conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Perform work under these specifications confirming to the most stringent of the applicable codes.

2. Provide the quality identified within these specifications and drawings when codes, standards, regulations, etc. allow Work of lesser quality or extent. The contract documents address the minimum requirements for construction.

G. Drawings

1. Layout: Follow the general layout shown on the Drawings except where other work may conflict with the Drawings.

2. Accuracy: The Drawings show a diagrammatic representation of the system within the constraints of the symbology applied.

3. Detail: The drawings do not fully represent the entire installation for the Security System. Drawings indicate the layout and location of control console(s) components, as well as location of security devices, i.e. card readers, door locks and contacts, and duress stations. The drawings do not show conduits, wire and cabling between every system component, equipment, or device.

4. Complete the details necessary for point-to-point design. This allows Contractor to achieve desired results applying their own procedures and methods. Submit shop drawings for review prior to installation.
H. Role of Engineer

1. During the construction phase of the project, Engineer will work with Contractor to provide interpretation and clarification of project contract documents, process and reply to relevant Requests for Information (RFI), and act as an interface between Contractor and Owner.

2. Owner has retained Engineer’s services to observe the work for general compliance with the contract documents.

3. In summary, Engineer will perform the following specific services during the design phase:
   a. Review product submittals and shop drawings for general compliance with the contract drawings and specifications.
   b. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
   c. Interpret field problems for Owner, and translate into understandable language.
   d. Review the testing procedures to confirm compliance with industry-accepted practices.

1.7 PERMITS AND INSPECTIONS

A. Obtain and pay for permits and inspections required for the work.

B. Furnish materials and workmanship for this work in conformance with applicable legal and code requirements.

C. Perform tests required herein, or as may be reasonably required to demonstrate conformance with the Specifications or with the requirements of legal authority having jurisdiction.

D. Obtain review from compliance officials responsible for enforcement of applicable codes and regulations to establish that the work is in compliance with requirements of reference codes indicated herein.

1.8 PROJECT MANAGEMENT AND COORDINATION SERVICES

A. Provide a project manager for the duration of the project to coordinate the security system work with other trades. Coordination services, procedures and documentation responsibility include at a minimum, the items listed in this section.

B. Review of Shop Drawings prepared by Other Subcontractors:
   1. Obtain copies of shop drawings for equipment and systems provided by others that require connections or interface with the security system work. Thoroughly review those shop drawings to confirm compliance with the interface requirements.
   2. Document discrepancies or deviations:
      a. Prepare memo summarizing the discrepancy.
      b. Submit a copy of the specific shop drawing, indicating via cloud, the discrepancy.
   3. Prepare and maintain a shop drawing review log indicating the following information:
      a. Shop drawing number and brief description of the system/material.
b. Date of your review.

c. Indication if follow-up coordination is required.

C. Scheduling: Prepare work schedules for each floor indicating the following information:

1. Submittals
2. Cable Installation
3. SEC Build Out
4. Device Installation
5. Programming
6. Testing
7. Training
8. Other tasks included under the alternate work section of these specifications

D. Job Conditions

1. Protection: Keep conduits, junction boxes, outlet boxes and other openings closed to prevent entry of foreign matter. Cover equipment, devices, and apparatus to protect them against dirt, paint, water, chemical or mechanical damage, before and during construction period. Prior to final acceptance, restore to original condition fixture, apparatus or equipment damaged including restoration of damaged factory applied painted finishes. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.

2. Supervision: Personally, or through an authorized and competent representative, supervise the work from beginning to completion and, within reason, keep the same foreman and workmen on the project throughout the project duration.

E. Weekly Status Reports: Prepare weekly status reports throughout the entire course of the project containing the following information:

1. Current / up-to-date 2-week look ahead schedule
2. Progress during prior week
3. Work expected to be completed during the upcoming week
4. Delivery dates for equipment
5. Coordination status for each device requiring coordination with other subcontractors
6. Summary of the information owed to Contractor, who is responsible for providing the information, and due date for the information

F. Weekly Meetings: Conduct or attend weekly coordination meetings with the electrical and other specialty subcontractors to coordinate the installation of the security systems.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Do not deliver security system components to the site until protected storage space is available.
2. Replace equipment damaged during shipping and return to manufacturer at no cost to Owner.

B. Storage
1. Store materials in a clean, dry, ventilated space free from temperature extremes. Storage outdoors covered by rainproof material (for example, a tarp) is not acceptable.
2. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
3. Provide heat where required to prevent condensation or temperature related damage.

C. Handling
1. Handle in accordance with manufacturer's written instructions.
2. Prevent internal component damage, breakage, denting and scoring. Do not install damaged equipment. Replace damaged equipment and return equipment to manufacturer.

1.10 WARRANTY
A. Provide the Security System as described in this specification with a one-year parts and service warranty at no additional cost to Owner.

B. Include in the warranty package, at a minimum, the following:
1. Emergency maintenance service on regular working hour basis
2. Service by factory trained and employed service representatives of system manufacturer

C. Maintain regular service facilities and provide a qualified technician familiar with this work at the site within four hours of receipt of a notice of malfunction including weekends and holidays. Provide material, devices equipment and personnel necessary for repairs. Install approved temporary, alternate equipment if required by Owner, complete and operational within 24 hours after notification of a malfunction, at no additional cost.

D. Conduct warranty repairs and service at the job site unless in violation of manufacturer's warranty; in the latter event, provide substitute systems, equipment and/or devices, acceptable to Owner, for the duration of such off-site repairs. Transport warranty substitute and/or test systems, equipment, devices, material, parts and personnel to and from the job site at no additional cost.

E. Warranty period shall commence upon written final acceptance by Owner or Owner's designated representative.

1.11 MAINTENANCE
A. Extra Materials
1. Deliver extra materials to a secured location determined by Owner.
2. Provide a complete bill of materials listing quantities, part numbers, and descriptions for each device for Owner to sign indicating receipt of equipment.
3. Provide new and unused spare parts in their original packing materials upon delivery.

B. Maintenance Service
1. For the first year of service, conduct quarterly system performance review meetings to review system operation problems and/or defects that occurred during the preceding 3 months. During these performance review meetings, perform the following:
   a. Visual checks and operational tests of the central processor, local processors, monitors, keyboards, system printers, peripheral equipment, security equipment and devices, power supplies, and electrical and mechanical controls.
   b. Clean system equipment, including interior and exterior surfaces.
   c. Perform diagnostics on equipment.
   d. Check and calibrate each device.
   e. Run system software and correct diagnosed problems.
   f. Resolve previous outstanding problems.

2. Provide software and firmware updates issued free of charge by the manufacturer.

PART 2   PRODUCTS

2.1 GENERAL

A. Material and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as components of the included systems. Where a particular material, device, equipment or system is specified directly, the current manufacturer's specification for same is a part of these specifications, as if completely elaborated herein.

B. Remove manufacturer identification marks from visible equipment. Provide materials permanently labeled with the manufacturer's name, model and serial number.

C. Use standard, regularly manufactured, materials and equipment for this and/or other similar systems, and not custom designed especially for this project. Provide systems and components thoroughly tested and proven in actual use. Provide subsystems of one manufacturer.

2.2 EQUIPMENT ENCLOSURES AND JUNCTION ENCLOSURES

A. Application: For indoor use to house panels and equipment, and to house terminations, relays, and other components local to controlled doors and other field devices

B. Type: NEMA type 1 enclosure

C. Description:
   1. Solid steel enclosure with solid, continuous-hinged door
   2. Finish: ANSI 61 gray polyester powder paint finish inside and out
   3. Lockable / equipped with a lock kit (lock kits shall be keyed alike with other security enclosures throughout the project)
   4. Perforated back panel within enclosure (for mounting control boards, relays, terminal strips, etc.)
   5. One tamper switch per enclosure
6. One 5” electric fan with a screen at the port per enclosure that houses electrically-powered devices/equipment

D. Size:
   1. For use as Security Equipment Enclosure: 36"L x 24"W x 6"D minimum
   2. For use as Security Junction Enclosure: 12"L x 12"W x 6"D minimum

E. Manufacturer, or equal:
   1. Eaton Cooper B-Line
      a. #36246-1PP; 36"L x 24"W x 6"D enclosure with back panel and lock kit
      b. #12126-1PP; 12"L x 12"W x 6"D enclosure with back panel and lock kit
   2. Hoffman
      a. #A36N24M; 36"L x 24"W x 6"D enclosure
      b. #A36N24MPP back panel for 36" x 24" enclosure
      c. #A12N126; 12"L x 12"W x 6"D enclosure
      d. #A12N12PP; back panel for 12" x 12" enclosure
      e. #A612AR; lock kit
   3. Wiegmann
   4. SquareD

2.3 SLOTTED WIRING DUCT

A. For indoor use inside equipment enclosures to manage/mind wiring.

B. Description:
   1. Type: Lead-free PVC with narrow finger design
   2. Color: Light gray

C. Manufacturer, or equal:
   1. Panduit Type-F narrow slot wiring duct
   2. Iboco #T1-1010 wiring duct

2.4 WIREWAYS

A. For indoor use with equipment enclosures to manage and route wiring and cabling.

B. Type: NEMA type 1 screw cover ‘gutter’ wireway and accessories

C. Description:
   1. Wireways shall have open top assembly and closure plates/end caps (to secure end of wireway sections).
   2. Finish: ANSI 61 gray polyester powder paint finish inside and out
3. Size: 4" x 4", minimum

D. Manufacturer, or equal:
   1. Eaton Cooper B-Line #4448-G-NK; lay-in painted wireway without knockouts
   2. Hoffman #F44T148GVP lay-in painted wireway without knockouts

2.5 INTERFACE RELAYS

A. Application: lock power switching and interfacing with other high-voltage powered equipment, i.e. gates, high-voltage locks, etc. (not for use at the output contacts on the access controllers since their rating is not adequate)

B. Type: Standard industry control, plug-in type with LED indicator lights to indicate when the relay is energized.

C. Contacts: Rated for 10 amps at 120VAC.

D. Coil Operating Voltage: as required, with 24VDC as first choice

E. Features:
   1. Color-coded test button
   2. Mechanical flag
   3. Snap-on label
   4. Pilot light
   5. 2mm test jacks
   6. Dual contact markings
   7. Snap-on number and letter markers
   8. Solid bus-bar socket construction

F. Relay bases shall be mountable on standard mounting rails

G. Manufacturer, or equal:
   1. Turck #Releco
   2. Idec

2.6 TAMPER RESISTANT HARDWARE

A. Tamperproof hardware shall be used in locations below 10' exposed to the public.

B. Hardware exposed in public spaces shall be pinned-allen type.

C. Hardware used in specialty metal surfaces shall have a similar finish color.

2.7 WIRE CONNECTORS

A. Wire connectors shall be heat activated, gel filled.

B. Twist and solder/taped or wire nut connections are not acceptable.
C. Manufacturer, or equal:
   1. Dolphin
   2. 3M Terminals
   3. Fastenal Sealed Crimp and Solder connector

PART 3 EXECUTION

3.1 EXAMINATION

A. Conditions: Verify existing conditions, which have been previously provided under other sections, are acceptable for product installation in accordance with manufacturer’s instructions.

B. Pathways: Verify that pathways and supporting devices, which have been previously provided under other sections, are properly installed, and that temporary supports and devices have been removed.

C. Field Measurements: Verify dimensions of pathways, including length of pathways. For example, “True Tape” the conduits to verify cable distances.

3.2 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman who is in charge of the work and who is present at the job site at times work is being performed. Perform the work using skilled technicians under the direction of the foreman. Supervise the work force executing the work. Perform the installation within the restraints of the construction schedule. Do not change the supervisor during the project without prior written approval from Owner.

B. Inspection: Perform inspection after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion released for inspection. Document completion, and inspection as required.

3.3 INSTALLATION

A. Perform this work in accordance with acknowledged industry and professional standards and practices and the procedures specified herein.

B. Provide a complete, operating system. Include devices specified including basic components and accessories, interconnecting wiring and other equipment and installation devices necessary for a complete system as specified.

C. System Password Management:
   1. Change default passwords.
   2. Create a base administrator account for Owner’s use/login.
   3. Install the latest security patches (for the operating system and each individual piece of equipment).
   4. Disable unused communication ports or protocols.
   5. Perform quarterly software security patch updates for the client during the warranty period.
6. Contractor to turn over all source media including installation discs, manuals, drives, dongles, and licensing keys and codes.

D. Manufacturer's Instructions:

1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

2. Maintain jobsite file of Material Safety Data Sheets (MSDS) for each product delivered to jobsite.

E. Boxes, Panels, and Enclosures

1. Install boxes, panels, and enclosures square and plumb.

2. Set flush-mounted units with the face of the cover, bezel, or escutcheon in the same plane as the surrounding finished surface.

3. Mount boxes, panels, and trim so that there are no gaps, cracks, or obvious lines between the trim and the adjacent finished surface; ready them to receive final finish, as applicable.

4. Install insulating terminations in signal circuit boxes, panels, wireways, or enclosures.

F. Painting

1. Custom paint devices as indicated on the drawings.

3.4 REPAIR/RESTORATION

A. Replace or repair work completed by others that you deface or destroy, and at no cost to Owner.

B. Punch List:

1. Inspect installed work and develop a punch list for items needing correction.

2. Submit punch list to Engineer for review prior to performing punch walk with Engineer.

C. Re-Installation:

1. Make changes to the system such that defects in workmanship are correct and cables and the associated termination hardware passes the minimum test requirements.

2. Repair defects prior to system acceptance.

D. Painting: Repaint surfaces altered during installation of the security system to match previous conditions.

3.5 CLEANING

A. Remove temporary coverings and protection of adjacent work areas. Remove unused products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Legally dispose of debris in an environmentally friendly manner.
E. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Cables and wires for security systems

B. Related Sections:

1. Consult other sections; determine the extent and character of related work and properly coordinate work executed under this section with that specified elsewhere to produce a complete and operable system.

2. Section 28 00 00, “Basic Security Requirements”


4. Section 27 05 28, “Communications Building ISP Pathways”

5. Section 27 05 33, “Communications Building Pathways – Conduit and Boxes”

6. Section 27 15 13, “Communications Horizontal Twisted Pair Cabling”

1.2 REFERENCES

A. Comply with the References requirements of section 28 00 00.

B. In additional to those codes, standards, etc., listed in section 28 00 00, products and work shall comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. NFPA 262, “Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces”

2. ANSI/UL 1581, “Reference Standard for Electrical Wires, Cables and Flexible Cords”


1.3 SUBMITTALS

A. Submittal Requirements at Start of Construction:

1. Product Data: Submit product information, including manufacturer, part number, description, use/application, jacket rating, outside diameter, etc.

B. Submittal Requirements at Closeout:

1. Include wire and cable types in As-Built Drawings

2. Include wire and cable information in O&M Manuals

1.4 SCOPE OF WORK

A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working security system installation as described in these specifications.
B. Cables for Security System

1. Provide wires and cables sized to allow for voltage drop of 12VDC and 24VDC power service from power supplies in equipment rooms to field devices.

2. Provide cables effectively shielded for video signal cable within the same conduit to mitigate interference or signal noise.

3. Provide plenum rated jacket (type CL2P, CL3P, or CMP) on cables installed indoors where required.

4. Provide PVC or PE jacket, flooded cables to prevent water intrusion where installed outdoors, underground, and/or within slab-on-grade. Provide transition of outdoor/underground cables to indoor cables when entering a building.

5. Provide surge protection when cables enter buildings from outdoors where required by CEC.

C. Cable Supports and Pathways for Security System Cabling

1. Provide dedicated cable support for security cables when not within primary pathways (such as cable tray). Coordinate work with Division 27 – particularly for use of pathways/cable support.

PART 2 PRODUCTS

2.1 INDOOR PLENUM MULTI-CONDUCTOR CABLES

A. Application: Indoor use, for ACAMS, VSS, Security Communications System, and IDS

B. Type: multi-conductor or paired, unshielded and shielded

C. CMP (plenum) rated

D. Manufacturers, or equal:

1. Belden
   a. #6500UE; 22AWG/2C, unshielded
   b. #6502UE; 22AWG/4C, unshielded
   c. #1325A; 22AWG/2PR, individually shielded
   d. #6502FE; 22AWG/4C, overall shielded
   e. #6504FE; 22AWG/6C overall shielded
   f. #3004A; 22AWG/8C overall shielded
   g. #6300UE; 18AWG/2C, unshielded
   h. #6302UE; 18AWG/4C, unshielded
   i. #6302FE; 18AWG/4C, overall shielded
   j. #6100UE; 14AWG/2C, unshielded

2. West Penn
   a. #25221B; 22AWG/2C, unshielded
b. #25241B; 22AWG/4C, unshielded
c. #D25510B; 22AWG/2PR, individually shielded
d. #253241B; 22AWG/4C, overall shielded
e. #253270B; 22AWG/6C overall shielded
f. #253271B; 22AWG/8C overall shielded
g. #25224B; 18AWG/2C, unshielded
h. #25244Bl; 18AWG/4C, unshielded
i. #253244B; 18AWG/4C, overall shielded
j. #25226B; 14AWG/2C, unshielded

3. Windy City Wire
   a. 444362; 22AWG/2C, unshielded
   b. 444381; 22AWG/4C, unshielded
c. 4150102; 22AWG/2PR, individually shielded
d. 4443440; 22AWG/4C, overall shielded
e. 444351-03; 22AWG/6C overall shielded
f. 444352-08; 22AWG/8C overall shielded
g. 442363; 18AWG/2C, unshielded
h. 442384; 18AWG/4C, unshielded
i. 442344; 18AWG/4C, overall shielded
j. 447960; #6100UE; 14AWG/2C, unshielded

2.2 IP CAMERA CABLE
   A. Application: Suitable for indoor installation within conduit
   B. Refer to Section 27 15 13 for product requirements.

2.3 MISCELLANEOUS COMPONENTS
   A. Cable Ties
      1. Width: 0.75 inches
      2. Color: Black
      3. Manufacturers, or equal:
         a. Panduit #HLS-15-R-0 Black, 15 feet roll, cut to length

PART 3 EXECUTION
3.1 INSTALLATION
A. Cable Installation and Routing

1. Install cables and wires continuously (splices will not be permitted without written approval from the Engineer) for the entire length of run between connections and/or terminations.

2. Place and suspend cables within designated pathways, such as cable hangers, cable tray, etc. Do not fasten or attach cables (such as with cable ties) to other building infrastructure (such as ducts, pipes, conduits, etc.), other systems (such as ceiling support wires, wall studs, etc.), or to the outside of conduits, cable trays, or other non-approved pathway systems.

3. Place and suspend cables during installation and termination in a manner to protect them from physical interference or damage. Place cables with no kinks, twists, or impact damage to the sheath. Replace cables damaged during installation or termination at no additional cost.

4. Route cables at 90-degree angles, allowing for bending radius, along corridors for ease of access.

5. Route cables under building infrastructure (such as ducts, pipes, conduits, etc.) so the installation results in easy accessibility to the cables in the future.

6. Do not exceed manufacturer's limits for pulling tension.

7. Do not use cable-pulling compounds for indoor installations.

8. Dress and secure cables without stress and/or deformation. Dress and bind cabling with cable ties every 24" minimum. Within telecommunications spaces and covered wireways, provide Velco-style cable ties on security cabling.

9. Install shielded wiring or route in separate raceways as recommended by the manufacturer's current requirements.

10. Place cables a minimum of 6" away from power sources to reduce interference from EMI.

11. Do not run signal wire and cable in parallel to power (120VAC).

12. When connecting to screw-type barrier blocks, terminate wires with insulated crimp-type spade lugs. Size lugs properly to assure high electrical integrity, i.e., low resistance connections.

13. Follow manufacturers recommended guidelines for installation.

14. When exiting the primary pathway (such as cable tray) to the device, exit via the top of the pathway. Secure the cables to the pathway using an approved cable tie.

15. When routing cables vertically in conduit for continuous distances greater than 30 feet, secure cables as the cables exit the vertical pathways. Secure cables using screw-flange nylon cable ties or similar approved ties. Provide symmetrical clamping devices with split, circular, or other wire conforming, nonmetallic bushings for coaxial cables.

16. Within telecom rooms, route and dress cables on the overhead cable support and, when routing vertically, fasten the cables onto wall-mounted vertical cable support every 24 inches on-center using cable ties.

B. Cable Support
1. Coordinate cable support work with sections 27 05 28 and 27 05 33 for indoor pathways such as cable hangers.

2. Above ceilings, support cables at intervals no greater than 5 feet.

3. Anchor cable support system/components to structure.

4. Vertical Support on floor space, not in riser system
   a. Route cable from below suspended ceiling devices to above ceiling when possible.
   b. When routing cable in fire-rated wall assemblies, provide conduit and firestopping.
   c. When routing cable on concrete tilt up style walls from below ceiling devices to above ceiling, provide conduit – either surface or recessed (depending on wall construction).
   d. For cable routed vertically from devices with no suspended ceiling, provide conduit stub from device junction box to 14 feet, minimum, above finish floor.

5. Vertical Support in riser system
   a. In vertical riser systems, route cable within conduit.
   b. Terminate conduit at each stacked closet in a lockable junction box. Size junction box as required per conduit size and quantity – 12" x 10" x 8", minimum.
   c. Support cables within the junction box at every other floor or approximately every 24 feet utilizing cable ties equipped with eyelets designed to accept screws for fastening or approved equivalent method.


END OF SECTION
PART 1 GENERAL

1.1 SUMMARY
A. General: Furnish labor, materials, tools, etc., as required to complete security system labeling.

B. Section Includes:
   1. Labeling of wire, cable, security devices, enclosures, and raceways.

C. Related Sections:
   1. Consult other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
   2. Section 28 00 00, “Basic Security Requirements”

1.2 SUBMITTALS
A. Product Data: Submit the following:
   1. Product information for components specified herein.
   2. List of equipment (wire, cable, devices, enclosures, and raceways) and the corresponding text for the label.

PART 2 PRODUCTS

2.1 NAMEPLATES
A. Engraved, plastic laminated nameplates, signs, and instruction plates. Engrave stock melamine plastic laminate 1/16 inch minimum thickness for signs up to 20 square inches, or 8 inches in length; 1/8 inch thick for larger sizes. Use white letters for engraved nameplates and punch for mechanical fasteners.

2.2 WIRE AND CABLE LABELS
A. General
   1. Self-laminating adhesive laser labels.
   3. Cable size: 0.16 – 0.32” OD
   4. Color: white with black lettering

B. Manufacturer, or equal:
   1. Brady #WML–211-295 and #WML-311-292 wire marking labels

2.3 DEVICE LABELS
A. Self-laminating, type on tape, adhesive labels. Use Helvetica 12 pt text
PART 3 EXECUTION
3.1 INSTALLATION

A. General Requirements

1. Label the security system components. The components include, but are not limited to, the following:
   a. Equipment Enclosures
   b. Conduits
   c. Security Devices
   d. Batteries
   e. Wires and Cables
   f. Equipment Racks
   g. Terminal Blocks
   h. Relays
   i. Patch panels, and the termination positions within the patch panels.

2. Labels shall coincide with device IDs used on the record drawings.

3. Degrease and clean surfaces to receive nameplates and labels.

4. Install nameplates parallel to equipment lines. Secure nameplates to equipment fronts using machine screws.

B. Equipment Cabinets

1. Label SEC enclosures associated with the security system with a nameplate.

2. Mount label on exterior of door, centered horizontally, and positioned one-third of the door height vertically from the top.

   Example: Line 1 [1/2 inch high letters]: “SEC-01”
   Line 2 [1/4 inch high letters]: “Security Equipment Cabinet”

C. Conduits

1. Write the destination for every conduit entering a junction box, SEC, and CEC enclosure, or wireway using a black permanent ink marker next to the conduit inside the box.

2. Example: “To SEC-01”

D. Security Devices

1. Label devices associated with the security system with a permanent machine generated, laminated, label. Use 12 point Helvetica text with a clear background. Use white or black lettering depending upon the color of the device.

2. Label each device in a concealed location with the system point number and address.

E. Batteries

1. Label power supply batteries with the month and year they were installed.
2. Example: “April 2019”

F. Wire and Cable

1. Identify wire and cable clearly with permanent machine-generated labels wrapped about the full circumference within 1 inch of each connection.

2. Indicate the cable ID designated on the associated field or shop drawings or run sheet, as applies.

3. Assign wire or cable designations consistently throughout a given system; i.e., each wire or cable to carry the same labeled designation over its entire run, regardless of intermediate terminations.

4. Provide labels where wire and cable first enter and exit from conduit, junction or distribution boxes; locate labels within 6 inches of the point of exit.

5. Positional labels so they are clearly visible without the need to remove wire management or other obstructions.

6. Label cables at both ends of a run and within pull and junction boxes using machine generated wrap-around labels.

3.2 CABLE LABEL FORMAT

A. Text: Helvetica font, 12 point (minimum size, unless otherwise specifically stated)

B. From Panel to Field Device

1. Line 1: Device Type and Device Number

2. Line 2: Panel ID – Port Number

3. Example: CR 001
   PANEL 2 – CR5

4. Standard Device Types
   a. CR = Card Reader
   b. K = Camera
   c. R = Relay Output
   d. A = Alarm Point

5. Standard Port Numbers
   a. CR = Reader
   b. M = Monitored Input
   c. R = Relay Output

C. From Door Junction Box to Card Reader

1. Line 1: Device Type and Device Number

2. Line 2: Panel ID – Port Number
Example: CR 001
    PANEL 4 – CR3

D. Miscellaneous Examples:

1. From Door Junction Box to Door Contact
   a. CR001
   b. DC

2. From Door Junction Box to Rex Alarm
   a. CR001
   b. REX ALM

3. From Panel to Rex
   a. CR001
   b. REX PWR
   c. 12 VDC

4. From Panel to Lock
   a. CR001
   b. LCK PWR
   c. 24 VDC

E. Communications Cable

1. Line 1: Communication Type and Direction
2. Line 2: Panel ID
3. Example: RS-485 TO PANEL 2
4. Typical Communication Types
   a. RS-485
   b. RS-232
   c. RS-422

END OF SECTION
SECTION 28 08 00
SECURITY SYSTEM ACCEPTANCE TESTING

PART 1  GENERAL

1.1  SCOPE OF WORK

A. General: Furnish engineering, labor, materials, apparatus, tools, equipment, and transportation required to test a completed security system installation as described in these and the related Specifications.

B. Base Bid Work

1. Comprehensive testing for all systems installed as part of the project in two distinct phases which includes:
   a. Functional Testing
   b. Acceptance Testing

2. Produce and submit for review and approval the test results documentation for each of the two distinct phases of testing.

C. Related Sections:

1. Section 28 00 00, “Basic Security Requirements”
2. Section 28 05 13, “Security System Cabling”
4. Section 28 13 00, “Access Control and Alarm Monitoring System”
5. Section 28 16 00, “Intrusion Detection System”
6. Section 28 23 00, “Video Surveillance System”

1.2  SUMMARY OF ACCEPTANCE TESTING ACTIVITIES

A. Overview

1. The purpose of these testing activities is to ensure the security system operates properly and per the Owner’s requirements. Security systems are very complex from both an equipment and programming standpoint and thorough testing is necessary to ensure correct operation.

2. Perform testing activities after-hours or on weekends when the system is not being actively utilized and the building is generally unoccupied. This will minimize the amount of irrelevant activity in the system activity reports that will be used as a record of the Functional Testing and Acceptance Testing test results documentation.

B. Functional Testing

1. Functional Testing represents a complete and documented test of the security systems. At a minimum, Functional Testing shall demonstrate proper operation of security system components, including: devices, sensors, switches, power supplies, controllers, input/output boards, relays, network communications, tamper switches, initiating circuits, and associated accessories and appurtenances required for system functionality.
2. Perform Functional Testing of security systems to verify correct operation prior to scheduling the Acceptance Testing.

3. Document the results of the Functional Testing and submit to the Engineer along with system activity reports for approval.

4. Functional Testing test results documentation shall be reviewed and approved prior to scheduling the Acceptance Testing.

C. Acceptance Testing

1. Acceptance Testing represents a final walk test with the Engineer and Owner to demonstrate proper operation of security system components including system integration, programming, operational capabilities, and functional performance.

2. Perform Acceptance Testing of the security systems in the presence of the Engineer and Owner to demonstrate fully functional and completely operational security systems.

3. Submit Acceptance Testing test results documentation and punch list/deficiencies corrections, prior to Owner approval of Substantial Completion and the start of the Warranty period.

1.3 SUBMITTALS

A. Functional Testing test results documentation submittal

B. Acceptance Testing test results documentation submittal

C. Operation and Maintenance (O&M) Manuals: Submit O&M Manuals for review and approval at the completion of the project consisting of the following:

1. Warranty letter: copy of Warranty letter reflecting start and end dates, and instructions covering warranty procedures.

2. Functional Design Manual: includes a detailed explanation of the operation of the system.

3. Hardware Manual, which includes:
   a. Pictorial parts list and part numbers
   b. Pictorial and schematic drawings of wiring systems including devices, control panels, instrumentation, and annunciators
   c. Telephone numbers for the authorized parts and service distributors
   d. Service bulletins

4. Software Manual, which includes:
   a. Use of system and applications software
   b. Initialization, start-up, and shut down procedures
   c. Alarm reports

5. Operator’s Manual, which fully explains procedures and instructions for the operation of the system and includes:
   a. Computers and peripherals
   b. System start up and shut down procedures
c. Use of system, command, and applications software

d. Recovery and restart procedures

e. Graphic alarm presentation

f. Use of report generator and generation of reports

g. Data entry operator commands

h. Alarm messages and reprinting formats

i. System access requirements

j. Service maintenance call procedures

6. Maintenance Manual, which includes:

a. Instructions for routine maintenance listed for each component, and a multi-page summary of component’s routine maintenance requirements

b. Detailed instructions for repair of the security system

c. A summary of the software licenses, including license numbers, quantity of clients, summary of the software options provided, and database capabilities

d. A list of IP addresses used and with which system component they are associated, including MAC address

e. A list of gateway addresses, subnet masks, DNS servers, and host name information

7. Test Results Manual which includes the document results of tests, required under this Specification, organized by System, Floor, and Door.

8. As-Built Drawings, which includes 11”x17” prints of the as-built drawings.

D. As-Built Drawings

1. Submit As-Built Drawings for review and approval at the completion of the project.

2. As-Built Drawings shall fully and accurately represent installed systems and conditions, including: actual locations of devices and components, actual cable and terminal block numbering, and actual wire routing and wiring (wire type, gauge/size, rating, etc).

3. Record changes in the work during the course of construction on blue or black line prints. Transfer construction mark-ups to AutoCAD or Revit format drawings at the completion of the project.

4. Include the following additional information:

   a. Device addresses and IP address information

   b. Settings for each camera (lens specs, mm setting, auto shutter setting, and other available camera settings, etc.)

5. Include approved Shop Drawings.

6. Final acceptance requires the Engineer’s approval of the As-Built Drawings.

E. Owner’s acceptance, Substantial Completion, and start of the Warranty period requires all submittals above be approved and punch list deficiencies be corrected.
1.4 QUALITY ASSURANCE

A. Provide a project manager to coordinate the security system acceptance testing work with other trades.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 SCHEDULING

A. Coordinate the security system Functional Testing and Acceptance Testing acceptance testing specific activities into the overall project construction schedule.

B. Provide the Engineer and Owner with a minimum one-week notice prior to scheduling Functional Testing and Acceptance Testing activities.

3.2 TESTING REQUIREMENTS

A. Site Tests

1. At a minimum, security system testing requirements shall include the following tests (where applicable to the project):

a. Building Perimeter Test: Test doors, cameras, and devices related to securing the perimeter of the building.

b. IDF Test: Test devices related to securing the IDF. Inspect system panels, power supplies, and other related security equipment located in these areas.


d. Video Surveillance System Test: Test the system for correct programming, operation, and alarm camera call-up.

e. Video Recording System Test: Test the recording system for correct programming, alarm recording, and event retrieval. Verify correct integration with the ACAMS and IDS system for alarm call-up. Test and verify the system is viewable from client workstations.

f. Intrusion Detection System Test: Test the network connection and alarm dialer and duress stations for correct programming and operation. Verify correct arming/disarming functions from each keypad. Verify integration with ACAMS and Video Surveillance System.

g. Video Camera Test: Review cameras for proper coverage, quality of video, focus, configuration, etc.
h. Other Readers/Door Test: Test remaining card readers and doors not included in the above tests.

i. Battery and UPS Load Test: Disconnect AC power to security system equipment to verify battery operation functions and system remains fully operational.

j. Door Hardware Test: Coordinate with the Division 08 door hardware contractor to resolve electrified locking door hardware failures and door alignment or door closer problems.

B. Site Tests Preparation

1. Provide device identification numbers that differ from or were not included on the original Construction Drawings.

2. Provide a complete system point list.

3. Provide paper and toner for the printer so that an event log can be printed out and attached to the test reports as verification of test sequence and systems response.

4. During testing, provide technicians familiar with the installation to assist with the test. Stage the technicians as follows: one at the host, one at the device being tested, and one runner responsible to furnishing tools, step ladders, etc.

5. Provide radios for use by the Engineer and Owner during testing.

6. Provide pre-programmed access cards for use during testing. Provide one authorized card for each access level. Provide one card with no access authorization. Provide keys for lockset mechanical key override.

3.3 TEST PROCEDURES

A. Follow manufacturer’s written test procedures for each type of device and system.

3.4 FIELD DOCUMENTATION

A. Provide printed system documentation containing detailed wiring diagrams for each security equipment enclosure. Documentation shall include, at a minimum, layout of equipment, elevation detail, complete parts list, and complete wiring diagrams for each security system controller, input / output board, relay, and power supply.

B. Provide a printed service log for each security equipment enclosure. Service log shall include, at a minimum, columns for the following information: date of service, description of work performed, service technician(s), and service company.

C. Neatly fold the printed system documentation and service log and place it inside a clear plastic pocket affixed to the inside door of the security equipment enclosure.

3.5 TRAINING

A. Upon completion of the Acceptance Testing, provide training to the Owner's representatives, at times convenient to them, in the function and operation as well as the service and maintenance of the security systems.

B. Utilize the production database for the training to give the users project-specific examples from which to learn.
C. Provide 16 hours, minimum, of on-site training by a factory trained representative. Maintain a sign-in sheet with names and dates of persons trained and forward to Owner upon completion of training.

D. Provide for designated Owner’s representatives to attend off-site factory certification training for all systems installed as part of the project, including:

1. Access Control and Alarm Monitoring System
2. Video Surveillance System
3. Intrusion Detection System
4. Security Communications System

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

1. ACAMS, including access control units, input/output units, and card readers
2. ACAMS power supplies
3. Alarm initiating devices, including: magnetic switch contacts, request-to-exit sensors, and duress buttons
4. Power supplies
5. Interface to electric door hardware, ADA door operators, and gate operators
6. Interface to Fire/Life-Safety system
7. Interface to VSS and other security subsystems with bi-directional communication

B. Products Furnished but not Installed under This Section

1. None

C. Products Installed but not Furnished under This Section

1. New electric feed-through power transfer hinges
2. Electrified locking hardware cable and termination to transfer hinge and security system

D. Products Specified but not Installed under This Section

1. None

E. Products Furnished and Installed under Another Section

1. 120VAC power
2. Telecommunication pathways; refer to Section 27 05 28.
3. Network switches, with Power over Ethernet (PoE)

F. Related Sections

1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a fully functional and completely operational system.
2. Section 08 71 00, “Door Hardware”
3. Section 28 00 00, “Basic Security Requirements”
4. Section 28 05 13, “Security System Cabling”
5. Section 28 05 53, “Security System Labeling”
7. Section 28 16 00, “Intrusion Detection System”
8. Section 28 23 00, “Video Surveillance System”

1.2 REFERENCES
A. Comply with the References requirements of Section 28 00 00.
B. In addition to the codes and standards listed in Section 28 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:
   1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
      a. UL 497, “Protectors for Paired-Conductor Communication Circuits”

1.3 DEFINITIONS
A. Definitions as described in Section 28 00 00 shall apply to this Section.
B. In addition to those definitions in Section 28 00 00, the following list of terms as used in this specification defined as follows:
   1. “A” and “AMP”: amperes
   2. “ACAMS”: access control and alarm monitoring
   3. “IDS”: intrusion detection system
   4. “KVM”: Keyboard, Monitor, Mouse (as in KVM drawer to access a server)
   5. “LAN”: Local Area Network
   6. “NC”: Normally closed
   7. “NO”: Normally open
   8. “REX”: request to exit
   9. “SCS”: security communications system
   10. “UPS”: uninterruptible power supply
   11. “VAC”: volts alternating current
   12. “VDC”: volts direct current
   13. “VMS”: video management system
   14. “VSS”: video surveillance system

1.4 SYSTEM DESCRIPTION
A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working Access Control and Alarm Monitoring system installation, as described in these specifications.
B. Access Control and Alarm Monitoring System (ACAMS) Overview

1. ACAMS is a distributed network of control panels connected to and programmed from a central server and client workstation(s). The ACAMS is utilized for electronically controlling access within the building for employees, visitors, delivery personnel, and persons.

2. ACAMS consists of an existing ACAMS server/host computer (located at the district office), ACAMS client workstations/computers, badging system, field panels, card readers and alarm initiating devices (refer to the drawings for locations of field panels, card readers, and other devices). The server will communicate with the control panels via the Owner’s LAN and/or hardwire connections. The control panels control the electronic door hardware allowing or disallowing passage through a controlled door or gate.

3. The ACAMS will provide secondary monitoring of the IDS.

C. ACAMS Software

1. ACAMS Software: Provide ACAMS software package and licenses in a quantity sufficient to support the project’s client workstations and card readers +20% (minimum, round up to nearest whole number), including loading onto the ACAMS server, integrating into the network, programming the software system to meet the project requirements, and loading card readers, input points, output points, alarm notifications (email, pages, etc.), and other aspects of the system.

2. Provide software interface to the VSS platform. Program ACAMS software such that alarm events (e.g., door forced open, door held open, etc.) make the video associated with that alarm device call up onto the main monitor and to mark the video recording.

3. Provide interface to the IDS. Program ACAMS software to receive alarm events from the IDS for bi-directional monitoring.

D. ACAMS Client Software

1. ACAMS Client Software: Provide ACAMS client software, including loading onto the client workstation and configuring for monitoring and viewing capabilities.

E. ACAMS Panels and Power Supplies

1. Provide access control panels, including enclosures, wireway, enclosures, wiring duct, panels, daughter boards, wiring, connectors, and other components for a complete system.

2. Provide input and output modules as required to fulfill the project’s requirements.

3. Provide power supplies for power to ACAMS panels, field devices, door locks, motion detectors, indicator lamps, etc. Provide separate power supplies dedicated for lock power. Other devices such as REX’s and alarm horns may be combined on common power supplies.

4. Provide battery backup for power supplies and system components.

5. Provide tamper switches within each security equipment enclosure and wireway, each security junction box, and each door junction box. Program ACAMS for monitoring and alarming (unsupervised inputs for this purpose).
6. Provide real-time monitoring of power supplies and batteries. Connect power supplies to ACAMS panel as an input. Program ACAMS for monitoring and alarming (unsupervised inputs for this purpose).

F. Card Readers / Door Devices

1. Provide proximity card readers, including rough-in, wiring, reader, and other components for a complete system and connect to the ACAMS. Provide tamper switches per card reader wired/connected to the ACAMS input module.

2. Provide door contacts and request-to-exit motion detectors for card reader controlled doors and connect to the ACAMS. Refer to drawings for configurations and instances.

3. Provide double pole double throw contacts on doors controlled by card readers with associated IDS alarm monitoring keypads. Wire one contact to the serving ACAMS panel and connect to the ACAMS panel as an input.

4. Provide door contacts for non-card reader controlled doors noted on drawings (such as ground floor perimeter doors) and connect to the ACAMS. ACAMS shall monitor these doors. Program the ACAMS to alarm should the monitored doors open when not authorized.

G. Provide end of line resistors as required (e.g., on supervised lines).

H. Provide interface to ADA automatic/power assist door operator and corresponding actuator push plates

I. Fire/Life-Safety System Interface

1. Coordinate with Fire/Life-Safety system contractor to automatically drop power from stairwell, elevator vestibule lobby, and other doors within the path of egress upon alarm activation of the Fire/Life-Safety system.

2. Coordinate with Fire/Life-Safety system contractor for scheduled release of electromagnetic door holders on designated card reader doors or scheduled unlocked doors as indicated on project drawings. Provide ACAMS output modules as necessary to interface with Fire/Life-Safety system to release electromagnetic door holders on doors that are required to close and lock on scheduled events.

J. Extra Materials

1. Furnish 10% spare parts of total installed the following (round up to the next complete device):

   a. Access controller boards
   b. Input expansion modules
   c. Output expansion modules
   d. Reader interface modules
   e. Card readers
   f. Power supply boards
   g. Relays
2. Fuses: 5 of each type of fuse

1.5 SUBMITTALS

A. Quantity: Furnish quantities of each submittal as noted in Section 28 00 00.

B. Contractor Qualifications: Submit certification letters for the manufacturer of the ACAMS.

C. Product Data: Submit product information for components specified herein.

D. Shop Drawings: Include the following, minimum:

   1. Device placement on floor plans and RCPs

   2. Point-to-Point Diagrams: Include wiring, points of connection and interconnecting devices between the following:
      a. ACAMS control panel
      b. ACAMS card reader and input/output modules
      c. ACAMS power supplies
      d. Card Readers
      e. Door and lock position monitoring contact switches and request-to-exit sensors
      f. Interface to electrified door hardware
      g. Interface to Fire/Life-Safety system
      h. Cable conductors (identify conductors on the point to point diagrams with the same tag as the installed conductor)
      i. Miscellaneous control relays

   3. Block Diagram/Riser Diagram: Show ACAMS components, conduit, wire types, and sizes between them, including cabling interties between termination hardware.

   4. Schedules: Include schedules for ACAMS control panels that show each point ID with a description of the connected devices

   5. Include user interface graphics with icons and control buttons displayed.

   6. Include custom mounting details.

E. Submittal Description: Training Submittal

   1. Format: PDF

   2. Contents:
      a. Cover sheet, showing:
         1) Owner Name
         2) Project Name and Address
         3) Project Submittal Number
         4) Submittal Name
5) System Name

6) Specification Section Number (e.g., “Section 28 13 00”)

7) Date of Submittal. Format: Month Day, Year (e.g., “January 1, 2019”)

8) Contractor Name

b. Table of Contents

c. Training Schedule

d. Training Course outline/ agenda

e. Course materials and training manuals for the following users as applicable:

1) System Administrator

2) Security staff

3) Operator, and nurse/staff.

F. Submittal Requirements at Closeout:

1. As-Built Drawings: submit as-built drawings that includes approved block diagram, riser diagram, wiring diagram, security control room layout and elevations, floor plans, and reflected ceiling plans, and site plans showing device locations.

2. O&M Manual: submit O&M Manual as a binder or soft copy (bookmarked PDF) including the following, at a minimum:

   a. Product data – approved submittals (‘cleaned up’) and electronic

   b. As-built drawings, printed to 11x17 / tabloid landscape and electronic PDF files and native files (DWG or RVT) on storage media

   c. Warranty statement and service protocol (guidelines, contact numbers, etc.)

   d. Maintenance requirements

   e. Station Matrix, printed to 11x17 / tabloid landscape and electronic PDF files and native XLSX file on storage media

   f. Include information for the network switches and ports.

1.6 WARRANTY

A. Warrant work and the system to perform as described within this Section for a period of one year from the date of system acceptance. The warranty shall cover system operation/performance, parts, and labor. During the warranty period, respond within 4 hours and correct deficiencies within 24 hours of notification.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Access Control and Alarm Monitoring System

1. Software House | Tyco Security Products (to match campus standard)
B. Card Readers
   1. Allegion
   2. HID

2.2 ACAMS SOFTWARE PACKAGE AND CLIENT WORKSTATION SOFTWARE
   A. Software Package shall integrate with the VSS (refer to 28 23 00) and badging software.
   B. Manufacturer and System:
      1. Software House CCURE 9000

2.3 SECURITY EQUIPMENT ENCLOSURES AND DEMARCATION ENCLOSURES
   A. Refer to 28 00 00 for product requirements.

2.4 SLOTTED WIRING DUCT
   A. Refer to 28 00 00 for product requirements.

2.5 WIREWAYS
   A. Refer to 28 00 00 for product requirements.

2.6 POWER SUPPLIES/BATTERY CHARGERS
   A. Power supplies shall be UL Listed and suitable for the purpose of powering ACAMS controllers, reader boards, intrusion detection panels, electric locks, and field devices (such as REXs, local alarms, etc.). Power supplies shall also be suitable for continuous charging of batteries (for power back up).
   B. Description / Features:
      1. Input: 120 VAC, hard-wired
      2. Output: sixteen 12 VDC and/or 24 VDC, 10 A continuous current, PTC Class 2 rated power limited
      3. Fire alarm disconnect, individually selectable per output
      4. Short circuit and thermal overload protection
      5. Fail Safe and/or Fail Secure power outputs, individually selectable per output
      6. LEDs indicate outputs triggered
      7. Integrated battery charger
      8. Monitor loss of input power and alarm in the Access Control System
      9. Manufacturers, or equal:
         a. Altronix MAXIMAL Series; 12 VDC and 24 VDC dual power supply
         b. LifeSafety Power #FPO150-C8E1; 12 VDC power supply
         c. Securitron #AQD6-8F; “AccuPower” switching power supply, 8-output
d. Securitron #AQD6-8F8R; “AccuPower” switching power supply, 8-output with relays

2.7 BATTERIES

A. Batteries shall be UL Listed and suitable for the purpose of backing up power to security system equipment, field devices, electric locks, etc.

B. Description / Features:
   1. Voltage: 12 VDC
   2. Amps: 12 A
   3. Chemistry: SLA or VRLA
   4. Termination: Spade protected terminals

C. Manufacturer, or equal:
   1. Interstate Batteries #SLA1105 sealed lead acid 12V 12Ah battery
   2. Yuasa Battery Inc #RE12-12 sealed lead acid 12V 12Ah battery

2.8 ACCESS CONTROLLERS

A. Description / Features:
   1. An intelligent controller with integrated battery backup, database, and communication ports that supports up to 32 card readers
   2. Supports HID proximity, MIFARE, and DESFire card reader formats
   3. Expansion capacity/additional modules (e.g., for additional memory and/or for future feature enhancements)
   4. Supports flash upgrades for firmware updates
   5. Global input/output and anti-passback functionality
   6. Capable of utilizing keypad commands to activate/deactivate events
   7. Monitor Inputs: Station switch, tamper, power fail, and alarm

B. Functions:
   1. Central control for attached devices
   2. Makes decisions for access
   3. Responds to monitor activity
   4. Receives input to control its decision making
   5. Reports activity to other devices

C. Mounting: within wall mounted NEMA enclosure

D. Power:
   1. Main Power Source: controller shall be powered from the associated power supply unit
2. Battery Backup: the controller board shall have an integrated low voltage battery (such as a lithium cell) to maintain internally stored database and setup in case main power is interrupted

E. Self-Protection: Controller shall detect power input failures and tampering

F. Communications

1. TCP/IP via 10Base-T/100Base-TX

2. Supports multiple communication channels to which a variety of devices can connect – RS-485, RS-422, or 20mA communications to addressable modules:
   a. Input Module: Supports 16 Class A supervised input points
   b. Output Module: Supports 16 Form C dry contact relays
   c. Reader Interface Module: Supports up to 2 card readers with associated alarm contacts, request-to-exit devices, and lock outputs

G. Manufacturer:

1. Software House “iSTAR” series
   a. #iSTAR Ultra 128MB control panel
   b. #RM-4E four-reader interface module

2.9 MONITOR INPUT/RELAY OUTPUT BOARDS

A. Description

1. Monitor Input: module that monitors inputs that occur over network and sends them via RS-485 protocol to the Controller.

2. Relay Output: executes relay commands received from the Controller via RS-485 protocol.

3. Monitor Inputs: 8, minimum, four-state monitor points

4. Relay Outputs: 8, minimum, normally opened (NO) or normally closed (NC)

B. Manufacturer, or equal:

1. Input Module:
   a. Software House #I/8

2. Output Module:
   a. Software House #R/8

2.10 CARD READERS

A. Description / Features:

1. FCC and CE certified, and conform to the following ISO standards:
   a. 15693 (CSN read-only)
b. 14443A (CSN read-only)
c. 14443B (CSN read-only)

2. Capable of reading the following frequencies and card formats:
a. 125 kHz and 13.56 MHz

3. Utilize a Wiegand protocol for communication for compatibility with standard access control systems.

4. Multi-color LED and an audible sounder to indicate the status of the door

5. For exterior locations, reader shall be fully weatherized with a rugged, polycarbonate enclosure, designed to withstand an operating temperatures of -22 to 150 degrees Fahrenheit (-30 to 65 degrees Celsius) and operating humidity of 5-95% non-condensing.

B. Functions:

1. Card reader shall continuous emit radio radiation with a continuous sensing of an access card.

2. Upon reading an access cord, the card reader shall initiate a single transmission to the ACAMS controller.

3. Upon receiving status from the ACAMS controller, the card reader shall change the state of the LED to the programmed state.

C. Manufacturer, or equal:

1. HID ProxPro series
   a. Wall mount: #5355; “ProxPro” proximity card reader
   b. Wall mount with keypad: #5355K; “ProxPro” proximity card reader with integrated keypad
   c. Long-range (16 inch read range): #5375; “MaxiProx” proximity card reader
   d. Mullion style: #5365; “MiniProx” proximity card reader

2. HID multiCLASS series
   a. Wall mount: HID SE Series; multi-technology card reader
   b. Wall mount with keypad: HID SE Series with keypad; multi-technology card reader with integrated keypad
   c. Mullion style: HID SE Series mullion; multi-technology card reader

2.11 MAGNETIC CONTACT SWITCHES

A. Magnetic contact switches shall be UL 634 Listed.

B. Wood, Steel, and Hollow Metal Doors

1. Description / Features
   a. Mounting: Recessed
b. Switch Type: Double Pole, Double Throw

c. Gap Distance: 0.5” maximum

2. Manufacturer, or equal:
   a. Interlogix #1078C; 3/4” dia., closed-loop contact switch, with leads
   b. Magnasphere #MSS-19CL; 3/4” dia., open loop contact switch, with leads
   c. Magnasphere #HSS-L2C; UL 264 Level 2 high security recessed contact switch, with leads

C. Gates

1. Description / Features
   a. Mounting: Surface
   b. Switch Type: Double Pole, Double Throw
   c. Gap Distance: 0.5” maximum
   d. Utilizes three independent Form C biased reed contacts
   e. Supervised loop with magnetic tamper feature

2. Manufacturer, or equal:
   a. Interlogix #2707A-L high security contact switch
   b. Magnasphere #HSS-L2S-000; UL 634 Level 2 surface mount contact switch, with leads

2.12 REQUEST-TO-EXIT SENSORS

A. General

1. Power: 12 or 24VDC, 35mA
2. Relay Output: 2 form “C” contacts
3. Adjustable relay latch time
4. Programmable retrigger or non-retrigger mode
5. Radio Frequency Interference (RFI) Immunity range from 26 to 1,000 MHz at 50 v/m

B. Manufacturer, or equal:

1. Bosch #DS160 with TP160 trim plate
2. Honeywell #IS320WH with IS310WHTP trim plate
3. Interlogix #RCR-REX motion sensor REX

2.13 DURESS BUTTONS

A. Under-Counter

1. Description / Features
a. Actuating lever, housing, and cover plate made of ABS fire-retardant plastic
b. Latching circuit with integrated LED
c. Switch Type: <normally open><normally closed>
d. Operating Voltage: 12VDC

2. Manufacturer, or equal:
   a. Ademco #269R; hold-up switch
   b. Interlogix #3040; panic switch

B. Wall Mount
   1. Description / Features
      a. Push button activation with key reset
      b. Latching circuit
      c. Unique protective housing to avoid accidental activation

   2. Manufacturer, or equal:
      a. STI #SS-2400E; ‘Stopper Station’ emergency button

2.14 INTERFACE RELAYS
   A. Refer to section 280000 for relay product requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. General
   1. Install equipment per manufacturer’s instructions.
   2. Install devices, stations, etc., square and plumb. Set flush-mounted units so that the face of the cover, bezel, or escutcheon matches the surrounding finished surface.
   3. Install so that there are no gaps, cracks, or obvious lines between the trim and the adjacent finished surface.
   4. Install to heights shown on drawings. Heights shall comply with applicable ADA requirements.
   5. Provide supervisory and end of line resistors as required.

B. ACAMS Software Package
   1. Install Windows Server and necessary client access licenses.
   2. Install ACAMS software package onto the ACAMS server, client workstation and integrate the software onto the network. Coordinate with the Owner’s IT department for network integration and other IP-related requirements.

C. ACAMS Control Panels (Reader Board, Input/Output Boards)
1. Install security equipment enclosures and wireway <per approved shop drawings> <to best suit the system layout and to properly manage wiring and connections>.

2. Ensure cuts, knock-outs, punches, etc. have no sharp edges.

3. Install power supplies and associated hardware in same location.

D. Card Readers

1. Install card reader to the rough-in, not directly to dry wall.

2. Connect readers directly to reader boards. Do not daisy chain readers together.

3. Cable Requirements:
   a. 6-conductor 22 AWG stranded shielded cable for signal.
   b. 1-pair 22AWG stranded shielded cable for device power.

4. Wire the card reader’s multi-color LED to indicate the following status of the door.
   a. Red = the door is secure (locked).
   b. Green = the door is unsecured (unlocked).
   c. Yellow = the card reader is not functioning (off-line/trouble), is processing a read request, or has denied access.

5. Wire/program the card reader to produce an audible beep tone to indicate to the user:
   a. The card was read and/or access was denied.
   b. Door is being held open and needs to be closed.

6. Enable optical tamper using configuration card. Wire the card reader’s optical tamper to spare input on the ACAMS reader module and jumper ground wire from door contact to provide a normally closed circuit.

E. Four-State End-of-Line (EOL) Supervision

1. Provide designated resistors at device end of line per manufacturer’s EOL recommendation to provide four-state supervision of security device and cabling.

2. Provide EOL supervision for alarm contacts, local alarm sounders, REXs, motion detectors, glass break detectors, help/duress buttons, and other designated security devices connected to the ACAMS and IDS.

3. Program ACAMS with the following states of supervision:
   a. Contact closed = Secure
   b. Contact open = Alarm
   c. Short circuit = Line fault
   d. Open circuit = Line fault

4. All NO/NC circuits shall be wired NC.

F. Door Hardware
1. Setup and conduct a door hardware coordination meeting.

2. Coordinate the installation and termination of the security cable with the installation of the electric door hardware and transfer hinge.

3. Route power to electrically controlled locks on Life-Safety doors through fire alarm output to automatically unlock the door upon activation of Fire/Life-Safety system. Connect fire alarm output to the disconnect relay on the associated 24VDC lock power supply.

4. Provide cable and terminate wires to delayed egress devices for monitoring activation of delayed egress by the ACAMS system.

G. Door Contacts
   1. Install 6” from latch side of door.

H. Duress Buttons
   1. Coordinate with architect and casework contractor to field determine exact placement of duress buttons prior to installation.

I. Request-To Exit Motion Detectors
   1. Install motion detector on the secured (protected) side of door. Install so that its detection pattern is not obstructed by exit signs, light fixtures or other objects that would interfere with proper operation.
   2. Adjust relay hold time and pattern to properly detect valid exit and allow shunting of door contact.
   3. Adjust detection sensitivity to pulse.
   4. Mask detector lens to provide a confined detection area limited to the door handle or push bar.
   5. Run wire inside structural tube steel frame into back of conduit body for cage locations.

J. Low voltage transformers
   1. Install low voltage transformer in security junction box to prevent tampering. Coordinate with Division 26 for location of outlet in junction box.

3.2 PROGRAMMING

A. Prior to the completion of construction, schedule a meeting with the Owner to determine the programming criteria. Document the results of the meeting and perform necessary programming to achieve the Owner’s requests. During the meeting, discuss the following:

   1. Access card levels and door groupings
   2. Alarm priority levels
   3. Schedules and time codes
   4. Holidays and holiday types (priorities)
   5. Action/responses from individual input points
   6. Standard and custom (expanded) reports
7. Defining alarm messages and standard response messages applicable to site

8. Routing of alarm points to operator’s workstations, printers, and history files

9. Owner’s graphics – develop sample graphic complete with icons and text. Alarms to appear on building floor plans depicting the nature and location of alarms. Review and revise graphic layout as required by Owner.

10. System database backup procedures

11. Video integration camera call-up

B. Program and setup the system such that no additional programming other than entering new access cards is required. Include setup of available features of the software.

C. Import Owner’s cardholder database.

D. Using CAD drawing files of floor plans, perform the following relative to system graphics:
   1. Delete non-applicable drawing layers and details to arrive at simple floor plans of the building as built.
   2. Convert drawings to a graphic file format compatible with the Owner’s access control and alarm monitoring system.
   3. Load drawing files into the system.
   4. Apply new and predefined icons and other points on each graphic to indicate point and control status.
   5. Link graphic images/icons to represent reader, monitor, alarm initiating devices, and control points.
   6. Program device icons on plans with functionality.
   7. Create camera call-up events.
   8. The point names shown on the as-built drawings shall match the system point schedule.

E. Program ACAMS such that alarm events generate email notification to offsite addresses via the Internet. Also, as required by the Owner, program ACAMS such that alarm events generate pages.

F. Program customized client workstation log-ins (restrict functions by user privileges).

G. Program routing of monitor and control points. Route activations and restore messages to one or more of the following locations as directed by the Owner’s Representative:
   1. One or more system workstations
   2. One or more system printers
   3. One or more alphanumeric pagers
   4. History files in addition to the above
   5. History files only
H. Program the system such that reliance on a remote host for routine building operations, such as scheduled door commands and conditional events, are minimized to the greatest extent possible and decisions are made at the local building controller.

I. System Operation, Alarm and Reporting Function: Program door control panel tamper switches to immediately report as a separate “tamper” point to the system resulting in an alarm condition displayed in both text and graphic form on the applicable workstation(s) and an alarm message transmitted to the appropriate pager(s).

J. Program the system in a manner that minimizes the amount of time required for the users to make updates and maintain the system on a daily basis especially updates that impact card holder record updates. Nested programs, such as reader groupings used in access codes, shall be used to the greatest extent possible such that single actions are required to update an entire card data population. If there is a question regarding the appropriate approach to programming, given the flexibility of most systems, contact the Engineer prior to any initial programming.

K. Perform 2 full system back-ups at completion of initial programming and deliver one copy to owner with letter of Transmittal explaining information included in back-up and brief description of recovery procedures. Label the second removable storage device and store onsite. Perform back-ups on a regular bases through the remainder of the project.

L. Customize menus with the assistance of the factory to “gray-out” features not used on project (such as elevator control).

M. Perform field software changes after the initial programming session to “fine tune” operating parameters and sequence of operations based on revised operating requirements.

N. Password management – refer to Section 280000.

3.3 EXTRA MATERIALS

A. Furnish extra materials to Owner. Produce a transmittal with an itemized list including quantities, recipient, and receipt date. Submit copy of Owner-signed transmittal with project closeout documents.

B. Place fuses inside each equipment/panel and power supply enclosure.

C. Turn over keys (equipment enclosures, low voltage power supplies, security junction boxes, rack cabinets, etc.) to the Owner. Produce a transmittal with an itemized list of keys, recipient, and receipt date. Submit copy of Owner-signed transmittal with project closeout documents.

3.4 TRAINING

A. Combine training on the ACAMS with training on the IDS (Section 281600) and the VSS (Section 28 23 00).

B. Training Requirements

1. Security Staff/System Operators:
   a. Prior to the first day of business at the new facility, provide 1 day of training, 4 hours per day.
   b. Three weeks later; provide 1 day of training, 4 hours per day.
c. Two months later, provide 1 day of training, 4 hours per day.

2. Administrators:
   a. Prior to the first day of business at the new facility, provide 1 day of training, 4 hours per day.
   b. Three weeks later; provide 1 day of training, 4 hours per day.
   c. Two months later, provide 1 day of training, 4 hours per day.

3.5 TESTING

   A. Test ACAMS in accordance with Section 28 08 00.

END OF SECTION
SECTION 28 16 00
INTRUSION DETECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Intrusion Detection System
   2. Door contact switches, and keypads
   3. Duress alarm stations
   4. Interface to other security systems with bi-directional communication

B. Products Furnished but not Installed under this Section:
   1. None

C. Products Installed but not Furnished under this Section:
   1. None

D. Products Specified but not Installed under this Section:
   1. None

E. Products Furnished and Installed under another Section:
   1. 120VAC power
   2. Analog phone line (for alarm dial out)
   3. Cellular service (for wireless backup)
   4. Network Connection (LAN / IP network / switches)

F. Related Sections:
   1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
   2. Section 28 00 00, “Basic Security Requirements”
   3. Section 28 05 13, “Security System Cabling”
   5. Section 28 08 00, “Security System Acceptance Testing”
   6. Section 28 13 00, “Access Control and Alarm Monitoring System”
   7. Section 28 23 00, “Video Surveillance System”

1.2 DEFINITIONS

A. Definitions as described in Section 28 00 00 shall apply to this section.
B. In addition to those Definitions of Section 27 00 00, the following list of terms as used in this specification defined as follows:

1. “A” and “AMP”: amperes (electrical current)
2. “ACAMS”: access control and alarm monitoring system
3. “IDS”: Intrusion Detection System
4. “LAN”: local area network
5. “LCD”: liquid crystal display
6. “REX”: request-to-exit
7. “VAC”: volts alternating current
8. “VDC”: volts direct current
9. “VSS”: Video Surveillance System

1.3 SYSTEM DESCRIPTION

A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working intrusion detection system installation, as described in these specifications and shown on the associated drawings.

B. System Overview:

1. The IDS is a network of distributed control panels and monitoring devices covering multiple areas that can be armed and disarmed independently of each other (alarm zones). Though interconnected, the IDS is a separate system from the ACAMS and is utilized for monitoring the building perimeter and designated interior spaces and for generating alarms.
2. The IDS consists of control panels, communicators, keypads, and field devices (refer to the drawings for locations).
3. Activation of the IDS shall notify the central monitoring station designated by the District.

C. Intrusion Detection System

1. Provide an IDS control panel with integrated digital communicator with connections to the LAN and to a dedicated outside phone line for remote monitoring by contracted central monitoring station and/or the Contra Costa Community College District Police Department. Provide wireless back up.
2. Provide 12 VDC power supplies dedicated to IDS to power control panels, and keypads. Provide battery backup associated with the power supplies system to keep the IDS operating for a minimum of 8 hours in the event of a utility power failure or emergency. Provide connection between power supplies and ACAMS to monitor power supply status and battery status. Program as unsupervised inputs for this purpose.
3. Provide expansion input modules to the IDS panels as necessary to support the field devices shown on the drawings.
4. Provide keypads to allow security and authorized staff arming and disarming of the IDS. Refer to drawings for quantity and locations. Keypad name brand shall match that of the control panel.

5. Program duress alarm inputs as 24 hours zones. Also refer to section 28 13 00 for duress button requirements.

6. Interface with ACAMS
   a. Connect designated ACAMS alarm outputs to the IDS control panel. Provide expansion input modules to the IDS panels as necessary to support input from the ACAMS.
   b. Provide software interface with the ACAMS.

7. Interface with VSS
   a. Provide software interface to the VSS platform. Program IDS software (and VSS software, as needed) such that alarm events (e.g., motion detected, etc.) make the video associated with that alarm device call up onto the main monitor and to mark the video recording.

D. Tamper Monitoring
   1. Provide tamper switches within each IDS control panel enclosure, IDS power supply enclosure, and associated wireway. Connect tamper switches to IDS control panel as monitor input points. Program these input as unsupervised inputs for this purpose. Coordinate this work with section 281300 (as this section also requires tamper switches location within control panels, power supplies, and wireway).

E. Extra Materials
   1. Furnish 10% spare parts of total installed the following (round up to the next complete device)
      a. Door contacts
      b. Duress button
   2. Fuses: 5 of each type of fuse

1.4 SUBMITTALS

A. Product Data: Submit product information for the intrusion detection systems, including:
   1. Controller
   2. Digital communicator
   3. Power supplies, with power supply sizing calculations
   4. Door contacts
   5. Duress alarms
   6. Cellular backup

B. Shop Drawings: Submit shop drawings containing the following:
   1. Device placement on floor plans
PART 2 PRODUCTS

2.1 IDS CONTROL PANEL

A. IDS control panel and associated components, when assembled, shall be UL listed for Central Station, Local, Police Station Connect, Holdup, Bank Safe and Vault, Mercantile Safe and Vault, and Household Burglar Alarm and Encrypted line Security when communicating via a network.

B. Description / Features:

1. Zones: up to 75 individually addressable alarm zones and 8 programmable areas/partitions
2. 8, minimum, on-board supervised inputs
3. Programmable and supervised relay outputs
4. Capacity for expansion and relay output modules
5. Dialout:
   a. Multiple telephone numbers storage/programmability
   b. Primary and duplicate dialouts (for main and alternate destinations)
   c. Capable of utilizing a dual phone line switcher to monitor 2 phone lines
   d. Phone line monitor (loop or ground start)
6. Ethernet/TCP/IP connectivity capable integrated digital communicator
7. Reporting: capable of automatically issuing test and status reports
8. Support RS-232 connectivity to third party devices for automation
9. Enclosure: UL listed, lockable

C. Manufacturer, or equal:

1. DSC PowerSeries #PC1864 8-64 zone control panel
   a. Accessories
      1) DSC #PC5200 Power Supply Module
      2) DSC #PC5204 Power Supply Module
   b. Expansion modules
      1) DSC #PC5100 Addressable Xone Expander
      2) DSC #PC5108 8-Hardwire Xone Expander
      3) DSC #PC 5208 Programmable Output Module
      4) DSC #TL250GS Internet Alarm Communicator

2.2 WIRELESS COMMUNICATOR
A. Wireless communicator shall operate on 3G/4G networks as a back-up communications channel if the wired phone port cannot function properly.

B. Wireless communicator shall meet the requirements for UL Commercial Fire, as well as UL Listed for Residential Burglary and Fire applications.

C. Wireless communicator shall meet applicable FCC requirements.

D. Enclosure:
   1. Metal
   2. Key-locking

E. Manufacturer, or equal:
   1. DSC #GS3060; Universal Wireless Alarm Communicator

2.3 SLOTTED WIRING DUCT

A. Refer to section 28 00 00 for slotted wiring duct product requirements.

2.4 WIREWAYS

A. Refer to section 28 00 00 for wireway product requirements.

2.5 POWER SUPPLIES

A. Refer to section 28 13 00 for power supply product requirements.

2.6 BATTERIES

A. Refer to section 28 13 00 for battery product requirements.

2.7 KEYPAD

A. Keypads shall the control panel.

B. Keypads shall come equipped with the following:
   1. LCD, 2 text lines (minimum), 16-character per line (minimum)
   2. Back lighted multi-key touch pad
   3. Keys light on entry or key press
   4. Audible annunciator (e.g., piezo buzzer) for audible feedback
   5. User-controlled/adjustable brightness and loudness

C. Keypads shall provide the ability to display for each detection point the following:
   1. Alarm
   2. Trouble
   3. Supervisory
   4. Faulted
   5. Custom text
D. Keypads shall display system-wide events, including:
   1. Local system test
   2. Sensor reset
   3. Event log

E. Manufacturer, or equal:
   1. DSC #PK5500 64-Zone LCD Full-Message Keypad

2.8 MAGNETIC CONTACT SWITCHES

A. Refer to section 28 13 00 for magnetic contact switch product requirements.

2.9 DURESS BUTTON

A. Refer to section 28 13 00 for product requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. General
   1. Install equipment per manufacturer’s instructions.
   2. Install devices, stations, etc., square and plumb. Set flush-mounted units so that the face of the cover, bezel, or escutcheon matches the surrounding finished surface.
   3. Install so that there are no gaps, cracks, or obvious lines between the trim and the adjacent finished surface.
   4. Install to heights shown on drawings. Heights shall comply with applicable ADA requirements.
   5. Provide supervisory and end of line resistors as required.
   6. At control panels, place and route wiring within wireway and enclosures; do not leave wiring exposed. Within enclosures, route wiring within wire management apparatus, such as slotted wiring duct.

B. IDS Control Panel and Power Supply
   1. Install IDS enclosure on wall within the ACAMS enclosures and wireway infrastructure.
   2. Install control panel and associated expansion boards within IDS enclosure. Include standoff brackets and other accessories to mount control boards to perforated panel within enclosure.
   3. Connect IDS control panel, expansion modules, etc., to associated power supply. Do not power IDS control panels via plug-in transformers.
   4. Install power supply and associated hardware adjacent to the IDS panel.
   5. Coordinate connection of phone jacks in IDS control panel (for communications to the contracted central station) to designated phone lines.

C. Wireless Back-Up:
1. Locate antenna (or antennas) as determined by site cell coverage conditions.

D. Keypads:

1. Coordinate final locations (exact placement) prior to rough-in and installation.

3.2 PROGRAMMING

A. Prior to the completion of construction, schedule a meeting with the Owner to determine the programming criteria. Document the results of the meeting and perform necessary programming to achieve the Owner’s requests. During the meeting, discuss the following:

1. Alarm priority levels
2. Zone or alarm point descriptions
3. User authority levels to arm/disarm areas or alarm partitions
4. Alarm notification requirements
5. Action/responses from individual input points
6. Defining alarm messages and standard response messages applicable to site
7. Interface requirement with ACAMS and VSS
8. Central station requirements, response from individual alarm points, password, and call list information
9. Auto arm/disarm schedules
10. Schedules and time codes
11. Holidays and holiday types (priorities)
12. Standard and custom (expanded) reports
13. System database backup procedures

B. Program and setup the system such that no additional programming other than entering new access codes is required.

C. Use the point names provided on the system point schedule.

3.3 EXTRA MATERIALS

A. Furnish extra materials to Owner. Produce a transmittal with an itemized list including quantities, recipient, and receipt date. Submit copy of Owner-signed transmittal with project closeout documents.

B. Place fuses inside each equipment/panel and power supply enclosure.

C. Turn over keys (equipment enclosures, low voltage power supplies, security junction boxes, rack cabinets, etc.) to the Owner. Produce a transmittal with an itemized list of keys, recipient, and receipt date. Submit copy of Owner-signed transmittal with project closeout documents.

3.4 TRAINING

A. Combine training on the IDS with training on the ACAMS (refer to section 28 13 00).

3.5 TESTING
A. Perform acceptance testing to the intrusion detection system in accordance with Section 28 08 00.
SECTION 28 23 00
VIDEO SURVEILLANCE SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes
   1. Video Surveillance System (complete system)
   2. Video Management System (software)
   3. Fixed cameras, lenses, mounts, and housings
   4. Panoramic cameras, lenses, mounts, and housings
   5. Power Supplies

B. Products Furnished But Not Installed Under This Section
   1. None

C. Products Installed But Not Furnished Under This Section
   1. None

D. Products Specified But Not Installed Under This Section
   1. None

E. Products Furnished And Installed Under Another Section
   1. 120VAC power
   2. Telecommunication cabling between telecom room and cameras; refer to Section 27 15 13.
   3. Network switches, with Power over Ethernet (PoE)

F. Related Sections
   1. Consult other Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
   2. Section 27 15 13, “Communications Horizontal Twisted Pair Cabling”
   3. Section 28 00 00, “Basic Security Requirements”
   4. Section 28 08 00, “Security System Acceptance Testing”
   5. Section 28 05 13, “Security System Cabling”
   7. Section 28 13 00, “Access Control and Alarm Monitoring System”
   8. Section 28 16 00, “Intrusion Detection System”

1.2 REFERENCES
A. Comply with the References requirements of Section 28 00 00.

B. In addition to the codes and standards listed in Section 28 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. Underwriters Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
   a. UL 497, “Protectors for Paired-Conductor Communication Circuits”

1.3 DEFINITIONS

A. Definitions as described in Section 28 00 00 shall apply to this Section.

B. In addition to those definitions in Section 28 00 00, the following list of terms as used in this specification defined as follows:

1. “A” and “AMP”: amperes
2. “ACAMS”: access control and alarm monitoring
3. “CCD”: charge-coupled device
4. “CMOS”: complementary metal oxide semiconductor
5. “DSP”: digital signal processing
6. “FC”: foot candles
7. “FPS”: frames per second
8. “IDS”: intrusion detection system
9. “KVM”: keyboard, video, mouse switch
10. “NAS”: network-attached storage
11. “NVR”: network video recorder
12. “PoE”: Power over Ethernet
13. “PTZ”: pan-tilt-zoom
14. “RAID”: redundant array of independent disks
15. “SAN”: storage area network
16. “VAC”: volts alternating current
17. “VDC”: volts direct current
18. “VMS”: video management system
19. “VSS”: video surveillance system

1.4 SYSTEM DESCRIPTION

A. General: Provide engineering, labor, materials, apparatus, tools, equipment, transportation, temporary construction, and special or occasional services as required to make a complete working video surveillance system, as described in this specification.
B. Video Surveillance System (VSS) Overview

1. The VSS is an enterprise-wide system generally comprised of fixed and panoramic cameras (with associated mounting apparatus, housings, cabling, etc.), video management system (software), and network video recorder and storage (hardware), that provides live video feeds for real-time surveillance and monitoring, recorded video for forensic analysis, and (in some cases) intrusion detection through video analytics.

2. The VSS serves as the video component of the facility’s overall security and safety program. Camera deployment and their respective field-of-views are strategically determined to coincide with points of security and access control as well as surveillance of open and high-security spaces.

3. The VSS interconnects and integrates with the ACAMS, IDS, and security/emergency communications system such that alarms/events generated within the other systems (generally carried through the ACAMS) cause VSS and the VMS to behave in a programmed manner.
   a. Program active icons in graphic user interface map in the ACAMS to allow camera call up based on the selection of icon.

C. Video Surveillance System (VSS) Scope

1. Video Management System Software: Provide VMS software package, including loading the VMS package onto the owner provided network video recorders. Coordinate with the Owner’s IT department for additional network video recorder requirements, storage requirements, network integration and other IP-related requirements. Provide VMS licenses in a quantity sufficient to support the project’s cameras and client workstations plus 20% (minimum, round up to nearest whole number).

2. Program the software system to meet the project requirements including programming recording input points, video call up, and other aspects of the system. Provide software interface to the ACAMS, IDS, and security/emergency communications system for alarm call up of cameras on predefined alarm events.

3. VMS Client Software: Provide (load and configure) VMS client software onto owner provided security workstation(s) for monitoring and viewing capabilities as shown on the drawings.

4. Provide cameras as shown on the drawings. Provide outdoor housing and mounts for exterior cameras.

5. Provide power supplies to supply power to cameras. Do not combine with ACAMS power supplies.

D. Tamper Monitoring: Provide one tamper switch within each camera dome enclosure to monitor the enclosure, including wiring, connection to ACAMS panel; and programming this tamper switch into ACAMS system as monitor input point.

E. Surge Protection: Regardless of who provides the cabling to outdoor cameras, ensure that the connection infrastructure for outdoor cameras receive proper protection against transient voltages. Installations shall comply with CEC 800.47, CEC 800.50 and CEC 800.90.

F. Extra Materials

1. Furnish 10% spare parts of total installed the following (round up to the next complete device):
a. Fixed cameras
b. Panoramic cameras
c. Power Supplies (specifically for VSS)
d. Relays

1.5 SUBMITTALS

A. Contractor Qualifications: Submit certifications for the manufacturers of the video surveillance equipment.

B. Product Data: Submit product information for components specified herein.

C. Shop Drawings:
   1. Device placement on floor plans.
   2. Point-to-Point Diagrams: Include wiring, points of connection and interconnecting devices between the following:
      a. Video surveillance system, monitors, and recording equipment
      b. Network Switches
      c. Devices connected to the system
      d. Miscellaneous control relays
      e. Conductors (identify conductors on the point-to-point diagrams with the same tag as the installed conductor)
   3. Camera Matrix: Submit as an Excel-compatible spreadsheet a matrix that includes each camera. The matrix, using the same ID as shown on the as-built drawings, shall include the following column headers, at a minimum:
      a. Device
      b. Device Identifier
      c. Location
      d. MAC Address
      e. IP Address
      f. IDF Room
      g. Network Switch
      h. Switch Port
   4. Block Diagram/Riser Diagram: Show the video surveillance system components, conduit, wire types, and sizes between them, including cabling interties between termination hardware.
   5. User interface graphics with icons and control buttons displayed.
   6. Custom mounting details

D. Submittal Requirements at Closeout:
1. As-Built Drawings (this may be combined with the ACAMS as-built drawings): submit as-built drawings that includes block diagram, riser diagram, wiring diagram, and reflected ceiling plans, floor plans and site plans showing camera locations (tagged with a unique ID per camera).

2. Camera Matrix: submit as an Excel-compatible spreadsheet a matrix that includes each camera. The matrix, using the same ID as shown on the as-built drawings, shall include the following column headers, at a minimum:
   a. Camera Type
   b. Camera ID (shall match the as-built plans)
   c. Camera manufacturer and model (shall match the approved product data submittal)
   d. Camera lens manufacturer and model (shall match the approved product data submittal)
   e. Location
   f. MAC Address
   g. IP Address
   h. IDF Room
   i. Network Switch
   j. Switch Port
   k. Maintenance requirements

3. O&M Manuals: submit O&M Manual as a binder or soft copy (bookmarked PDF) including the following, at a minimum:
   a. Product data – approved submittals (‘cleaned up’) and electronic
   b. As-built drawings, printed to 11x17 / tabloid landscape and electronic PDF files and native files (DWG or RVT) on storage media
   c. Warranty statement and service protocol (guidelines, contact numbers, etc.)
   d. Maintenance requirements
   e. Station Matrix, printed to 11x17 / tabloid landscape and electronic PDF files and native XLSX file on storage media
   f. Network switches and ports configuration information

1.6 WARRANTY

   A. Warrant the system for a period of one year from the date of system acceptance. The warranty shall cover system operation/performance, parts, and labor. Correct deficiencies within 24 hours of notification.

PART 2 PRODUCTS

2.1 VIDEO MANAGEMENT SOFTWARE

   A. Manufacturer
1. Salient Systems CompleteView Enterprise (to match existing standard)

2.2 CAMERAS

A. Fixed IP Interior Dome Camera
   1. Type: Color, vandal-resistant
   2. Power: PoE
   3. Imager: 1/3 inch format, unless otherwise noted
   4. Lens Mount: Accept a “CS” mount auto or manual-iris lens
   5. Resolution: 1080p HD
   6. Minimum Light Level: 0.1 fc imager illumination at full video, unless otherwise noted
   7. Lens: 3 to 9mm, unless otherwise noted
   8. Frame Rate: 30fps at H.264
   9. Manufacturer, or equal:
      a. Axis #P3346-V IP dome megapixel camera
      b. Sony
   10. Accessories, or equal:
      a. Axis #5502-781 ceiling mount kit
      b. Axis #5502-401 mounting plate
      c. Sony

B. Fixed IP Exterior Dome Camera
   1. Type: Color, vandal-resistant
   2. Power: PoE
   3. Imager: 1/3 inch format, unless otherwise noted
   4. Lens Mount: Accept a “CS” mount auto or manual-iris lens
   5. Resolution: 1080p HD
   6. Minimum Light Level: 0.1 fc imager illumination at full video, unless otherwise noted
   7. Lens: 3 to 9 mm, unless otherwise noted
   8. Frame Rate: 30fps at H.264
   9. Manufacturer, or equal:
      a. Axis #P3346-VE vandal resistant fixed dome with remote focus and zoom for outdoor use
      b. Sony
   10. Accessories, or equal:
a. Axis #T91A61 wall bracket

C. 180-Degree Camera

1. Video Compression format: H.264, MPEG-4, MJPEG
2. Power over Ethernet (IEEE 802.3af, Class 3)
3. Resolution: 8192 x 1536 – 12 Megapixel
4. Frame Rate: 5.2fps at H.264
5. Sensor: Four 1/3.2” progressive scan CMOS sensors
6. Vandal Resistant Dome
7. Type: Day/Night
8. Manufacturer, or equal:
   a. Arecont Vision #AV12186DN
9. Accessories, or equal:
   a. Arecont Vision #MD-WMT2 wall mount
   b. Arecont Vision #SV-JBA junction box
   c. Arecont Vision #SV-EBA junction box adapter plate

D. 360-Degree Camera

1. Video Compression format: H.264, MPEG-4, MJPEG
2. Power over Ethernet (IEEE 802.3af, Class 3)
3. Resolution: 10240 x 1920 – 20 Megapixel
4. Frame Rate: 3.5fps at H.264
5. Sensor: Four 1/2-1/2” progressive scan CMOS sensors
6. Vandal Resistant Dome
7. Type: Day/Night
8. Manufacturer, or equal:
   a. Arecont Vision #AV20365DN
9. Accessories, or equal:
   a. Arecont Vision #SV-EBA junction box adapter plate

2.3 LINE PROTECTORS

A. For use on data cables serving exterior cameras.

B. Manufacturer, or equal:

1. Transtector #1101-994
2. DITEK
PART 3 EXECUTION

3.1 PRE-CONSTRUCTION PLANNING

A. Prior to the completion of construction, schedule a meeting with the Owner and the Engineer to determine the system programming requirements, such as the following:

1. Camera naming/numbering
2. Field of view per camera
3. Settings for contrast, wide dynamic range, and auto-iris
4. Camera call-up and recording features, including video motion detection

B. Camera Locations

1. Prior to installation, coordinate/confirm camera locations. As needed, perform a field walk with the Owner. Obtain Owner signoff of camera locations and field of view per camera prior to installation.
2. Prior to rough-in construction, coordinate rough-in locations and requirements per camera.

3.2 INSTALLATION

A. Cameras

1. Field determine exact placement of cameras to ensure complete coverage.
2. Field determine fixed camera lens size to ensure complete coverage.
3. For exterior cameras, provide liquidtight flexible metallic conduit from junction box to camera housing and connect from below.

B. Exterior PTZ Cameras

1. Install transformers and cables for the defroster/heater in exterior camera housing separate from the power supply serving the camera. Do not connect the defroster/heater load to the camera power supply.
2. Connect no more than two defroster/heaters per power supply.

3.3 PROGRAMMING

A. Network Video Recorder

1. Connect the servers/storage to the Owner’s LAN/WAN to allow remote viewing from authorized workstations utilizing the VMS client viewing software. Configure the cameras and servers at the following initial requirements:
   a. Codec: H.264
   b. Resolution: 1080P (Minimum)
   c. Storage: 30 Days (minimum)
   d. Recording: Continuous
   e. Frame Rate: 12-15 fps
B. Document the results of the meeting and perform necessary programming to achieve the Owner’s requests.

C. Setup and program the system such that no additional programming required.

D. Use the camera naming convention agreed upon at in the programming meeting when programming point names into the system.

E. Perform two full system back-ups at completion of initial programming and deliver one copy to the Owner with a letter of transmittal explaining information included in back-up and brief description of recovery procedures. Perform back-ups on a regular bases through the remainder of the project.

3.4 TESTING

A. Test the video surveillance system in accordance with Section 28 08 00.

3.5 SYSTEM OPERATION CONFIRMATION

A. At 30 days after substantial completion, perform field review of video surveillance system software with the Owner to "fine tune" configuration settings for resolutions, recording, and frame rate to meet the storage and operational requirements.

END OF SECTION
SECTION 283111
FIREINDER XLS ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL
1.1.1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Related Sections:
   1. Division 01 General Requirements
   2. Division 07 Thermal and Moisture Protection, Section 078413 Penetration Firestopping
   3. Division 08 Openings, Section 087100 Door Hardware
   4. Potential divisions Div 13, 15, Division 21 Fire Suppression – Agent or pre-action/foam
   5. Division 23 Heating Ventilating and Air Conditioning Monitoring & Control (HVAC)
   6. Division 26 Electrical, Section 260500 Common Work Results for Electrical
   7. Division 28 Electronic Safety and Security, Section 283913 Local-Area Mass Notification Systems

1.1.1.2 SUMMARY
A. Section Includes:
   1. This specification describes an addressable Fire Detection and alarm signaling system. The control panel shall be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. The features and capacities described in this specification are required as a minimum for this project and shall be furnished by the successful contractor.
   2. The system shall be in full compliance with National and Local Codes.
   3. The system shall include all required hardware, raceways, interconnecting wiring and software to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein.
   4. All equipment furnished shall be new and the latest state-of-the-art products of a single manufacturer, engaged in the manufacturing and sale of analog fire detection devices for over 35 years.
   5. The system as specified shall be supplied, installed, tested and approved by the local Authority Having Jurisdiction, and turned over to the owner in an operational condition.
   6. In the interest of job coordination and responsibilities, the installing contractor shall contract with a single supplier for fire alarm equipment, engineering, programming, inspection and tests, and shall be capable of providing a “UL Listing Certificate” for the complete system.
   7. The system specified shall be that of Siemens Fire Safety which meets the project requirements. Other systems shall be submitted 10 days prior to bid date for approval by the Engineer. All systems approved shall meet all the requirements spelled out in this
specification. System approval shall be in writing by the Engineer and a copy shall be submitted with the system submittals.

1.1.1.3 ALLOCANCES
A. Specify products and work included in this Section that are covered by cash or quantity allowance. Do not include amounts. Insert descriptions of items in Part 2 or 3 to provide information affecting the cost of the Work that is not included under the allowance.

1.1.1.4 UNIT PRICES
A. Specify products and work included in this Section that are covered by unit prices. Do not include amounts. Insert descriptions of items in Part 2 or 3 to provide information affecting the cost of the Work that is not included under the unit price.

1.1.1.5 DEFINITIONS
A. ASME: American Society of Mechanical Engineers.
B. Broadcast Media: The speakers, radio, cell phone, and other media that will carry the selected message to the selected audience.
C. FACP: Fire alarm control panel.
D. FM: FM Global (Factory Mutual).
E. Furnish: To supply the stated equipment or materials.
F. Install: To set in position and connect or adjust for use.
G. LED: Light-emitting diode.
H. LOC: Local Operating Console.
I. MNS: Mass Notification System.
J. DMS: danger management systems (Management Station)
K. NFPA: National Fire Protection Association. Definitions in NFPA 72 apply to fire alarm terms used in this Section.
M. Provide: To furnish and install the stated equipment or materials.
N. UL: Underwriters Laboratories.

1.1.1.6 SYSTEM DESCRIPTION
A. Basic FireFinder XLS System - The system shall be a complete, electrically supervised fire detection and notification system, with a microprocessor based operating system having the following capabilities, features, and capacities:
   2. The control panel shall allow control and monitoring from a wireless handheld display device during maintenance, inspection and troubleshooting tasks
      a. The control panel shall allow complete control and monitoring from a wireless handheld display device during one-man testing of the system
      b. Testing supported should be real smoke testing of devices, automatically logged and made available in NFPA format reports. Manual test entries will not be accepted.
3. System shall provide an output port for monitoring purposes by external systems. Communications to an external system shall be RS-232 or RS-485 communications.

4. A single node or system shall support at least 50 remote transponders.

5. At least 64 nodes shall be networkable.

6. Communications between network nodes, each supporting an interactive, self-standing, intelligent local control panel, with system wide display. Any network node shall be capable of supporting a local system in excess of 4000 input/output points.

7. The local system shall provide status indicators and control switches for all of the following functions:
   a. Audible and visual notification alarm circuit zone control.
   b. Status indicators for sprinkler system water-flow and valve supervisory devices.
   c. Any additional status or control functions as indicated on the drawings, including but not limited to: emergency generator functions, fire pump functions, door unlocking and security with bypass capabilities.

8. The system shall be UL 1076 listed for monitoring and reporting security System Zoning.

9. Each intelligent addressable device or conventional zone on the system shall be displayed at the Central Alarm Receiving Terminal and the local fire alarm control panel by a unique alphanumeric label identifying its location.

10. The FireFinder XLS network shall have the ability to identify 4 levels of alarm for each of the 15 sectors of VFT-15 when used for Rack Level monitoring.

11. Audio shall be synchronized between nodes in order to take into account common areas.

12. The network, audio, and telephone risers between nodes shall be copper and support Class A loop configuration to allow communication to continue in the event of a fault.

13. Speakers shall have the ability to play coded audio tones.


15. Global and local command abilities.

16. Time-based control for entire system.

17. SVGA graphics support.


19. Event display by color and icon.

20. Full touch screen support.


22. The system shall have the ability for multiple command centers with full control of the fire detection. (ALL)

23. Integration with building automation Management Station

24. Integration with security system (ALL)
B. FireFinder XLS network compatibility with MXL feature(s) – FireFinder XLS system shall have the ability to be networked to MXL and MXL-IQ systems for purposes of annunciation and control.

C. FireFinder XLS shall have the ability to interface with existing MXL addressable devices. Replacement of existing field devices shall be unnecessary for proper system operation.

D. FireFinder XLS components shall have the ability to be mounted in MME-3, MME-3R, MLE-6, MLE-6R, MSE-2, MSE-2R or MBR-2 enclosures. Replacement of existing back boxes shall be unnecessary.

1.1.1.7 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with NFPA 72 and all contract documents and specification requirements.

B. All interconnections between this system and the monitoring system shall be arranged so that the entire system can be UL-Certificated.

C. System shall be a complete, supervised, non-coded, addressable multiplex fire alarm system conforming to NFPA 72.

D. The system shall have Style 7 circuits for each floor. The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until all initiating device(s) are reset and the fire alarm control panel is manually reset and restored to normal.

E. The system shall provide the following functions and operating features:

1. The FACP and auxiliary power panels shall provide power, annunciation, supervision and control for the system.

2. Provide Class B initiating device circuits.

3. Provide Style 7 signaling line circuits for the network.

4. Provide integrated fire and smoke management with firefighter’s override functions.

5. Provide Class B notification appliance circuits. Arrange circuits to allow individual, selective, and all-call voice and visual notification by zone. Notification Appliance circuits shall be zoned to correspond with the building fire barriers and other building features.

6. Stair-towers: Each Stair-tower NAC shall be separately zoned

7. Strobes shall be synchronized throughout the entire building.

8. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.

F. The system shall provide a field test function where one person can test the complete system or a specific area while maintaining full operational function of other areas not being tested. Alarms, supervisory signals and trouble signals shall be logged on the system printer and in system history during the walktest.

G. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.

H. Fire alarm signal initiation shall be by one or more of the following devices:
1. Manual pull station
2. Heat detector
3. FirePrint® Addressable area smoke detector
4. NEW Line of detectors including ASA line
5. Duct smoke detector
6. Automatic sprinkler system water flow switch

I. Activation of any system fire, security, supervisory, trouble, or status initiating device shall cause the following actions and indications at all network Person Machine Interfaces using basic graphics and multiple detail screens.

1. Fire Alarm Condition:
   a. Sound an audible alarm and display a custom screen/message defining the building in alarm and the specific alarm point initiating the alarm in a graphic display.
   b. Log into the system history archives all activity pertaining to the alarm condition.
   c. Print alarm condition on system printer.
   d. Sound the ANSI 117-1 signal with synchronized audible and synchronized strobes throughout the facility.
   e. Audible signals shall be silenced from the fire alarm control panel by an alarm silence switch. Visual signals shall be programmable to flash until system reset or alarm silencing, as required.
   f. A signal dedicated to sprinkler system water flow alarm shall not be silenced while the sprinkler system is flowing at a rate of flow equal to a single head.
   g. Activation of any smoke detector in a single elevator lobby or an elevator equipment room shall, in addition to the actions described, cause the recall of that bank of elevators to the main exit discharge and the lockout of controls. In the event of recall initiation by a detector in the main extinguishing discharge lobby, the recall shall be to the alternate floor as determined by the AHJ.
   h. Where indicated on drawings, heat detectors in elevator shaft and machine rooms shall activate an elevator power shunt trip breaker. The heat detectors shall be rated at a temperature below the ratings of the sprinkler heads in respective locations to insure that the power shall be shut off before activation of sprinkler system.
   i. System operated duct detectors as per local requirements shall accomplish HVAC shut down.
   j. Door closure devices shall operate by fire barrier area, by floor, by local requirements or by local requirements.

2. Supervisory Condition:
   a. Display the origin of the supervisory condition report at the local fire alarm control panel graphic LCD display.
   b. Activate supervisory audible and dedicated visual signal.
   c. Audible signals shall be silenced from the control panel by the supervisory acknowledge switch.
d. Record within system history the initiating device and time of occurrence of the event.

e. Print supervisory condition to system printer.

3. Trouble Condition

a. Display at the local fire alarm control panel graphic LCD display, the origin of the trouble condition report.

b. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.

c. Audible signals shall be silenced from the fire alarm control panel by a trouble acknowledge switch.

d. Trouble conditions that have been restored to normal shall be automatically removed from the trouble display queue and not require operator intervention. This feature shall be software selectable and shall not preclude the logging of trouble events to the historical file.

e. Trouble reports for primary system power failure to the master control shall be automatically delayed for a period of time equal to 25% of the system standby battery capacity to eliminate spurious reports as a result of power fluctuations.

f. Record within system history: the occurrence of the event, the time of occurrence and the device initiating the event.

g. Print trouble condition to system printer.

4. Security Condition:

a. Display at the local fire alarm control panel graphic LCD display, the origin of the security condition report. A dedicated security LED shall flash until the alarm has been acknowledged, then revert to a steady "ON" state.

b. The control system shall be capable of bypassing the alarms from an individual security system installed within selected areas. The pass code allowing this function shall be assignable to individual security personnel and each bypass action shall be logged to system history. Intrusion alarms occurring during a bypass period shall be logged to history and displayed but no audible alarm shall occur at the control panel.

c. Print security condition on system printer.

d. The Local Fire Control Panel shall be UL 1076 listed for security purposes.

1.1.1.8 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete manufacturer’s catalog data including supervisory power usage, alarm power usage, physical dimensions, and finish and mounting requirements.

B. Power calculations. Battery capacity calculations. Battery size shall be a minimum of 125% of the calculated requirement. Provide the following supporting information:

1. Supervisory power requirements for all equipment.

2. Alarm power requirements for all equipment.
3. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst-case condition plus 25% spare capacity.

4. Voltage drop calculations for wiring runs demonstrating worst-case condition.

5. NAC circuit design shall incorporate a 20% spare capacity for future expansion.

C. Submit manufacturer’s requirements for testing Device Loop Card (DLC) circuits and device addresses prior to connecting to control panel. At a minimum, the following tests shall be required: device address, the usage (alarm, supervisory etc), environmental compensation, temperature ratings for thermal detectors and smoke detector sensitivities. This requirement shall need approval before any wiring is connected to the control panel.

D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.
   3. Complete drawings covering the following shall be submitted by the contractor for the proposed system:
      a. Floor plans in a CAD compatible format at a scale of 1/8”=1’-0” showing all equipment and raceways, marked for size, conductor count with type and size, showing the percentage of allowable National Electric Code fill used.
      b. Provide a fire alarm system function matrix as referenced by NFPA 72, Figure A-7-5.2.2 (9). Matrix shall illustrate alarm input/out events in association with initiation devices. Matrix summary shall include system supervisory and trouble output functions. Include any and all departures, exceptions, variances or substitutions from these specifications and/or drawings at time of bid.

4. Installation drawings, shop drawings, and as-built drawings shall be prepared by an individual experienced with the work specified herein.

5. Incomplete submittals shall be returned without review, unless with prior approval of the Engineer.

E. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Light fixtures
   2. HVAC registers
   3. Fire protection equipment interfaces
   4. Special suppression system interfaces

F. Qualification Data: For qualified installer, applicator, manufacturer, fabricator, professional engineer, testing agency, and factory-authorized service representative.

G. Source quality-control reports.

H. Field quality-control reports.
I. Operation and Maintenance Data: For all fire alarm equipment, to include in operation and maintenance manuals.

J. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

K. Warranty: Sample of special warranty.

1.1.1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: The publications listed below form a part of this publication to the extent referenced. The publications are referenced in the text by the basic designation only. The latest version of each listed publication shall be used as a guide unless the authority having jurisdiction has adopted an earlier version.

1. FM Global (Factory Mutual (FM)): FM Approval Guide
2. National Fire Protection Association (NFPA)
   a. NFPA 70 National Electrical Code
   b. NFPA 72 National Fire Alarm Code
   c. NFPA 90A Standard For The Installation of Air Conditioning and Ventilating Systems
   d. NFPA 2001, Standard for the installation of Clean Agent fire suppression
   e. NFPA 13, and NFPA 25
   f. NFPA 720
   g. NFPA 101 Life Safety Code
   a. UL Fire Protection Equipment Directory
   b. UL Electrical Construction Materials Directory
   c. UL 38 – Manually Actuated Signaling Boxes for Use With Fire Protection Signaling Systems
   d. UL 228 – Door Holding Devices
   e. UL 268 - Smoke Detectors for Fire Protective Signaling Systems
   f. UL 268A - Smoke Detectors for Duct Application
   g. UL 464 - Audible Signal Appliances
   h. UL 497A – Secondary Protectors for Communications Circuits
   i. UL 521 - Heat Detectors for Fire Protective Signaling Systems
   j. UL 864 - Control Units for Fire Protective Signaling Systems
   k. UL 1076 – Security
1. UL 1283 – Electromagnetic Interference Filters
m. UL 1449 - Transient Voltage Surge Suppressors
n. UL 1971 - Signaling Devices for the Hearing Impaired
o. UL 2572 – Mass Notification Systems
4. Underwriters Laboratories Canada (ULC)
5. International Code Council
   a. International Building Code
   b. International Fire Code
6. State and Local Building Codes as adopted and/or amended by The Authority Having Jurisdiction, ADA, and/or State and local equivalency standards as adopted by The Authority Having Jurisdiction.
7. California State Fire Marshal
8. NY-MEA
9. City of Chicago approvals Class 1, Class II and High Rise
10. ISO 9002

B. Supplier Qualifications:
   1. The manufacturer of the supplied products must utilize multi-channel product distribution on a national basis to be considered for this bid. The manufacturer must have factory branches as well as independent distributors to allow the end user with the ability to utilize factory trained and authorized competitive service providers after system installation and commissioning.

   2. Provide the services of a factory trained and certified representative or technician, experienced in the installation and operation of the type of system provided. The representative shall be a minimum of NICET level 2 in Fire alarm and licensed in the State if required by law.

   3. The technician shall supervise installation, software documentation, adjustment, preliminary testing, final testing and certification of the system. The technician shall provide the required instruction to the owner's personnel in the system operation and maintenance.

   4. The factory trained service provider shall furnish evidence they have an experienced service organization, which carries a stock of spare and repair parts for the system being furnished.

   5. The manufacturer’s representative shall be authorized and trained by the manufacturer to calculate, design, install, test, and maintain the air sampling system and shall be able to produce a certificate stating such upon request.

C. Installer Qualifications:
   1. Before commencing work, submit data showing that the manufacturer has successfully installed fire alarm systems of the same scope, type and design as specified.

   2. The contractor shall submit copies of all required Licenses and Bonds as required in the State having jurisdiction.
3. The manufacturer representative shall employ on staff a minimum of one NICET level 3 or 4 designer and level 2 technician or a professional engineer, registered in the State of the installation.

4. The manufacturer’s representative shall be qualified by UL for certifying fire alarm systems if required by local jurisdiction. Upon completion of the installation, the contractor shall certify the final system meets UL ongoing maintenance.

5. Manufacturer’s representatives unable to comply with the provisions of qualification of installers shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

D. Testing Agency Qualifications: Qualified for testing indicated.

E. Source Limitations for fire alarm equipment: Obtain fire alarm equipment from single source.

F. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 50 or less.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Pre-installation Conference: Conduct conference at Project site.

1.1.1.10 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products to project site in original, unopened packages with intact and legible manufacturers’ labels identifying product and manufacturer, date of manufacture, and shelf life if applicable.
   B. Store materials inside, under cover, above ground, and kept dry and protected from physical damage until ready for use. Remove from site and discard wet or damaged materials.

1.1.1.11 PROJECT CONDITIONS
   A. Installed products or materials shall be free from any damage including, but not limited to, physical insult, dirt and debris, moisture, and mold damage.
   B. Environmental Limitations: Do not deliver or install products or materials until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.1.1.12 WARRANTY
   A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire alarm equipment that fail(s) in materials or workmanship within specified warranty period.
      1. Warranty Period: 2 year from date of Substantial Completion.

1.1.1.13 SERVICE AGREEMENT
   A. Technical Support: Beginning with Substantial Completion, provide software support for 1 year.
B. Upgrade Service: Update software, firmware, to latest version at project completion. Install and program software upgrades that become available within two years from date of substantial completion. Upgrading software, firmware shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.1.1.14 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1.1.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, all equipment shall be Siemens.

2.1.1.2 CONTROL PANEL

A. The fire alarm control panel shall be microprocessor-based using multiple microprocessors throughout the system, providing rapid processing of smoke detector and other initiation device information to control system output functions.

B. There shall be a watchdog circuit, which shall verify the system processors and the software program. Problems with either the processors or the system program the panel shall activate a trouble signal and reset the panel.

C. The system modules shall communicate with an RS 485 network communications protocol. All module wiring shall be to terminal blocks, which will plug into the system card cage. The control panel shall be capable of expansion via up to 100 SLC’s. Maximum system capacity shall be at least 2500 intelligent initiation devices per panel.

D. The system shall be capable of supporting unshielded wiring applications.

E. System Components:

1. The Device Loop Card (DLC) loop shall be capable of 252 intelligent devices distributed between two SLC circuits. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. Card shall not limit the address selection for sensors and input/output devices. This module shall also provide the signaling to the field devices for controlling the output of specific initiation devices. The on board microprocessor provides the DLC with the ability to function even if the main microprocessor fails. LEDs on the board shall provide annunciation for the following: Power, Card Failure, Network Failure, Gnd. Fault, Alarm, Trouble, Short Zone 1, Short Zone 2, Style 6 Open Zone 1, Style 6 Open Zone 2. This card shall plug into the system card cage. The card shall be model number DLC. [***circuit shall be capable of either input or output devices on any address without limitations. You can split the SLC in any ratio while maintaining short circuit isolation between the two legs of the circuit***]

2. The MXL Line Card (MLC) MLC for FireFinder XLS shall supply two SLC circuits utilizing Siemens “I” series, “IL” series, or “FP” series type intelligent addressable devices. Each MLC circuit shall support 0 to 60 addressable devices. Any trouble on one circuit shall not affect the other circuit. This module controls the signaling from the initiation devices reporting alarms and troubles to the control panel. This module shall also provide the signaling to the field devices for controlling the output of specific
initiation devices. The on board microprocessor provides the MLC with the ability to function even if the microprocessor fails. Each circuit shall have the ability to be wired in either a Class B or Class A configuration. When using Class B, T-tapping shall be permitted with no loss of supervision.

3. The Signal Line Circuits (SLC) shall be tested for opens, shorts and communications with all addressable devices installed before connection to the control panel. Systems without this capability shall have a test panel installed for initial testing to eliminate any possible damage, short term or long term, to the control panel. After initial testing replace the test panel and proceed with complete testing.

4. The Person Machine Interface (PMI-2) shall provide the system information on ¼ VGA Color LCD, with Touch Screen and LED display. Color is event specific based on regulatory requirements alarms-red, Supervisory-blue, security-magenta, trouble yellow Graphic user interface shall be menu driven with four (4) tabs showing the level and the total events for each tab. The tabs shall be: Alarm, Supervisory, Trouble and Security. At least five (5) events shall be shown simultaneously with two full lines of text message for each event. Each event shall have a 32 character custom message describing the event’s location. In addition, the time stamp and category of the event (i.e. Smoke, Water flow, Manual, etc) shall be displayed. When configured for Canadian operation, nine (9) events shall be displayed simultaneously. The LED displays shall indicate Power, Audibles On or Silenced, and Partial System Disabled. Systems not having the above LEDs shall provide separate LEDs within the control panel enclosure with appropriate labels. Selection buttons shall be backlit to aid the operator in the selection process. There shall be controls for scrolling throughout the event list. A button shall provide zoom in and zoom out control for the amount of information desired for a specific entry. The PMI shall be capable of monitoring the power supply loading and show available capacity for future expansion planning. The PMI shall provide a "More Info" button that can display addition device information such as the device type and device address. This More Info button shall also have the ability to display a detailed screen that provides the following:

   a. 200 character custom message associated with the group of the device and physical location in the building to alert personnel
   b. NFPA symbols representing fire service equipment in the area
   c. NFPA symbols representing hazards in the area
   d. NFPA symbols representing people in the area
   e. Number of devices in the associated group that are in alarm
   f. Name and phone number of emergency contact

5. The PMI-2 shall also have the ability to display a bitmap of a floor plan showing a “You are Here” symbol to tell the responding person exactly where they are in the building in relation to the event. Systems without this type of display shall supply a UL listed Graphics package with their system. The LCD shall have a keyboard screen to allow the technician ability to enter test and numbers for passwords or text changes. The PMI shall also have a Context Sensitive Help button. A globally configured PMI shall have the ability to view events, acknowledge, silence and reset networked FireFinder XLS and MXL systems. A globally configured PMI shall also have the ability to arm and disarm input and output points on FireFinder XLSs and MXLs. A globally configured PMI shall have the ability to be configured for control of the entire network, control of the local...
FireFinder XLS, or annunciation only. In a networked configuration, the Partial System Disable LED shall be indicative of all networked FireFinder XLSs. A globally configured PMI in a networked configuration shall have the ability to store 6 maps for every FireFinder XLS panel. At least 10 globally configured PMIs shall be supported in a network. The module shall be model number PMI.

6. The PMI International (International Version) shall provide Spanish, Portuguese or Canadian overlays. The PMI shall have the ability to be configured display text in Spanish, Portuguese, Hebrew or French while having the ability to swap in English text at anytime by a simple button press at the panel. Printers shall also have the ability to be configured for Spanish, Portuguese or French.

7. The Network Interface Card (NIC-C) shall provide either intranode (HNET) communication or internode (XNET) communication between enclosures. HNET and XNET communication shall support Class B Style 4 or Class A Style 7 wiring. NIC-C shall have the ability to be configured as an electrical repeater in order to increase communication distances. In addition, the NIC-C shall support CAN network communication. This card shall plug into the system card cage.

8. The Network Ring Card (NRC2) shall provide the ability to network FireFinder XLS systems in a Class A Style 7 Ring configuration. A single NRC per system (node) shall provide XNET peer-to-peer communication between FireFinder XLS systems allowing a total of 59 FireFinder XLS systems to be networked together. The NRC Card shall reside in the same enclosure as the PMI (Person Machine Interface). The NRC shall supervise the XNET ring network to ensure proper operation. The NRC shall also isolate a short-circuit fault to each individual segment of the XNET network and perform ground fault detection on its outgoing ring port. Any faults that are detected by the NRC shall be reported to the PMI for annunciation. The NRC shall isolate faults only to the individual node in trouble allowing communication on the network ring to continue. The NRC shall act as an electrical repeater for each XNET pair.

9. The System Status Display (SSD) shall provide a remote LED/LCD display that shows the local status of a FireFinder XLS system. An LED shall illuminate when alarm, supervisory, trouble and security events occur on the system. The SSD shall consist of a LCD display that has four lines of forty characters each that provides details of the event in alphanumeric form. The SSD-C and SSD-C-REM shall have three additional control buttons for acknowledging events, silencing audible circuits, and resetting the system. The SSD-C shall have an integral key switch that enables these control buttons to operate. The SSD-C-REM shall have the ability to be located within a locked cabinet, so no additional key switch is required for enabling the control buttons. The SSD and SSD-C shall be mountable in a 2-gang electrical box or 4-inch square electrical box. The SSD-C-REM shall be mountable in a model REMBOX2 or REMBOX4 Remote Lobby Enclosure. [Remote Display]

10. The Zone Indicating Card (ZIC-4A) shall contain four (4) NAC circuits rated at 4 amps each with power-limited outputs. The zone inputs for the card shall be isolated and independently supervised. There shall be at least three (3) unique codes/signals for each circuit based on system logic. These signals shall be Temporal Code 3 (Evacuation), Steady (such as “Recall”) and Alert (such as “Tornado Alert”). The card shall be listed for notification appliances, horns, bells, strobes, and speakers. The card shall also be listed for NFPA 13 Pre-Action Release, FE-227ea and NOVEC1230, Lease Line, and Municipal Tie. The card shall have the ability to wire the circuits Style Y or Style Z with outputs synchronized. The card shall have the following LEDs to provide trouble.
shooting and annunciation: Power, Card Failure, Network Failure, Gnd. Fault, Zone Activation or Trouble. This card shall plug into the system card cage. The card shall be model number ZIC-4A.

11. The Zone Indicating Card (ZIC-8B) shall contain eight (8) NAC circuits rated at 2 amps each with power-limited outputs. The zone inputs for the card shall be isolated and independently supervised. There shall be at least three (3) unique codes/signals for each circuit based on system logic. These signals shall be Temporal Code 3 (Evacuation), Steady (such as “Recall”), and Alert (such as “Tornado Alert”). The card shall be listed for notification appliances, horns, bells, strobes, and speakers. The card shall have the ability to wire the circuits Class B with outputs synchronized. The card shall have the following LEDs to provide trouble shooting and annunciation: Power, Card Failure, Network Failure, Gnd. Fault, Zone Activation or Trouble. This card shall plug into the system card cage. The card shall be model number ZIC-8B.

12. The Control Relay Card (CRC) shall contain six (6) fully programmable relays each rated at 4A, 30 VDC / 120 VAC resistive and 3.5A, 120 VAC 0.6 PF inductive. The card shall have the following LEDs to provide trouble shooting and annunciation: Power, Card Fail, HNET Fail, Relay 1 Active, Relay 2 Active, Relay 3 Active, Relay 4 Active, Relay 5 Active, and Relay 6 Active. The card shall be model number CRC-6.

13. The system card cage shall provide the mounting of all system cards, field wiring, and panel’s inter-card wiring. All power limited field wiring shall connect to the top of the card cage. All non-power limited internal wiring shall be connected to the bottom of the card cage. The card cage shall hold the systems cards and have capability of connecting multiple card cages to meet system demands. All terminal blocks are removable. The card cage shall be model number CC-2 or CC-5.

14. The Supervised Input Module (SIM-16) shall provide sixteen input circuits for remote system monitoring. Each input shall have the ability to be individually programmed as supervised (dry contact only) or unsupervised (general purpose input). The SIM-16 shall provide two programmable Form C relays. The SIM-16 shall be mountable in an enclosure that is remotely located from the main control panel. The SIM-16 shall be capable of supervising inputs 500 feet away.

15. The Output Control Module (OCM-16) shall provide sixteen open collector outputs to drive LEDs, incandescent lamps or external relays. There shall also be an additional output for a local audible and two inputs for momentary lamp test as well as local audible silence switches. The OCM-16 shall be mountable in an enclosure that is remotely located from the main control panel.

16. The Switch Control Module (SCM-8) shall be a supervised module with eight (8) switches and two LEDs per switch for controlling such items as speaker/strobe or telephone circuits. The switches shall also be used as generic inputs into the system. The SCM-8s shall be mounted in the door for easy access. These modules shall be connected to the control area network and have a maximum distance of 1000 ft. The module shall be model number SCM-8.

17. The LED Control Module (LCM-8) shall contain eight (8) groups of two (2) LED’s that shall be programmable by Zeus programming software. Eight LED’s shall be dual color capable that can be lighted either RED or GREEN flashing or steady. The remaining LEDs shall be Amber color, flashing or steady. A space shall be provided for labeling of LED functions. The label shall slide behind a clear protective membrane. The LCM-8s
shall be mounted in the door for easy access. These modules shall be connected to the control area network and have a maximum distance of 1000 ft.

18. The XLS digital Message card (XDMC) shall provide 300-message capacity with 100 minutes of recording time, and enables multi-layered and custom (pinpoint specific) messages. The card supports MP3 and WAV files, and broadcast up to two different messages simultaneously.

F. System response time from alarm to output shall be an average of three (3) seconds.

G. To expedite system troubleshooting, the system cards shall have ground fault detection and diagnostic LEDs by card.

H. All system cards and modules shall have Flash memory for downloading the latest module firmware.

I. Passwords:

1. Maintenance/Control Password - There shall be a 5 character password that a user must enter into the control panel in order to perform such maintenance- and control-related functions at the panel as:
   a. Arming and disarming devices.
   b. Activating, deactivating or modifying detector ASD and sensitivity settings.
   c. Activating and deactivating the History Log function, and deleting obsolete entries.
   d. Changing the system time and date.

2. Function Key Password - There shall be a 5 character password that a user must enter into the control panel in order to access the panel's Function Keys: touch screen buttons which perform custom-programmed system functions.

3. Reports Password - There shall be a 5 character password that a user must enter into the control panel in order to access the panel's reporting functions.

4. Walktest Password - There shall be a 5 character password that a user must enter into the control panel in order to access the panel's walk testing functions.

5. Acknowledge Silence Reset Password - There shall be a 5 character password that a system user must enter into the control panel in order to acknowledge events, turn silenceable audibles and visuals on and off, and perform panel resets.

J. Networking:

1. Digital communication capabilities supporting Style 4 (Class B) or Style 7 (Class A) communications using either DC digital or fiber optics technologies or combinations of both as required for the control panel to communicate with at least 50 remote transponders.

2. Digital communication capabilities supporting Style 4 (Class B) or Style 7 (Class A) communications using either DC digital or fiber optics technologies or combinations of both as required for the control panel to communicate with at least 59 network nodes.

3. Capability shall exist within the system to extend the network at any node. The system shall support a maximum of two network extension circuits in series on any system branch, extending the inherent distance limitations for network communications.

4. Communication protocol shall be of the CSMA/CD (carrier sense, multiple access, collision detect) type, eliminating delays incorporated into other protocols.
Communication techniques using token passing and requiring sensing of delays and regeneration of the token to re-establish network communications in the event of a fault shall not be acceptable.

K. Network Fiber Modules
1. Siemens model D2300CPS (multimode) and D2325CPS (single mode).
2. The network fiber interface modules shall be used to transmit RS-485 communications between the NCC, MXL and FireFinder XLS intelligent addressable fire alarm control panels. This includes the H-Net communications between FireFinder XLS panels, M-Net communications between MXL panels and X-Net communications between FireFinder XLS, MXL and the Management Station. Each module shall have power, transmit and receive status LEDs. The module can act as a repeater or end-point unit, in a daisy chain or star configuration. It shall be capable of being powered by 24VDC from the FireFinder XLS, MXL or Siemens model PAD-3/4 or PS-35 remote power supply. It can mount in the FireFinder XLS or MXL backbox, or can be mounted in a Siemens MBR-2 or MME-3 remote backbox. It can be located up to 5,000’ from the local FACP using 1 pair #18AWG twisted/shielded cable between the fiber interface module and the FACP.

L. Degrade Mode Alarm Activation:
1. Each data gathering panel shall support the ability to have its corresponding ZIC-4A, ZIC-8B and output devices on a DLC's loop activate when the DLC or CDC-4 is in Degrade Mode (has lost HNET communication with the PMI control panel). For example, if the device loop includes HFP detectors with relay bases and lamps, the relays and lamps will activate upon any system alarm when the DLC is in Degrade Mode.

M. Software Modifications: The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made. Systems that require the use of external programmers or change of EPROMs are not acceptable.

N. Logic: The fire alarm system shall support generic functions that deal with binary states (True/False, high/low), and produce desired outputs from one or more binary inputs (for example, alarm outputs from spot detectors, VESDA detectors, monitor modules or manual station inputs). AND, OR, NOT, Any N, D Latch, RS Latch, Time Base Control, Start Timer, Restart Timer are generic functions. Generic functions can be used as inputs to other function. The system shall support 2500 logic functions.

O. History: The system shall store 5000 events in history while in straight mode and 4500 in circular mode. In straight mode, trouble warnings will occur at 4000 and 4500 events. In circular mode, the control panels shall maintain a 2000 event Alarm History buffer, which consists of the 2000 most recent alarm events from the 4500 event history file.

P. Reports:
1. The system shall have the ability to provide configuration, status, queue and history reports.
2. Configuration reports shall provide the following information:
   a. Custom Messages
   b. Database information
   c. Entity type
3. Status reports shall provide the following information:
   a. Disarmed cards and devices
   b. ASD settings
   c. Sensitivity in %/foot
   d. Alarm threshold in %/foot
   e. Temperature in degrees C
   f. LOW TEMP DETECTOR Condition
   g. Walktest

4. Queue reports shall provide the following information:
   a. Alarm events with custom message and event time
   b. Supervisory events with custom message and event time
   c. Security events with custom message and event time
   d. Trouble events with custom message and event time

5. History reports shall provide Address, History Type, Description, Time & Date and Custom Message. The following event types shall be reported:
   a. Alarm events
   b. Supervisory events
   c. Security events
   d. Status changes
   e. Alarm verification
   f. Output activation from logic
   g. System Reset
   h. Event Acknowledgements
   i. Block Acknowledgements
   j. Audible Silence System Flag Changes
   k. Sensitivity Changes
   l. Arm / Disarm Commands
   m. Arm / Disarm By Logic
   n. Manual Output Overrides
   o. Output Overrides By Logic
   p. Time Changes
   q. Menu Logins
r. ASD Changes
s. Walktest
t. Device Input to Logic Activations/Deactivations

2.1.1.3 POWER SUPPLY
A. The system Power Supply/Charger (PSC) shall be a 12-amp supply with battery charger. The power supply shall be filtered and regulated. The power supply shall have a minimum of 1 power limited output rated at 4 amps, and a minimum of 1 output rated at 12 amps. The system power supply can be expanded up to 48 amps. The auxiliary power supply module shall share common batteries with the primary power supply. The system power supply shall have 4 relays, 1 for common alarm, one for common trouble and two programmable relays. The power supply shall be rated for 120/240V AC 50/60 Hz. The module shall be model number PSC-12 or
B. An extender power supply (PSX-12) shall be available for additional system power requirements
C. The battery charger shall be able to charge the system batteries up to 100 AH batteries. Battery charging shall be microprocessor controlled and programmed with an optional Thermistor for monitoring battery temperature to control charging rate shall be available.
D. The power supply shall have a plug for an AC adapter cable, which allows a technician to plug in a laptop computer for up or down loading program information or test equipment.
E. Transfer from AC to battery power shall be instantaneous when AC voltage drops less than 90% or brown out conditions it is not sufficient for normal operation.

2.1.1.4 SYSTEM ENCLOSURE
A. Enclosure needed to hold all the cards and modules as specified with at least spare capacity for extra cards. The enclosure outer door shall be either black or red. Provide the color as to the local AHJ requirements. The outer doors shall be capable of being a left hand open or a right hand open. The inner door shall have a left hand opening. System enclosure doors shall provide where required ventilation for the modules or cards in the enclosure.
B. Provide system enclosure for all amplifiers. Where required by the manufacturer, provide means for venting heat from the enclosure either by having enclosure sides and top vented or the doors vented.

2.1.1.5 SYSTEM PRINTERS

2.1.1.6 INTELLIGENT INITIATING DEVICES
A. General
   1. All initiation devices shall be insensitive to initiating loop polarity. Specifically, the devices shall be insensitive to plus/minus voltage connections.
B. Smoke Detectors – Standard Addressable H-Series
   1. The detector shall be guaranteed in writing not to false alarm when configured by the factory trained certified technician. The detector must provide up to 11 different environmental algorithms that allow the detector to provide superior false alarm immunity without the need for additional alarm verification delays.
2. The detector shall have a multicolor LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.

3. The multi-criteria smoke detector shall be an intelligent digital photoelectric detector with a programmable heat sensor. Detectors shall be listed for use as open area protective coverage, in duct installation, and sampling assembly installation and shall be insensitive to air velocity changes. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. So as to minimize the effort required by the installing and maintenance technician to appropriately configure the detector to ensure optimal system design, the detectors shall be programmable as application specific. Application settings shall be selected in software for a minimum of eleven environmental fire profiles unique to the devices installed location.

4. The detector shall be designed to eliminate the possibility of false indications caused by dust, moisture, RFI/EMI, chemical fumes, and air movement while factoring in conditions of ambient temperature rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report.

5. The intelligent smoke detector shall be capable of providing three distinct outputs from the control panel. The outputs shall be from an input of smoke obscuration, a thermal condition or a combination of obscuration and thermal conditions. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber.

6. The detector shall support the use of a relay, or LED remote indicator without requiring an additional software address. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.

7. For the detector where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.

8. The smoke detector shall be model number HFP-11.

9. Where required, there shall be available a programmable remote lamp configurable to remotely duplicate the on-board LED status of another system device. It shall be model ILED-H.

C. Smoke Detectors – C-Line Addressable FD-Series:

1. The smoke detectors must provide at least 3 environmental parameter sets to assist in device sensitivity configuration.

2. The detectors shall have a tri-color LED to streamline system maintenance/inspection by plainly indicating detector status as follows: green for normal operation, amber for maintenance required, red for alarm.

3. The detector shall be RoHS-compliant: it shall meet standards for Reduction of Hazardous Substances (RoHS) by reduction in lead content and other restricted substances.

4. The detectors shall be UL listed for operation in a 95% relative humidity (RH) environment.

5. The detectors shall be designed to eliminate calibration errors associated with field cleaning of the chamber.
6. The detectors shall support the use of a relay, or LED remote indicator without requiring an additional software address. Low profile, white case shall not exceed 2.5 inches of extension below the finish ceiling.

7. For the detectors where required, there shall be available a locking kit and detector guard to prevent unauthorized detector removal.

8. Available models:
   a. FDOT421. Multi-Criteria incorporating 1 Optical sensor and 1 Thermal sensor with an operating temperature range of 32°F to 100°F. Available in four parameter sets. Polarity insensitive installation wiring. Three color LED.
   b. FDO421. Photoelectric Smoke detector with an operating temperature range of 32°F to 120°F. Available in three parameter sets. Polarity insensitive installation wiring. Three color LED.

D. Heat Detectors – Addressable

1. Thermal Detectors shall be rated at 135 degrees fixed temperature and 15 degrees per minute rate of rise. Detectors shall be constructed to compensate for the thermal lag inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 135 degrees Fahrenheit. The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate of rise shall be made in system software and be changeable at any time without the necessity of hardware replacement.

2. The detectors furnished shall have a listed spacing for coverage up to 2,500 square feet and shall be installed according to the requirements of NFPA 72 for open area coverage. The thermal detector shall be model number HFPT-11.

3. Model FDT421 heat detector shall have the following temperature settings:
   a. Fixed temperature at 135°F, 145°F, 155°F, 165°F, 174°F
   b. Rate of Rise at 15°F/ min (8.3°C) at 135°F (57°C)
   c. Rate of Rise at 15°F/ min (8.3°C) at 174°F (79°C)
   d. Low temperature warning at 40°F (4.4°C)

E. Duct Smoke Detectors – Addressable

1. For duct detector applications, the smoke detector shall be an intelligent digital photoelectric detector. Detectors shall be listed for use as open area protective coverage, in duct installation and sampling assembly installation and shall be insensitive to air velocity changes.

2. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within four (4) seconds. The detector shall be mounted in a duct detector housing listed for that purpose. The duct detector shall support the use of a remote test switch, relay or LED remote indicator. The duct detector shall be supplied with the appropriate sampling tubes to fit the installation.

3. Where duct detectors are exposed to the weather a weatherproof enclosure shall be available. A NEMA-3R and NEMA-4X option shall be available. The duct housing cover shall include a test port for functional testing of the detector without cover removal. The duct housing shall include a cover removal switch capable of indicating cover removal status to the fire alarm control panel.

4. The intelligent duct detector shall have a model number from the FDBZ-Series. Where required there shall be available a duct housing with an on-board relay. Also where required, there shall be a standalone housing available with its own power supply and
test/reset switch that does not require connection to a fire alarm control panel. It shall be model FBZ492-PR.

5. Duct smoke detector housing shall allow use in duct systems with air velocity ranging from 100 to 4,000 feet per minute, within temperature ranges of 32°F to 120°F per minute, and with relative humidity ranging from 0 to 95%.

6. Duct Housings and Accessories:
   a. FDBZ492 Global Air Duct Housing for Conventional and Addressable Detectors
   b. FDBZ492-R Global Air Duct Housing for Addressable P2 Detectors with Relay Application
   c. FDBZ492-R Global Air Duct Housing for Conventional Detectors with Relay Application
   d. FDBZ492-PR Global Air Duct Housing for Conventional Detectors with Relay Application and Built-in Power Source
   e. FDBZ-WP Weather-Proof housing to accommodate all versions of Global Air Duct Housings
   f. FDBZ-RTL Remote Test Lamp for Conventional Detectors

F. Detector Bases – Addressable
   1. Detector bases shall be low profile twist lock type with screw clamp terminals and self-wiping contacts. Bases shall be installed on an industry standard, 4” square or octagonal electrical outlet box.
   2. Multi-Criteria Fire Detector Model FDOOTC441 shall be listed as providing CO detection in duct application.
   3. The model number for the standard base shall be DB-11 - 6” Version.
   4. The model number for the standard base shall be DB-11E - 4” Version.

G. Manual Pull Stations – Addressable
   1. Provide addressable manual stations where shown on the drawings, to be flush or surface mounted as required. Manual stations shall contain the intelligence for reporting address, identity, alarm and trouble to the fire alarm control panel. The manual station communications shall allow the station to provide alarm input to the system and alarm output from the system within less than four (4) seconds.
   2. The manual station shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Surface mounted stations where indicated on the drawings shall be mounted using a manufacturer's prescribed matching red enamel outlet box.
   3. The single action pull station shall be model number HMS-S.
   4. Where required, there shall also be available pull stations with break glass, capable of explosion proof installation, capable of weatherproof installation, reset key operation, and metal housings.

H. Addressable Interface Devices
   1. Addressable Interface Devices shall be provided to monitor contacts for such items as water-flow, tamper, and PIV switches connected to the fire alarm system. These interface devices shall be able to monitor a single or dual contacts. An address will be
provided for each contact. Where remote supervised relay is required the interface shall be equipped with a SPDT relay rated for 4 amps resistive and 3.5 amps inductive. The addressable interface modules shall be model number HTRI or FDCIO Series.

2. Where needed, a Conventional Zone Module shall connect to the Signal Line Circuit, which will allow the use of conventional initiation devices. This module shall have the ability to support up to 15 conventional smoke detectors and an unlimited number of contact devices. This module shall also be capable of monitoring Linear Beam detectors and conventional Flame detectors. Where required, there shall be an intrinsically safe detection solution for NEMA defined intrinsically safe installations (model DI-3IS with ISI-1) compatible with the conventional zone module. The module shall be model HZM.

3. Single Device Damper Monitoring and Control: A single HTRI switch input shall be able to monitor all 3 states of a damper – open, closed, and in transit. A single HTRI-R shall be able to fully control a damper (through the relay connected to the motor control) while also using its switch input for monitoring all 3 states of the damper.

4. Model FCIO422 addressable input/output module shall be insensitive to polarity and shall have capability for up to 4 separate inputs (Class B) or 2 separate Class A inputs and 4 separate outputs (Class B).

5. Model HCP addressable control point shall provide remote, independent control of any of the following:
   a. A notification appliance circuit (NAC)
   b. A telephone zone
   c. A speaker zone.

2.1.1.7 CONVENTIONAL INITIATION DEVICES

A. General:

1. The conventional detectors, via the tri-color LED shall provide an automatic UL-listed sensitivity monitoring arrangement in compliance with NFPA 72 sensitivity testing requirements.

2. The detector shall be UL listed for operation in a 95% relative humidity (RH) environment.

B. Photoelectric Smoke Detector shall be microprocessor operated providing indication of detector trouble. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble. The detector shall have supervised optics and shall provide an indication when detector requires service or is outside the normal sensitivity range. The detector shall be low profile and plug into a twist lock base. This detector shall be connected to a HZM module to provide a unique address. The photoelectric smoke detector shall be model number OP121.

C. Model OP121 Photoelectric Smoke Detector shall have listed operating temperature of 32°F to 120°F, 95% RH, 0 to 4000 ft/min air velocity. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble. The detector shall have supervised optics and shall provide an indication when detector requires service or is outside the normal sensitivity range. The detector shall be low profile and plug into a twist lock base.

D. Model OH121 Photoelectric and Thermal Detector shall have listed operating temperature of 32°F to 100°F, 95% RH, 0 to 4000 ft/min air velocity. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble. The detector shall have
supervised optics and shall provide an indication when detector requires service or is outside the normal sensitivity range. The detector shall be low profile and plug into a twist lock base.

E. Model HI121 Electronic Thermal Detector 135°F shall have listed operating temperature of 32°F to 100°F, 95% RH. The detector shall be listed for 2500 sq. ft. coverage. The detector shall be low profile and plug into a twist lock base. The detector shall have a tri colored LED, green for normal, red for alarm and amber for trouble.

F. Heat Detector explosion proof shall be rate compensation type detector rated for 140°F up to 450°F. Provide detector with temperature ratings for the appropriate application or as indicated on drawings. The detector shall mount in an explosion proof 4” electrical box. This detector shall be connected to a HZM module. The explosion proof thermal detectors shall be model number DT-EP Series.

G. Model DT-135R Conventional Thermal Fire Detectors shall be a dual heat detector using the rate of rise and fixed temperature principles. Rate of rise portion shall operate when a change of temperature exceeds 15 within 60 seconds. The fixed temperature portion shall operate at rated temperature. The detector shall mount to a standard electrical 4” box. This detector shall be connected to a HZM module.

H. Model DT-135F Conventional Thermal Fire Detectors shall operate at the rated temperature. The detector shall mount to a standard electrical 4” box. This detector shall be connected to a HZM module.

I. Model DT-135WP Weatherproof Conventional Thermal Fire Detectors shall use the rate compensation principle of detection. This type of detector compensates for the thermal lag inherent in heat detectors. The detector shall mount in a weatherproof 4” electrical box. This detector shall be connected to a HZM module.

J. Heat Detector 200°F Rate of Rise detector shall be a dual heat detector using the rate of rise and fixed temperature principles. Rate of rise portion shall operate when a change of temperature exceeds 15°F within 60 seconds. The fixed temperature portion shall operate at rated temperature. The detector shall mount to a standard electrical 4” box. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-200R.

K. Heat Detector 200°F Fixed temperature portion shall operate at the rated temperature. The detector shall mount to a standard electrical 4” box. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-200F.

L. Heat Detector 200°F Rate Compensated Weatherproof shall use the rate compensation principle of detection. This type of detector compensates for the thermal lag inherent in heat detectors. The detector shall mount in a weatherproof 4” electrical box. This detector shall be connected to a HZM module. The thermal detector shall be model number DT-200WP.

2.1.1.8 DEVICE PROGRAMMING UNIT

A. Device Programming Unit: The programming tool shall program the intelligent devices with addresses. The unit shall test the device to respond to its address. Dipswitches and rotary switches shall not be acceptable. The programmer shall be model DPU with carrying case.

2.1.1.9 NOTIFICATION APPLIANCES

A. Series LFS – Low Frequency Sounders

1. Notification appliances shall be Siemens Series LFS sounders.
2. Sounders shall be UL Listed under Standard 464 to meet the NFPA 72 (Fire) and NFPA 720 (CO Life Safety) requirements for sleeping rooms.

3. Low profile sounder-only design.

4. Selectable Tones (Temporal 3, Temporal 4, or Continuous)

5. Sounders capable of synchronized coded output from fire alarm control panel (FACP) notification appliance circuit when set to “Continuous”

B. Series ST Strobes

1. Visual-notification appliances shall be eSeries ST Strobe Appliances or approved equals

2. The Series ST shall meet and be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired) for Indoor Fire Protection Service

3. Strobe shall be listed for indoor use, and shall meet the requirements of FCC Part 15 Class B

4. Strobe appliances shall produce a flash rate of one (1) flash per second over the Regulated Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens

5. All inputs shall be compatible with standard, reverse polarity supervision of circuit wiring by a Fire-Alarm Control Panel (FACP)

6. Strobe Plates, when installed, shall be the ST-MC-RETRO Strobe Plate, and shall have the same electronic circuitry as the Series ST strobe.

7. The Series ST Strobe shall be of low-current design

8. The strobe intensity shall have field-selectable settings, and shall be rated per UL Standard 1971 for 15/30/75/95cd or 115/177cd for ceiling mount where Multi-Candela appliances are specified

9. The selector switch for selecting the candela shall be tamper resistant

10. The appliance shall be compatible with the DSC sync modules, FireFinder XLS panel, FC2025-2050, or PAD-3 power supply with built-in sync protocol when synchronization is required

11. The strobes shall not drift out of synchronization at any time during operation

12. If the sync module or Power Supply fails to operate, (i.e. - contacts remain closed), the strobe shall revert to a non-synchronized flash rate

13. The strobes shall be designed for indoor surface of flush mounting

14. The Series ST Strobe Appliances shall incorporate a Patented, Integral Strobe Mounting Plate that shall allow mounting to single-gang, double-gang, 4-inch square, 100mm European type back boxes, or the SHBBS Surface Back box

15. The Series ST Multi-Candela or Single-Candela Strobe Plate shall mount to either a standard, 4-inch square back box for flush mounting, or shall mount to the SBL2S back box for surface mounting

16. All notification appliances shall be backward compatible

C. Series MH115 AC Horn
1. AC horns shall be Series MH115, or approved equal
2. Models shall be UL 464 Listed for Fire Protective Service, and shall include a die-cast metal housing to protect the horn mechanism
3. Sound output shall be 95 dBA minimum at 10 feet
4. Mounting options shall include surface mounting for indoor or outdoor applications and semi-flush for indoor applications
5. All models shall have screw terminal inputs for in / out field wiring
6. The finish shall be textured enamel
7. All notification appliances shall be listed for “Special Applications”

D. Series MH – Mini Horn Appliances
1. Notification appliance shall be a MH115, or approved equal
2. Notification appliance shall be electronic, and shall have field-selectable settings for Temporal (Code 3) or continuous horn and support coded-systems operation
3. The anechoic sound pressure measurement on Temporal (Code 3) and Continuous Horn settings shall each be 87 dBA minimum at 24VDC
4. All models shall have provision for standard reverse polarity-type supervision and IN / OUT wiring using terminals that accept #12 to #18 AWG wiring
5. The appliances shall be mounted indoors, and mount on standard, single-gang electrical back boxes requiring no additional trim plates or adapters
6. All notification appliances shall be listed for “Special Applications”

E. Series HS – Horn and Horn Strobe Appliances
1. Audible / visual notification appliance shall be Series HS Horn Strobe and standalone Horn Appliances or approved equals
2. Series HS Horn Strobe and standalone Horn Appliances shall meet and be listed for:
3. UL Standard 1971 (Emergency Devices for the Hearing-Impaired for Indoor Fire Protection Service)
4. Standard 464 (Fire Protective Signaling)
5. Horn strobe shall be listed for indoor use and shall meet the requirement of FCC Part 15 - Class B
6. All inputs shall be compatible with standard reverse polarity supervision of circuit wiring by the Fire Alarm Control Panel (FACP)
7. Series HS Horn Strobe and standalone Horn Appliances shall have a minimum of three (3) field selectable setting for dBA levels, and shall have a choice of continuous or temporal (Code 3) audible outputs
8. Series HS shall be of low-current design
9. Strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Input Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens
10. Strobe intensity, where Multi-Candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
   a. 15/30/75/110cd
   b. 135/185cd
11. The selector switch for selecting the candela setting shall be tamper resistant
12. The appliance, when synchronization is required, shall be compatible with DSC Sync Modules or PAD-3 Power Supplies with built-in Proprietary Sync Protocol
13. The strobes shall not drift out of synchronization at any time during operation
14. The strobes shall revert to a non-synchronized flash-rate, if the sync module or Power Supply should fail to operate (i.e. – contacts remain closed)
15. All notification appliances shall listed for Special Applications:
   a. Strobes are designed to flash at 1-flash-per-second minimum over their “Regulated Input Voltage Range”
16. All candela ratings represent minimum-effective Strobe intensity, based on UL Standard 1971

F. Series NS / NH – NS Horn Strobes and NH Horns
1. Series NS appliances shall meet and be listed for UL Standard 1971(Emergency Devices for the Hearing-Impaired for Indoor Fire Protection Service)
2. Series NH Horn shall be UL Listed under Standard 464 (Fire Protective Signaling)
3. Horn strobe shall be listed for indoor use, and shall meet the requirements of FCC Part 15 - Class B
4. All inputs shall be compatible with standard reverse polarity supervision of circuit wiring by the Fire Alarm Control Panel (FACP)
5. Audible portion of the appliance shall have a minimum of two (2) field-selectable settings for dBA levels (90 and 95 dBA), and shall have a choice of continuous or temporal (Code 3) audible output
6. Strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Input Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens
7. Series NS shall be of low-current design
8. Strobe intensity – where ceiling mount, Multi-Candela appliances are specified – shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
   a. 15/30/75/95cd
   b. 115/117cd
9. The selector switch for selecting the candela setting shall be tamper resistant
10. The appliance, when synchronization is required, shall be compatible with DSC Sync Modules or PAD-3 Power Supplies with built-in Proprietary Sync Protocol
11. The strobes shall not drift out of synchronization at any time during operation
12. The strobes shall revert to a non-synchronized flash-rate, if the sync module or Power Supply should fail to operate (i.e. – contacts remain closed)

13. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation

14. Series NS Horn Strobes and NH horn shall incorporate a Universal Mounting Plate that shall allow mounting to a single-gang, double-gang, 4-inch square, 100mm European type backboxes, or the SHBBS Surface Backbox.

15. If required, an NATP (Notification Appliance Trim Plate) shall be provided

16. All notification appliances shall listed for Special Applications:
   a. Strobes are designed to flash at 1-flash-per-second minimum over their “Regulated Input Voltage Range”

17. All candela ratings represent minimum-effective Strobe intensity, based on UL Standard 1971

18. Series NS Strobe products are listed under UL Standard 1971 for indoor use with a temperature range of 32°F to 120°F (0°C to 49°C) and maximum humidity of 93% (± 2%)

19. Series NH horns are listed under UL Standard 464 for audible signal appliances (Indoor use only)

G. Series AS / AH – Audible Strobe Appliances and AH Audibles

1. Notification appliances shall be Series AS Audible Strobe appliances and Series AH Audible appliances or approved equals

2. Series AS Audible be listed for UL Standard 1971 (Emergency Devices for the Hearing-Impaired for Indoor Fire Protection Service)

3. Series AH Audible shall be UL Listed under Standard 464 (Fire Protective Signaling)

4. AS Audible and AH audible shall both meet the requirement of FCC Part 15 - Class B

5. All inputs shall be compatible with standard reverse polarity supervision of circuit wiring by the Fire Alarm Control Panel (FACP)

6. The audible portion of the appliance shall have a minimum of three (3) field-selectable settings for dBA levels, and shall have a choice of continuous or temporal (Code 3) audible outputs

7. Strobe portion of the appliance shall produce a flash rate of one (1) flash per second over the Regulated Input Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens

8. Series AS shall be of low-current design

9. Strobe intensity, where Multi-Candela appliances are specified, shall have field-selectable settings, and shall be rated per UL Standard 1971 for:
   a. 15/30/75/110cd
   b. 135/185cd

10. The appliance, when synchronization is required, shall be compatible with DSC Sync Modules or Cerberus™ PRO PAD-3 Power Supplies with built-in Sync Protocol
PAD-4 should be added to item #10

11. The strobes shall not drift out of synchronization at any time during operation

12. The strobes shall revert to a non-synchronized flash-rate, if the sync module or Power Supply should fail to operate (i.e. – contacts remain closed)

13. The appliance shall also be designed so that the audible signal may be silenced while maintaining strobe activation when used with synchronization

14. The Series AS Audible Strobe and Series AH Audible shall incorporate a Patented Universal Mounting Plate that shall allow mounting to a single-gang, double-gang, 4-inch square, 100mm European type backboxes, or the SHBBS Surface Backbox

15. All notification appliances shall listed for Special Applications:

16. Strobes are designed to flash at 1-flash-per-second minimum over their “Regulated Input Voltage Range”

17. All candela ratings represent minimum-effective Strobe intensity, based on UL Standard 1971

H. Series ZH & ZR – Strobes, Horns, Horn/Strobes

1. Audible/Visual notification appliances shall be listed for indoor use, and shall meet the requirements of FCC Part 15 - Class B

2. Appliances shall be listed under UL Standard 1971 (Standard for Safety Signaling Devices for Hearing Impaired) and UL Standard 464 (Fire Protective Signaling)

3. Appliances shall use a universal back plate, which shall allow mounting to a single-gang, double-gang, 4-inch-square, 4”-octal, or a 3-1/2”-octal backbox

4. Two-wire appliance wiring shall be capable of directly connecting to the mounting back plate

5. Continuity check shall occur for entire NAC circuit prior to attaching any audible / visual-notification appliances

6. Dust cover shall fit and protect the mounting plate

7. Dust cover shall be easily removed when the appliance is installed over the back plate

8. Removal of an appliance shall result in a trouble condition by the Fire Alarm Control Panel (FACP)

9. Strobe appliances shall produce a minimum flash rate of 60 flashes per minute (1 flash per second) over the Regulated Input Voltage Range, and shall incorporate a Xenon flashtube enclosed in a rugged Lexan® lens

10. Strobes shall be available with two or four field-selectable settings in one unit, and shall be rated – per UL 1971 – for up to:

   a. 185cd for wall mounting
   b. 177cd for ceiling mounting

11. Strobes shall operate over an extended temperature range of 32°F to 120°F (0°C to 49°C), and be listed for maximum humidity of 95% RH

12. Strobe inputs shall be polarized for compatibility with standard reverse-polarity supervision of circuit wiring by a Fire Alarm Control Panel (FACP)
13. Audibles and Audible/Strobe Combinations
   a. Horns and horn / strobes shall be listed for Indoor use under UL Standard 464
   b. Horns shall be able to produce continuous synchronized output or a temporal code-3 synchronized output
   c. Horns shall have at least 2 sound-level settings of 90 and 95 dBA
   d. Synchronization Modules
      e. The strobe portion, when synchronization is required, shall be compatible with DSC sync modules, FireFinder XLS panel, FC2025-2050 or PAD-3 power supply with built-in sync protocol (Also PAD-4)

14. The strobes shall not drift out of synchronization at any time during operation

15. Audibles and strobes shall be able to synchronize on a 2-wire circuit with the capability to silence the audible, if required

16. Strobes shall revert to a non-synchronized flash-rate, if the sync module or Power Supply should fail to operate (i.e. – contacts remain closed)

I. All notification appliances shall be listed for Special Applications: Strobes are designed to flash at 1-flash-per-second minimum over their “Regulated Input Voltage Range

2.1.1.10 MAGNETIC DOOR HOLDERS

Retain this article unless door holders are specified in Section 087100 "Door Hardware." If retaining, coordinate "Description" Paragraph below with Drawings and with Section 087100 "Door Hardware."

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
   1. Electromagnets: Require no more than 3 W to develop 25-lbf (111-N) holding force.
   2. Wall-Mounted Units: Flush mounted unless otherwise indicated.

Retain one of two "Rating" subparagraphs below.
   3. Rating: 24-V ac or dc.
   4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.1.1.11 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
   1. Mounting: Flush Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.
2.1.1.12 ADDRESSABLE INTERFACE DEVICE

A. General:
   1. Include address-setting means on the module.
   2. Store an internal identifying code for control panel use to identify the module type.
   3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

Retain "Integral Relay" Paragraph below for elevator recall, shutdown duty, or other relay functions.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall to circuit-breaker shunt trip for power shutdown.
   1. Allow the control panel to switch the relay contacts on command.
   2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:
   1. Operate notification devices.
   2. Operate solenoids for use in sprinkler service.

2.1.1.13 DIGITAL COMMUNICATOR

A. The Multi-Point Digital Alarm Communicator shall be UL864 listed to provide point identification of alarm, supervisory, security and trouble events to a Central or Remote Receiving Station. The MDACT shall support the following:
   1. Ademco Contact ID or SIA protocol
   2. Ademco Contact ID selection shall provide the ability to transmit events for up to 999 individual points
   3. SIA selection shall provide the ability to transmit events for up to 2040 individual points
   4. Programming of accounts and phone numbers
   5. Dual phone line interface
   7. Automatic 24-hour test
   8. Shall Interface with Internet Protocol Communication Dialer
   9. Shall Interface with Radio Communication Dialer

PART 3 - EXECUTION

3.1.1.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.1.1.2 INSTALLATION

A. Perform work in accordance with the requirements of NFPA 70, NFPA 72, NFPA 13, NFPA 2001, and NECA 1-2006, Standard of Good Workmanship in Electrical Contracting.

B. Fasten equipment to structural members of building or metal supports attached to structure, or to concrete surfaces.

C. In the event that limited energy cable installation is allowed, all cable runs shall be run at right angles to building walls, supported from structure at intervals not exceeding 3 feet and where installed in environmental air plenums, be rated for such use and tied/supported by components listed for environmental air plenums installation.

D. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.

E. Wiring Integrity and survivability requirements – Specify on shop drawings per NFPA 72, Chapter 12

F. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

G. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

H. Provide primary power for each panel from normal/ emergency panels as indicated on the Electrical Power Plans. Power shall be 120V AC service, transformed through a two-winding, isolation type transformer and rectified to low voltage DC for operation of all circuits and devices.

3.1.1.3 BOXES, ENCLOSURES AND WIRING DEVICES

A. Boxes shall be installed plumb and firmly in position.

B. Extension rings with blank covers shall be installed on junction boxes where required.

C. Junction boxes served by concealed conduit shall be flush mounted.

D. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers installed. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.

E. "Fire alarm system” decal or silk-screened label shall be applied to all junction box covers.

F. Panel enclosures shall be installed to meet clearance requirements per NFPA 70 and local codes. Minimum requirements shall be 3 foot clearance in front of the enclosure

3.1.1.4 CONDUCTORS

A. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.

B. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer.
C. Wiring for strobe and audible circuits shall be a minimum 14 AWG, signal line circuits; 18 AWG twisted shielded, speaker circuits; 18 AWG twisted, telephone circuit; 18 AWG twisted shielded.

D. Wiring for clean agent and pre-action releasing shall be in accordance with NFPA 13 and NFPA 2001

E. All splices shall be made using solder-less connectors. All connectors shall be installed in conformance with the manufacturer recommendations.

F. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.

G. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.

H. Wiring within sub panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

3.1.1.5 DEVICES

A. Relays and other devices to be mounted in auxiliary panels are to be securely fastened to avoid false indications and failures due to shock or vibration.

B. Wiring within panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance.

C. All devices and appliances shall be mounted to or in an approved electrical box.

3.1.1.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Permanently label or mark each conductor at both ends with permanent alphanumeric wire markers.

C. A consistent color code for fire alarm system conductors throughout the installation.

3.1.1.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Testing General:

1. All Alarm Initiating Devices shall be observed and logged for correct zone and sensitivity. These devices and their bases shall be tagged with adhesive tags located in an area not visible when installed, showing the initials of the installing technician and date.

2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance, current and voltage readings shall be made as work progresses.

3. The acceptance inspector shall be notified before the start of the required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.

4. Test reports shall be delivered to the acceptance inspector as completed.
5. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:
   a. Ladders and scaffolds as required to access all installed equipment.
   b. Multi-meter for reading voltage, current and resistance.
   c. Two-way radios and flashlights.
   d. A manufacturer recommended device for measuring air flow through air duct smoke detector sampling assemblies.
   e. Decibel meter
   f. Intelligibility meter
   g. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the authority having jurisdiction.

3.1.1.8 ACCEPTANCE TESTING

A. A written acceptance test procedure (ATP) for testing the fire alarm system components and installation will be prepared by the engineer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits, and programming.

B. A program matrix shall be prepared by the installing contractor referencing each alarm input to every output function affected as a result of an alarm condition on that input.

C. The installing contractor prior to the ATP shall prepare a complete listing of all device labels for alphanumeric annunciator displays.

D. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the owner and test results recorded for use at the final acceptance test.

E. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly. The letter shall also state that all panel functions were tested and operated properly. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

F. Testing requirements for pre-action systems in accordance with NFPA13

G. Testing requirements and room integrity testing for clean agent suppression systems refer to NFPA 2001.

H. Final Acceptance Test: Notify the owner in writing when the system is ready for final acceptance testing. Submit request for test at least 30 calendar days prior to the test date. A final acceptance test will not be scheduled until the loop resistance test results, and the submittals required in Part 1 are provided to the owner. Test the system in accordance with the procedures outlined in NFPA 72.
   1. Verify that the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
2. Test each initiating and indicating device and circuit for proper operation and response. Disconnect the confirmation feature for smoke detectors during tests to minimize the amount of smoke or test gas needed to activate the detector.

3. Test the system for all specified functions in accordance with the contract drawings and specifications and the manufacturer's operating and maintenance manual.

4. Visually inspect all wiring

5. Verify with all parties the required survivability of wiring, raceways, and junction boxes

6. Verify that all software control and data files have been entered or programmed into the FACP.

7. Verify that Shop Drawings reflecting as-built conditions are accurate. Upon final approval by all parties, provide two sets of AS-built documents in a cabinet adjacent to the main FACP or designated area within the building. Per NFPA 72 7.7.2 Measure the current in Notification appliance circuits under full load to assure that there is the calculated spare capacity for every circuit.

8. Measure voltage readings for circuits to assure that voltage drop does not exceed specified design requirements.

9. Field Verify and measure the voltage drop at the most remote appliance on each notification appliance circuit.

I. The acceptance inspector shall use the system record drawings in combination with the documents specified in this specification during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:

1. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
   a. Open, shorted and grounded signal line circuits.
   b. Open, shorted and grounded notification, releasing circuits.
   c. Primary power or battery disconnected.

2. System notification appliances shall be demonstrated as follows:
   a. All alarm notification appliances actuate as programmed
   b. Audibility and visibility at required levels.
   c. VOICE Intelligibility measurements at the time of commissioning and with a follow up inspection six months after substantial competition to verify conditions

3. System indications shall be demonstrated as follows:
   a. Correct message display for each alarm input at the control display.
   b. Correct annunciator light for each alarm input at each annunciator and graphic display as shown on the drawings.
   c. Correct history logging for all system activity.

4. System off-site reporting functions shall be demonstrated as follows:
   a. Correct zone transmitted for each alarm input
b. Trouble signals received for disconnect

5. Secondary power capabilities shall be demonstrated as follows:
   a. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
   b. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
   c. System battery voltages and charging currents shall be checked at the fire alarm control panel.

3.1.1.9 DOCUMENTATION
   A. System documentation shall be furnished to the owner and shall include but not be limited to the following:
      1. System record drawings and wiring details including one set of reproducible drawings, and a CD ROM with copies of the record drawings in DXF format for use in a CAD drafting program.
      2. System operation, installation and maintenance manuals.
      3. System matrix showing interaction of all input signals with output commands.
      4. Documentation of system voltage, current and resistance readings taken during the installation, testing and ATP phases of the system installation.
      5. System program showing system functions, controls and labeling of equipment and devices.

3.1.1.10 PROTECTION
   A. Remove and replace devices and panel components that are wet, moisture damaged, or mold damaged.

3.1.1.11 DEMONSTRATION
   A. Instructor: Include in the project the services of an instructor, who shall have received specific training from the manufacturer for the training of other persons regarding the inspection, testing and maintenance of the system provided. The instructor shall train the employees designated by the owner, in the care, adjustment, maintenance, and operation of the fire alarm system.
   B. Training sessions shall cover all aspects of system performance, including system architecture, signaling line circuit configurations, sensor and other initiating device types, locations, and addresses, fire alarm control panel function key operation, and other functions as designated by the owner.
   C. Required Instruction Time: Provide 16 hours of instruction after final acceptance of the system. The instruction shall be given during working hours on such dates and times as are selected by the owner. The instruction may be divided into two or more periods at the discretion of the owner. One training session shall be videotaped by the contractor. Required owner format shall be delivered to the owner.
   D. Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a conspicuous location observable from the FACP. The card shall show those steps to be taken by an operator when a
signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory and trouble. The instructions shall be approved by the owner.

E. Comprehensive system troubleshooting training shall be provided for a single individual designated by the owner. This session shall be separate and distinct from the above described sessions.

F. All training sessions shall be conducted following final system certification and acceptance. Three additional training sessions shall be provided for all security personnel on all shifts six months after final system certification.

G. All training sessions shall be conducted by an authorized fire alarm system distributor representative, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided.

END OF SECTION
SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 GENERAL

1.1 SUMMARY
A. Clearing vegetation, debris, trash and other materials within limits indicated.
B. Grubbing of vegetation within limits indicated.

1.2 RELATED DOCUMENTS
A. Geotechnical Report.
B. Caltrans Standard Specifications.
   Section 16, Clearing and Grubbing.

PART 2 PRODUCTS
NOT USED

PART 3 EXECUTION

3.1 PREPARATION
A. Locate and clearly flag vegetation to remain or to be relocated.

3.2 RESTORATION
A. Repair or replace vegetation indicated to remain that is damaged by construction operations, as directed by the Owner.
B. Employ a qualified arborist, licensed in jurisdiction where the Project is located, to submit details of proposed repairs and to repair damage to shrubs.

3.3 CLEARING AND GRUBBING
A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
B. Remove trash, debris, logs, concrete, masonry and other waste materials.
C. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
D. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18-inches below subgrade.
E. Use only hand methods for grubbing within drip line of remaining trees.

END OF SECTION
PART 1  GENERAL

1.1  SUMMARY

A. Protecting existing trees and vegetation to remain.
B. Trimming tree limbs and roots.
C. Removing trees as designated.

1.2  DEFINITIONS

B. CAL-OSHA: California Occupational Safety and Health Administration.

1.3  QUALITY ASSURANCE

A. Do not remove or prune trees without first securing a permit from the appropriate agency.
B. Prune to the standards of the International Society of Arborists and to ANSI 300.

PART 2  PRODUCTS

NOT USED

PART 3  EXECUTION

3.1  PREPARATION

A. Locate and clearly flag trees to remain or to be relocated.

3.2  TREE PROTECTION

A. Erect and maintain temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
B. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
C. Do not permit vehicles or equipment within drip line of remaining trees.
D. Do not excavate within drip line of remaining trees, unless otherwise indicated.
E. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation edge as possible.
Cover exposed roots with burlap and water regularly.

Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

Coat cut faces of roots more than 1-1/2-inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.

3.3 TREE PRUNING

A. Prune trees to balance the crown, and eliminate hazards. Perform main work to reduce sail effect through thinning, reducing end weights, shortening long heavy limbs, removing deadwood, weak limbs and sucker growth. Prune limbs back to an appropriate lateral branch.

B. Make final cuts at the outer edge of the branch collar in accordance with the arborist’s recommendations.

C. Perform pruning work in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards.

3.4 ROOT PRUNING

A. Do not cut tree roots greater than 3-inch in diameter and less than 12-inches below ground level without approval of the Owner.

B. Cut tree roots cleanly, as far from the trunk as possible, and not underneath any area where walkways are to be constructed. Root pruning shall be to a depth of 18-inches.

C. Tree root prune using a Vermeer root-cutting machine. Obtain the Owner’s approval before using alternate equipment or techniques.

D. Complete tree root pruning prior to any excavation adjacent to the tree.

E. Do not expose tree roots to drying out. Cover root ends with soil or burlap and keep moist until the final backfill is completed.

3.5 TREE REMOVAL

A. Remove trees designated for removal prior to the construction of new improvements.

B. Perform tree removal work in a safe and proper manner, adhering to CAL-OSHA and ANSI Standards.

C. Remove or grind stumps to a minimum of 18-inches below finish subgrade. Remove surface roots to this depth within 24-inches of the tree trunk.

3.6 RESTORATION

A. Repair or replace trees indicated to remain that are damaged by construction operations, as directed by the Owner.

B. Employ a qualified arborist, licensed in jurisdiction where the Project is located, to submit details of proposed repairs and to repair damage to trees.

C. Replace trees that cannot be repaired and restored to full-growth status, as determined by the Owner.
SECTION 31 14 00
EARTH STRIPPING AND STOCKPILING

PART 1  GENERAL

1.1  SUMMARY

A. Stripping of topsoil within limits indicated.

B. Geotechnical recommendations shall be implemented and geotechnical consultant shall observe site after stripping procedure.

C. Execution listed below is acceptable unless otherwise specified within the Geotechnical Report.

1.2  DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2-inches in diameter; and free of weeds, roots, and other deleterious materials.

PART 2  PRODUCTS

NOT USED

PART 3  EXECUTION

3.1  TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Remove trash, debris, weeds, roots, and other waste materials.

D. Stockpile topsoil materials designated to remain on site at a location approved by the Owner at a location away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

E. Do not stockpile topsoil within drip line of remaining trees.

3.2  DISPOSAL

A. Remove surplus soil material and unsuitable topsoil, and legally dispose of them off the Owner’s property.

END OF SECTION
SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavation and/or embankment from existing ground to subgrade, including soil sterilant, for roadways, driveways, parking areas, walks, paths, or trails and any other site improvements called for on the Plans.

B. Products and Execution listed below are acceptable unless otherwise specified within the Geotechnical Report.

1.2 SECTION EXCLUDES

A. Earthwork related to underground utility installation, see Section 31 23 33 – Trenching and Backfilling.

1.3 RELATED SECTIONS

A. Section 02 40 00 – Demolition.

B. Section 31 11 00 – Clearing and Grubbing.

C. Section 31 31 19 – Vegetation Control.

1.4 RELATED DOCUMENTS

A. Geotechnical Report.

B. ASTM:

1. D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

2. D 1586, Method for Penetration Tests and Split-Barrel Sampling of Soils.

3. D 2487, Classification of Soils for Engineering Purposes.


C. California Code of Regulation Title 24, Part 2, California Building Code:

1. Chapter 11B – Accessibility to Public Buildings.

2. Chapter 33 – Site Work, Demolition and Construction.

D. Caltrans Standard Specifications:

1. Section 17, Watering.

2. Section 19, Earthwork.
E. CAL/OSHA, Title 8.

1.5 DEFINITIONS

A. Borrow: Approved soil material imported from off-site for use as Structural Fill or Backfill.

B. Excavation: Removal of material encountered above subgrade elevations.

   1. Authorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions as shown on plans or authorized by the Geotechnical Consultant.

   2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.

C. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.

D. Geotechnical Consultant: The Geotechnical Consultant should be defined as the “Geotechnical Engineer-of-Record (GEOR) for the project. The GEOR can be represented by the Geotechnical Testing Agency (GTA) provided the GTA is either the same firm as the GEOR or is a qualified firm working directly for the GEOR.

E. Structural Backfill: Soil materials approved by the Geotechnical Consultant and used to fill excavations resulting from removal of existing below grade facilities, including trees. See Section 31 23 33 – Trenching and Backfilling.

F. Structural Fill: Soil materials approved by the Geotechnical Consultant and used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material ¾-cubic yards or more in volume that, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.

J. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project.

K. Utilities: onsite underground pipes, conduits, ducts and cables.

1.6 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Submit material certificates signed by the material producer and the Contractor, certifying that each material item complies with, or exceeds the specified requirements.

1.7 QUALITY ASSURANCE

A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.
B. Conform all work to the appropriate portion(s) of the California Code of Regulations, Title 24 and Caltrans Standard Specifications, Sections 17 and 19.

C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.

D. Perform excavation, filling, compaction and related earthwork under the observation of the Geotechnical Consultant. Materials placed without approval of the Geotechnical Consultant will be presumed to be defective and, at the discretion of the Geotechnical Consultant, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Consultant at least 24-hours prior to commencement of earthwork and at least 48 hours prior to testing.

E. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the Project earthwork. Correct earthwork that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.

F. Upon completion of the construction work, certify that all compacted fills and foundations are in place at the correct locations, and have been constructed in accordance with sound construction practice. In addition, certify that the materials used are of the types, quality and quantity required by these Technical Specifications. The Contractor shall be responsible for the stability of all fills and backfills constructed by his forces.

G. Finish soil grade tolerance at completion of grading:
   1. Building and paved areas: +0.05
   2. Other areas: ±0.10 feet.

1.8 PROJECT CONDITIONS

A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless the Contractor has notified the Owner in writing of differing conditions prior to the Contractor starting work on affected items.

B. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

C. Prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

D. Temporarily stockpile fill material in an orderly and safe manner and in a location approved by the Owner.

E. Provide dust and noise control in conformance with Division 1 General Requirements.

F. Environmental Requirements: When unfavorable weather conditions necessitate interrupting earthwork operation, areas shall be prepared by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion. After interruption, compaction specified in last layer shall be re-established before resuming work.

PART 2 PRODUCTS

2.1 SOIL MATERIALS
A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.

B. Obtain approval of on-site soil materials and borrow materials to be used for structural fill or structural backfill from the Geotechnical Consultant.

C. On-Site Structural Fill and Structural Backfill: Soil or soil-rock mixture from on site excavations, free from organic matter or other deleterious substances. On-site structural fill and backfill shall not contain any rocks or rock fragments over 3 inches in greatest dimension, and 90% by weight shall pass the 1” sieve and with an organic content less than 3.0 percent by weight.

D. Imported Structural Fill and Structural Backfill: Conform to the requirements of on-site structural fill. Material shall also be a non-expansive and predominantly granular soil or soil-rock mixture with plasticity index of 15 or less in accordance with ASTM D 4318 and an R-Value of 25 or greater.

PART 3 EXECUTION

3.1 GENERAL

A. Conform to Section 19, Earthwork, Caltrans Standard Specifications as modified by the Contract Documents.

B. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

C. The use of explosives will not be permitted.

3.2 CONTROL OF WATER AND DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the site and surrounding area. Provide dewatering equipment necessary to drain and keep excavations and site free from water.

B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.

C. Obtain the Geotechnical Consultant’s approval for proposed control of water and dewatering methods.

D. Protect subgrades from softening, undermining, washout and damage by rain or water accumulation.

E. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations.

F. Maintain dewatering system in place until dewatering is no longer required.

3.3 WET WEATHER CONDITIONS

A. Do not prepare subgrade, place or compact soil materials if above optimum moisture content.

B. If the Geotechnical Consultant allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Consultant.

3.4 BRACING AND SHORING

A. Conform to California and Federal OSHA requirements.
B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.

C. Be solely responsible for all bracing and shoring and, if requested by the Owner, submit details and calculations to the Owner. The Owner may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner.

D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

3.5 EXCAVATION

A. Excavate earth and rock to lines and grades shown on drawings and to the neat dimensions indicated on the Plans, required herein or as required to satisfactorily compact backfill.

B. Remove and dispose of large rocks, pieces of concrete and other obstructions encountered during excavation.

C. Where forming is required, excavate only as much material as necessary to permit placing and removing forms.

D. Provide supports, shoring and sheet piles required to support the sides of excavations or for protection of adjacent existing improvements.

3.6 REMOVAL OF EXISTING FILLS AND UNSUITABLE MATERIAL

A. Over-excavate areas of existing fills and other unsuitable material encountered during mass grading as directed by the Geotechnical Consultant.

B. Compensation for increased removal widths and depths that are not required by the Geotechnical Consultant will not be considered, except when such increase is necessary for protection of life and property as determined by and approved by the Owner.

C. The Geotechnical Consultant will provide written approval for each excavation prior to placement of fill. Allow adequate time after excavation and before filling for the Geotechnical Consultant's review and written approval and, if necessary, time for the Owner to conduct an as built survey prior to placing fill. Basis for calculating the quantity of material excavated or placed may be the difference between the grading shown on the Plan and an as built survey of the grading.

3.7 GRADING

A. Uniformly grade the Project to the elevations shown on plans.

B. Finish ditches, gutters and swales to the sections, lines and grades indicated and to permit proper surface drainage.

C. Round tops and bottoms of slopes as indicated or to blend with existing contours.

3.8 SUBGRADE PREPARATION
A. Install underground utilities and service connections prior to final preparation of subgrade and placement of base materials for final surface facilities. Extend services so that final surface facilities are not disturbed when service connections are made.

B. Prepare subgrades under paved areas, curbs, gutters, walks, structures, other surface facilities and areas to receive structural fill.

C. Prepare subgrades for paved areas, curbs and gutters by plowing or scarifying surface at least 12 inches below final subgrade elevations and 5-feet beyond edge of foundations and 3-feet beyond edge of pavement and flatwork unless specified otherwise by the Geotechnical Consultant. Uniformly moisture condition to obtain optimum moisture contents. Break clods and condition surface by harrowing or dry rolling. Moisture conditioning shall meet recommendations in Appendix F of the project Geotechnical Report. Remove boulders, hard ribs and solid rock. Prepare earth uniform for full depth and width of subgrade.

D. Protect utilities from damage during compaction of subgrades and until placement of final pavements or other surface facilities.

E. Obtain the Geotechnical Consultant’s approval of subgrades prior to placing pavement.

3.9 PLACEMENT OF STRUCTURAL FILL

A. Obtain the Geotechnical Consultant’s approval of surface to receive structural fill prior to placement of structural fill material.

B. Place structural fill on prepared subgrade.

C. Spread structural fill material in uniform lifts not more than 8-inches in un-compacted thickness and compact.

D. Place structural fill material to suitable elevations above grade to provide for anticipated settlement and shrinkage.

E. Overbuild fill slopes, as required by the Geotechnical Consultant, to obtain required compaction. Remove excess material to lines and grades indicated.

F. Do not drop fill on structures. Do not backfill around, against or upon concrete or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.

3.10 KEYWAYS AND BENCHES

A. Provide keyways as indicated for fill slopes steeper than 6 horizontal to 1 vertical. Extend keyway 5-feet minimum into competent, undisturbed soil or 3-feet minimum into competent, undisturbed rock as directed by the Geotechnical Consultant.

B. Place subsurface drains in bottom of keyway in conformance with Section 33 46 00 – Subdrainage.

C. Bench subgrade as indicated above toe of fill.

D. Place subsurface drains at benches every 20 vertical feet or as directed by the Geotechnical Consultant.

3.11 LOT FINISH GRADING

A. Blade finish lots to lines and grades indicated.

3.12 COMPACTION AND TESTING
A. Do not compact by ponding, flooding or jetting.

B. Compact soils at optimum water content. Aerate material if it is too wet. Add water to material if it is too dry. Thoroughly mix lifts before compaction to ensure uniform moisture distribution. Compact soils at moisture contents as recommended in Appendix F of Geotechnical Report.

C. Perform compaction using rollers, pneumatic or vibratory compactors or other equipment and mechanical methods approved by the Geotechnical Consultant.

D. Compaction requirements:
   1. Compact structural fills less than 7-feet thick to 90 percent compaction.
   2. Compact structural fill 7-feet thick or greater to 95 percent compaction.
   3. Compact the upper 12 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent compaction.
   4. Compact the upper 12-inches of subgrade soils under walks, structures and areas to receive structural fill to 90 percent compaction.

3.13 DISPOSAL

A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

END OF SECTION
SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Excavation, bedding, and backfill for underground storm drain, sanitary sewer, and water piping and associated structures.

1.2 SECTION EXCLUDES

A. Drainage fill material and placement around subdrains.
B. Trenching and backfill for other utilities such as underground HVAC piping, electrical conduit, telephone conduit, gas piping, cable TV conduit, etc.

1.3 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Fill.
B. Section 33 40 00 – Storm Drainage Utilities.

1.4 RELATED DOCUMENTS

A. Geotechnical Report.
B. ASTM:
   1. C 33, Specification for Concrete Aggregates.
   7. D 2487, Classification of Soils for Engineering Purposes.
C. California Code of Regulation Title 24, Part 2, California Building Code:
   1. Chapter 11B – Accessibility to Public Buildings.
   2. Chapter 33 – Site Work, Demolition and Construction.
D. Caltrans Standard Specifications:
   1. Section 19, Earthwork.
   2. Section 26, Aggregate Bases.
   3. Section 68, Subsurface Drains.
   4. Section 96, Engineering Fabrics.

E. CAL/OSHA, Title 8.

1.5 DEFINITIONS

A. AC: Asphalt Concrete.
C. Bedding: Material from bottom of trench to bottom of pipe.
D. CDF: Controlled Density Fill.
E. DIP: Ductile Iron Pipe.
F. Initial Backfill: Material from bottom of pipe to 12-inches above top of pipe.
G. PCC: Portland Cement Concrete.
H. RCP: Reinforced Concrete Pipe.
I. Springline of Pipe: Imaginary line on surface of pipe at a vertical distance of \( \frac{1}{2} \) the outside diameter measured from the top or bottom of the pipe.
J. Subsequent Backfill: Material from 12-inches above top of pipe to subgrade of surface material or subgrade of surface facility or to finish grade.
K. Trench Excavation: Removal of material encountered above subgrade elevations and within horizontal trench dimensions.
   1. Authorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions as shown on plans or authorized by the Geotechnical Consultant.
   2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions without authorization by the Geotechnical Consultant. Unauthorized excavation shall be without additional compensation.
L. Utility Structures:
   1. Storm drainage manholes, catch basins, drop inlets, curb inlets, vaults, etc.
   2. Sanitary sewer manholes, vaults, etc.
   3. Water vaults, etc.

1.6 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
B. Product Data:
   1. Grading and quality characteristics showing compliance with requirements for the Work.
   2. Certify that material meets requirements of the Project.

C. Samples:
   1. If required by the Geotechnical Consultant, provide 40-pound samples of all imported trench bedding and backfill material sealed in airtight containers, tagged with source locations and suppliers of each proposed material. Do not import materials to Project without written approval of the Geotechnical Consultant.
   2. Provide materials from same source throughout work. Change of source requires approval of the Geotechnical Consultant and the Owner.

1.7 QUALITY ASSURANCE

A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.

B. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19.

C. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.

D. The Geotechnical Consultant will perform observations and tests required to enable him to form an opinion of the acceptability of the trench backfill. Correct the trench backfill that, in the opinion of the Geotechnical Consultant, does not meet the requirements of these Technical Specifications and the Geotechnical Report.

E. Conform work to the requirements of the California Building Code.
   1. Section 1809A.14 – Pipe and Trenches.

1.8 PROJECT CONDITIONS

A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the Geotechnical Report. First notify the Owner verbally to permit verification and extent of condition and then in writing. No claim for conditions differing from those anticipated in the Contract Documents and disclosed in the Geotechnical Report will be allowed unless Contractor has notified the Owner in writing of differing conditions prior to contractor starting work on affected items.

B. Protect open, trenches, and utility structure excavations with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

C. Stockpile on-site and imported backfill material temporarily in an orderly and safe manner.

D. Provide dust and noise control in conformance with local requirements and project storm water pollution prevention plan.

2.1 PIPE BEDDING AND INITIAL BACKFILL

A. ASTM D 2321, Class IA, IB or II.
1. Clean and free of clay, silt or organic matter.

B. Permeable Material: Conform to Section 68-2.02F of Caltrans Standard Specifications, Class 1, Type A or Class 2.

C. Class 2 Aggregate Base: Conform to Section 26 of Caltrans Standard Specifications, ¾-inch maximum.

D. Sand: Conform to Section 19-3.02F of Caltrans Standard Specifications.

2.2 WARNING TAPE

A. See Section 33 10 00 – Water Utilities.

2.3 SUBSEQUENT BACKFILL

A. Conform to on-site or imported structural backfill in Section 31 23 00 – Excavation and Fill.

2.4 CONTROLLED DENSITY FILL (CDF) (IN TRENCHES)

A. Provide non-structural CDF, from bottom of trench to finish subgrade of subbase or base material, that can be excavated by hand and produce unconfined compressive 28-day strengths from 50-psi to a maximum of 150-psi. Provide aggregate no larger than 3/8-inch top size. The 3/8-inch aggregate shall not comprise more than 30% of the total aggregate content.

B. Cement: Conform to the standards as set forth in ASTM C-150, Type II Cement.

C. Fly Ash: Conform to the standards as set forth in ASTM C-618, for Class F pozzolan. Do not inhibit the entrainment of air with the fly ash.

D. Air Entraining Agent: Conform to the standards as set forth in ASTM C-260.

E. Aggregates need not meet the standards as set forth in ASTM C-33. Any aggregate, producing performances characteristics described herein will be accepted for consideration. The amount of material passing a #200 sieve shall not exceed 12% and no plastic fines shall be present.

F. Provide CDF that is a mixture of cement, Class F pozzolan, aggregate, air entraining agent and water. CDF shall be batched by a ready mixed concrete plant and delivered to the job site by means of transit mixing trucks.

G. The Contractor shall determine the actual mix proportions of the controlled density fill to meet job site conditions, minimum and maximum strengths, and unit weight. Entrained air content shall be a minimum of 4.0%. The actual entrained air content shall be established for each job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements.

H. Mix design shall meet the Geotechnical Consultant’s approval.

2.5 CONCRETE STRUCTURE BEDDING AND BACKFILL

A. Precast Structures: Same materials to the same heights as specified for pipe bedding and backfill, or other material approved by the Geotechnical Consultant.

B. Poured-in-Place Structures:

1. Bedding: Bedding shall meet the approval of the Geotechnical Consultant. In general, bedding is not required, pour bases against undisturbed native earth in cut areas and against engineered fill compacted to 90% relative compaction in embankment areas.
2. Side Backfill: On-site or imported structural fill meeting the requirements given in Section 31 23 00 – Excavation and Fill.

2.6 FILTER FABRIC

A. Filter Fabric:

1. Filter Fabric: Section 96-1.02B of Caltrans Standard Specifications.

2. Mirafi 140N (Mirafi Inc., Charlotte, NC) (Tel. 800-438-1855) or equal.

3.1 TRENCHING AND EXCAVATION

A. Existing PCC or AC Areas: Cut PCC or AC to full depth at a minimum distance of 12-inches beyond the edge of the trench.

B. Excavate by hand or machine. For gravity systems begin excavation at the outlet end and proceed upstream. Excavate sides of the trench parallel and equal distant from the centerline of the pipe. Hand trim excavation. Remove loose matter.

C. Excavation Depth for Bedding: Minimum of 4-inches below bottom of pipe or as otherwise allowed or required by the Geotechnical Consultant, except that bedding is not required for nominal pipe diameters of 2-inches or less.

D. Excavation Width at Springline of Pipe:

1. Up to a nominal pipe diameter of 24-inches: Minimum of twice the outside pipe diameter, or as otherwise allowed or required by the Geotechnical Consultant.

2. Nominal pipe diameter of 30-inches through 36-inches: Minimum of the outside pipe diameter plus 2-feet, or as otherwise allowed or required by the Geotechnical Consultant.

3. Nominal pipe diameter of 42-inches through 60-inches: Minimum of the outside pipe diameter plus 3-feet, or as otherwise allowed or required by the Geotechnical Consultant.

E. Over-Excavations: Backfill trenches that have been excavated below bedding design subgrade, with approved bedding material.

F. Comply with the Owner’s limitations on the amount of trench that is opened or partially opened at any one time. Do not leave trenches open overnight without the approval of the Owner.

G. Where forming is required, excavate only as much material as necessary to permit placing and removal of forms.

H. Bottoms of trenches will be subject to testing by Geotechnical Consultant. Correct deficiencies as directed by the Geotechnical Consultant.

I. Grade bottom of trench to provide uniform thickness of bedding material and to provide uniform bearing and support for pipe along entire length. Remove stones to avoid point bearing.

3.2 CONTROL OF WATER AND DEWATERING

A. Be solely responsible for dewatering trenches and excavations and subsequent control of ground and surface water. Provide and maintain such pumps or other equipment as may be necessary to control ground water and seepage to the satisfaction of the Geotechnical Consultant and the Owner until backfilling is completed.
B. Dewater during backfilling operation so that groundwater is maintained at least one foot below level of compaction effort.

C. Obtain the Geotechnical Consultant’s approval for proposed control of water and dewatering methods.

D. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.

E. Maintain dewatering system in place until dewatering is no longer required.

3.3 BRACING AND SHORING

A. Conform to California and Federal OSHA requirements.

B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the pipes and appurtenances being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.

C. Be solely responsible for all bracing and shoring and, if requested by the Owner, submit details and calculations to the Owner. The Owner may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations in trench section or around structures shall precede a response to the submittal by the Owner.

D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the line, grade, or backfill compaction or operation of the utility being installed or adjacent utilities and facilities.

3.4 PIPE BEDDING

A. Obtain approval of bedding material from the Geotechnical Consultant.

B. Accurately shape bedding material to the line and grade called for on the Plans. Carefully place and compact bedding material to the elevation of the bottom of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of bedding material will not be permitted.

C. Upon completion of bedding operations, and prior to the installation of pipe, notify the Geotechnical Consultant, who will inspect the bedding layer. Do not commence pipe laying until the Geotechnical Consultant has approved the bedding.

3.5 WARNING TAPE

A. Install in accordance with Section 33 10 00 – Water Utilities.

3.6 BACKFILLING

A. Obtain approval of backfill material from Geotechnical Consultant.
B. Bring initial backfill up simultaneously on both sides of the pipe, so as to prevent any displacement of the pipe from its true alignment. Carefully place and compact initial backfill material to an elevation of 12-inches above the top of the pipe in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of initial backfill material will not be permitted.

C. Bring subsequent backfill to subgrade or finish grade as indicated. Carefully place and compact subsequent backfill material to the proper elevation in layers not exceeding 8-inches in loose thickness. Compact bedding material at optimum water content to 90% relative compaction, except that the upper 12-inches in areas subject to vehicular traffic shall be compacted to at least 95% relative compaction, unless specified otherwise on the Plans or by the Geotechnical Consultant. Compact by pneumatic tampers or other mechanical means approved by the Geotechnical Consultant. Jetting or ponding of subsequent backfill material will not be permitted.

D. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive pipe displacement or damage the pipe.

E. Utility backfill shall be inspected and tested by the Geotechnical Consultant during placement. Cooperate with the Geotechnical Consultant and provide working space for such tests in operations. Backfill not compacted in accordance with these specifications shall be re-compacted or removed as necessary and replaced to meet the specified requirements, to the satisfaction of the Geotechnical Consultant and the Owner prior to proceeding with the Project.

3.7 CLEANUP

A. Upon completion of utility earthwork all lines, manholes catch basins, inlets, water meter boxes and other structures shall be thoroughly cleaned of dirt, rubbish, debris and obstructions of any kind to the satisfaction of the Owner.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Application of soil sterilant on subgrades for roadways, driveways, parking areas, walks, paths, trails and any other site improvements called for on the plans.

1.2 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Fill.

1.3 RELATED DOCUMENTS

A. CAL/OSHA, Title 8.

1.4 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

PART 2 PRODUCTS

2.1 SOIL STERILANT

A. Commercial chemical for weed control, registered by EPA. Provide granular, liquid or wet-able powder form.

PART 3 EXECUTION

3.1 SOIL STERILIZATION

A. Apply soil sterilant to areas indicated, such as beneath asphalt concrete pavement, brick pavement, concreter pavement and at grade concrete slabs, including sidewalks, curbs and gutters. Also where indicated apply soil sterilant below expansion and control joints and at areas where pipes, ducts or other features penetrate slabs.

B. Apply soil sterilant uniformly and at the rates recommended by the manufacturer.

C. Apply soil sterilant to prepared subgrade, or after installation of aggregate base as recommended by the manufacturer.

3.2 DISPOSAL

A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

END OF SECTION
SECTION 32 05 23
CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials for portland cement concrete.
B. Aggregate and aggregate grading for portland cement concrete.
C. Water for portland cement concrete.
D. Admixtures for portland cement concrete.
E. Proportioning for portland cement concrete.
F. Mixing and transporting portland cement concrete.
G. Formwork for cast in place portland cement concrete.
H. Embedded materials for portland cement concrete.
I. Steel reinforcement for portland cement concrete.
J. Placing and finishing portland cement concrete.
K. Curing portland cement concrete.
L. Protecting portland cement concrete.

1.2 RELATED SECTIONS

A. Section 31 23 00, Excavation and Fill.
B. Section 31 31 19, Vegetation Control (Increment 1).
C. Section 32 16 13, Concrete Curbs and Gutters.
D. Section 33 05 13, Manhole Grade Adjustment (Increment 1).

1.3 RELATED DOCUMENTS

A. ASTM Standards
   1. A 82, Cold Drawn Steel Wire for Concrete Reinforcement.
   2. A 185, Steel Welded Wire Fabric, Plain for Concrete Reinforcement.
   3. A 615, Deformed and Plain Billet Steel Bars, for Concrete Reinforcement.
   7. C 618, Fly Ash and Raw or Calcined Natural Pozzolan for use as Natural Admixture in Portland Cement.

B. Caltrans Standard Specifications:
   1. Section 51: Concrete Structures.
   2. Section 73: Concrete Curbs and Sidewalks.
   3. Section 90: Concrete.

C. California Building Code:
   1. Chapter 11B – Accessibility To Public Buildings.
   2. Chapter 19A – Concrete.
   4. Section 1133B – General Accessibility for Entrances, Exits and Paths of Travel.

1.4 DEFINITIONS

1.5 SUBMITTALS
A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Design Mixes: Have all concrete mixes designed by a testing laboratory and approved by the Consulting Engineer. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.

C. Reinforcing Steel Shop-Drawings

1.6 QUALITY ASSURANCE
A. Concrete shall be subject to quality assurance in accordance with Section 90 of the Standard Specifications.

   1. Slump tests: Have available, at job site, equipment required to perform slump tests. Make one slump test for each cylinder sample, from same concrete batch. Allowable maximum slump shall be 4 inches for walls and 3 inches for slabs on grade and other work.

B. Certifications:

   1. Provide Owner’s Representative at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:

   2. Materials contained comply with the requirements of the Contract Documents in all respects.

   3. Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.

   4. Statement of type and amount of any admixtures.
5. Provide Owner's Representative, at time of delivery, with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.

C. Conform to the applicable provisions of Section 51, 73 and 90 of the Caltrans Standard Specification and these Technical Specifications.

1. Conform construction of portland cement concrete surface improvements (including curbs, gutters, medians, valley gutters, walks) to the requirements of Section 73 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.

2. Construct "V" ditches in accordance with Section 72-4 of the Standard Specifications; except that finishing shall be in accordance with Standard Specification Section 73 instead of 53, or as otherwise required in these Technical Specifications or shown on the Plans.

3. Conform other construction of portland cement concrete items to the requirements of Section 51 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.

D. Conform to the requirements of the California Building Code section 1929A.2 for testing of reinforcing bars.

1.7 DESIGNATION

A. General: Whenever the 28-day compressive strength is designated herein or on the plans is greater than 3,600 psi, the concrete shall considered to be designated by compressive strength. The 28-day compressive strength shown herein or on the plans which are 3,600 psi or less are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the plans, the concrete shall contain the cement per cubic meter shown in section 90-1.01 of the Caltrans Standard Specifications.

B. Unless specified otherwise herein or on the Plans, Portland Cement Concrete for this Project shall be Class "2" as specified in Section 90-1.01 of the Caltrans Standard Specifications.

PART 2 PRODUCTS

2.1 GENERAL

A. For products to be installed within the jurisdiction of a local, state or federal agency, product(s) shall conform to the agency’s standard specifications.

2.2 PORTLAND CEMENT

A. General: Type V or type II (modified) cement conforming to the requirements of ASTM C 150, with the following modifications:

1. Cement shall not contain more than 0.60% by weight of alkalies, calculated as the percentage of Na₂O plus 0.658 times the percentage of K₂O when determined by either 4 intensity flame photometry or by the atomic absorption method. The instrument and procedure used shall be qualified as to precision and accuracy in accordance with the requirements of ASTM C 114.

2. The autoclave expansion shall not exceed 0.50%.

3. Mortar containing the Portland Cement to be used and the sand, when tested in accordance with Test Method No. Calif. 527, shall not expand in water more than 0.010% and shall have an air content less than .048%.
4. Allowable tri-calcium Aluminate (C\(_3\)A) by weight shall not exceed 5%. Allowable tetracalcium alumino ferrite plus twice the tricalcium aluminate (C\(_4\)AF+2C\(_3\)A) by weight shall not exceed 25%. The sulfate expansion test (ASTM C 452) may be used in lieu of the above chemical requirements, provided the sulfate expansion does not exceed 0.040% at 14 days (max.).

5. Contractor may substitute pozzolan for Portland Cement in amounts up to 15% of the required mix unless high early strength concrete is specified. Pozzolan shall consist of Class F Fly Ash meeting the requirements of ASTM C 618.

2.3 AGGREGATE AND AGGREGATE GRADING

A. General: Conform to the requirements of Section 90-1.02C of the Caltrans Standard Specifications.

B. Aggregate Size and Gradation: Conform to the requirements of section 90-1.02C the Caltrans Standard Specifications for 25-mm (1-inch) maximum combined aggregate.

2.4 WATER

A. General: Conform to the requirements of section 90-1.02D of the Caltrans Standard Specifications, for mixing and curing portland cement concrete and for washing aggregates.

2.5 CLASSIFICATION OF PORTLAND CEMENT CONCRETE

A. Concrete for the following items shall be designated by the following classes per Section 90-1.01 of the Caltrans Standard Specifications:

1. Vehicular Pavement: Class A.

2. Curbs, Gutters, and Sidewalks: Minor Concrete.

3. Cast in place Concrete Pipe: The concrete shall consist of a minimum of 564 pounds of Portland cement per cubic yard of concrete.

4. Thrust Blocks: The concrete shall have a minimum compressive strength of 3,000 psi.

5. Sign and Fence Footings: The concrete shall consist of a minimum of 376 pounds of Portland cement per cubic yard of concrete.


2.6 EXPANSION JOINT MATERIAL

A. Material for expansion joints in portland cement concrete improvements shall be premolded expansion joint fillers conforming to the requirements of ASTM Designation D 1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site. Unless noted otherwise herein or on the Plans expansion joint thickness shall be as follows:


2. Concrete Slope Protection, Gutter Lining, Ditch Lining and Channel Lining: 1/2-inch.

3. Structures: As indicated.

2.7 REINFORCEMENT AND DOWELS
A. Bar reinforcement for concrete improvements shall be deformed steel bars of the size or sizes called for on the plans conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Size and shape for bar reinforcement shall conform to the details shown or called for on the Plans. Substitution of wire mesh reinforcement for reinforcing bars will not be allowed.

B. Slip dowels, where noted or called for on the plans or detail drawings shall be smooth billet-steel bars as designated and conforming to the requirements of ASTM Designation A 615 for Grade 60 bars. Ends of bars inserted in new work shall be covered with a cardboard tube sealed with cork; no grease or oil shall be used.

C. Mesh for reinforcement for concrete improvements shall be cold drawn steel wire mesh of the size and spacing called for on the plans conforming to the requirements of ASTM Designation A 82 for the material and ASTM Designation A 185 for the mesh. Size and extent of mesh reinforcement shall conform to the details shown or called for on the plans.

D. Tie wire for reinforcement shall be eighteen (18) gauge or heavier, black, annealed conforming to the requirements of ASTM Designation A 82.

E. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.

2.8 ACCESSORY MATERIALS

A. Conform water stops and other items required to be embedded in of Portland Cement Concrete structures to the applicable requirements of Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans or detail drawings.

B. Curing Compounds:

1. Regular Portland Cement Concrete: "Non-Pigmented Curing Compound - chlorinated Rubber Base-Clear" conforming to the requirements contained in Section 90-7.01B, of the Caltrans Standard Specifications.

2.9 FORMS

A. Conform to the requirements of Section 51-1.03C of the Caltrans Standard Specifications.

2.10 PRECAST CONCRETE STRUCTURES

A. Conform to the following Sections of Caltrans Standard Specifications:

1. 51-7, Minor Structures.
2. 70-5.02, Flared End Sections.
3. 90-4, Precast Concrete Structures.

2.11 PORTLAND CEMENT CONCRETE VEHICLUAR PAVEMENT

A. General: See Section 32 13 00 – Rigid Paving.

PART 3 EXECUTION

3.1 STRUCTURAL EXCAVATION

A. Structural excavation may be either by hand, or by machine and shall be neat to the line and dimension shown or called for on the plans. Excavation shall be sufficient width to provide adequate space for working therein, and comply with CAL-OSHA requirements.
B. Where an excavation has been constructed below the design grade, refill the excavation to the bottom of the excavation grade with approved material and compact in place to 95% of the maximum dry density.

C. Remove surplus excavation material remaining upon completion of the work from the job site, or condition it to optimum moisture content and compact it as fill or backfill on the site, if the material is approved by the Geotechnical Consultant.

3.2 SOIL STERILANT

A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.3 BRACING AND SHORING

A. Conform to California and Federal OSHA requirements.

B. Place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; to prevent damage to the facility being constructed; and to prevent damage to adjacent structures or facilities. Remove all bracing and shoring upon completion of the work.

C. Be solely responsible for all bracing and shoring and, if requested by the Owner's Representative, submit details and calculations to the Owner's Representative. The Owner's Representative may forward the submittal to the Geotechnical Consultant, the Consulting Engineer and/or the California Division of Industrial Safety for their review. The Contractor's submittal shall include the basic design, assumed soils conditions and estimation of forces to be resisted, together with plans and specifications of the materials and methods to be used, and shall be prepared by a civil engineer or structural engineer registered in California. No excavations related to the proposed facility shall precede a response to the submittal by the Owner's Representative.

D. Be solely responsible for installing and extracting the sheathing in a manner which will not disturb the position or operation of the facility being constructed or adjacent utilities and facilities.

3.4 PLACING CONCRETE FORMS

A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.

B. Thoroughly clean all forms prior to placement and coat forms with an approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.

C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.

D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

3.5 PLACING STEEL REINFORCEMENT

A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond. All bending shall be done cold, to the shapes shown on the plans. The length of lapped splices shall be as follows:
1. Reinforcing bars No. 8, or smaller, shall be lapped at least 45 bar diameters of the smaller bar joined, and reinforced bars Nos. 9, 10, and 11 shall be lapped at least 60 bar diameters of the smaller bars joined, except when otherwise shown on the plans.

2. Splice locations shall be made as indicated on the plans.

B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads. Provide supports and ties of such strength and density to permit walking on reinforcing without undue displacement.

C. Place reinforcing to provide the following minimum concrete cover:

1. Surfaces exposed to water: 4-inches.
2. Surfaces poured against earth: 3-inches.
3. Formed surfaces exposed to earth or weather: -inches.
4. Slabs, walls, not exposed to weather or earth: 1-inch.

D. Minimum spacing, center of parallel bars shall be two and one half (2-1/2) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.

3.6 MIXING AND TRANSPORTING PORTLAND CEMENT CONCRETE

A. Transit mix concrete in accordance with the requirements of ASTM Designation C 94. Transit mix for not less than ten (10) minutes total, not less than three (3) minutes of which shall be on the site just prior to pouring. Mix continuous with no interruptions from the time the truck is filled until the time it is emptied. Place concrete within one hour of the time water is first added unless authorized otherwise by the Owner’s Representative.

B. Do not hand mix concrete for use in concrete structures.

3.7 PLACING PORTLAND CEMENT CONCRETE

A. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete.

B. Do not place concrete until the subgrade and the forms have been approved.

C. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.

D. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the Owner’s Representative. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.

E. Concrete in certain locations may be pumped into place upon prior approval by the Owner’s Representative. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.

3.8 PLACING ACCESSORY MATERIALS
A. Place water stops and other items required to be embedded in of portland cement concrete structures at locations shown or required in accordance with Section 51 of the Caltrans Standard Specifications unless otherwise specifically noted or called for on the Plans.

B. Curing Compounds:
   1. Regular Portland Cement Concrete: Apply "Non-Pigmented Curing Compound - chlorinated Rubber Base-Clear" in accordance with Section 90-7.01B, 7.01D and 7.03 of the Caltrans Standard Specifications.

3.9 EXPANSION JOINTS

A. Construct expansion joints incorporating premolded joint fillers at twenty (20) foot intervals in all concrete curbs, gutters, sidewalks, median/island paving, valley gutters, driveway approaches and at the ends of all returns. At each expansion joint install one-half inch by twelve inch (1/2" x 12") smooth slip dowels in the positions shown or noted on the detail drawings.

B. Orient slip dowels at right angles to the expansion joint and hold firmly in place during the construction process by means of appropriate chairs.

3.10 WEAKENED PLANE JOINTS

A. Construct weakened plane joints in concrete curbs, gutters, sidewalks, median/island paving and valley gutters between expansion joints at ten (10) foot intervals throughout, or as otherwise indicated. Depth of joint score depth to be one-fourth (25%) the thickness of the concrete.

   1. Grooved Joints: Form weakened plane joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of weakened plane joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

3.11 FINISHING CONCRETE

A. Finish curb and gutter in conformance with the applicable requirements of Section 73 of the Caltrans Standard Specifications as modified herein.

B. Where monolithic curb, gutter and sidewalk is specified, separate concrete pours will not be allowed.

C. Provide a medium broom finish to all horizontal surfaces unless otherwise shown.

3.12 FORM REMOVAL

A. Remove forms without damage to the concrete. Remove all shores and braces below the ground surface, before backfilling.

B. Do not backfill against concrete until the concrete has developed sufficient strength to prevent damage.

C. Leave forms for cast-in-place walls in place at least 72 hours after pouring.

D. Leave edge forms in place at least 24 hours after pouring.

3.13 CONSTRUCTION

A. Form, place and finish concrete walkways, island paving, valley gutters and driveway approaches in conformance with the applicable requirements of Section 73 of the Caltrans Standard Specifications as modified herein.

B. Construct new concrete curb, curb and gutter and valley gutters against existing asphalt concrete...
by removing a minimum of 12-inches of the asphalt concrete to allow placement of curb or gutter forms. Patch pavement with a 6-inch deep lift of asphalt concrete after gutter form is removed.

3.14 CONNECTING TO EXISTING CONCRETE IMPROVEMENTS

A. New curb, gutter, or sidewalk is to connect to existing improvements to remain by saw cutting to existing sound concrete at the nearest score line, expansion joint or control joint. Drill and insert 1/2-inch diameter by 12-inch long dowels at 24-inches on center into existing improvements. Install pre-molded expansion joint filler at the matching joint.

B. A cold joint to the existing curb is not acceptable.

3.15 FIELD QUALITY CONTROL

A. Finish subgrade for concrete improvements shall be subject to approval prior to placement of forms.

B. No concrete shall be placed prior to approval of forms.

C. Concrete improvements constructed shall not contain "bird baths" or pond water and shall be smooth and ridge free.

D. Conform the finish grade at top of curb, flow line of gutter, and the finish cross section of concrete improvements to the design grades and cross sections.

E. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances established in Sections 73-1.05 and/or 73-1.06 of the Caltrans Standard Specifications.

3.16 RESTORATION OF EXISTING IMPROVEMENTS

A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.

B. Remove, landscaping or plantings damaged or disturbed due to the installation of concrete improvements. Replace in kind.

END OF SECTION
SECTION 32 11 00
BASE COURSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate subbase.
B. Aggregate base.
C. Cement treated base.

1.2 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Fill.
B. Section 32 12 00 – Flexible Paving.

1.3 RELATED DOCUMENTS

A. Geotechnical Report.
B. ASTM:
   1. D 3740, Practice for Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
C. Caltrans Standard Specifications:
   1. Section 24, Lime Stabilization.
   2. Section 25, Aggregate Subbases.
   3. Section 26, Aggregate Bases.
   4. Section 27, Cement Treated Bases.

1.4 DEFINITIONS

A. Geotechnical Testing Agency: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock definition testing, as documented according to ASTM D 3740 and ASTM E 548.
B. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material ¾-cubic yards or more in volume that when tested, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.
C. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
D. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.

1.5 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Submit material certificates signed by the material producer and the Contractor, certifying that that each material item complies with, or exceeds the specified requirements.

1.6 QUALITY ASSURANCE

A. Conform all work and materials to the recommendations or requirements of the Geotechnical Report and meet the approval of the Geotechnical Consultant.

B. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted material to the maximum dry density of the material as determined by the procedure set forth in ASTM D 1557.

C. Perform installation of base materials under the observation of the Geotechnical Consultant. Materials placed without approval of the Geotechnical Consultant will be presumed to be defective and, at the discretion of the Geotechnical Consultant, shall be removed and replaced at no cost to the Owner. Notify the Geotechnical Consultant at least 24-hours prior to commencement of base material installation and at least 48 hours prior to testing.

D. Do not mix or place cement treated base when the temperature is below is below 36 degrees F or when the ground is frozen.

E. Finish surface of material to be stabilized prior to lime treatment shall be as specified in Section 24-1.04 of Caltrans Standard Specifications.

F. Finish surface of the stabilized material after lime treatment shall be as specified in Section 24-1.08 of Caltrans Standard Specifications.

G. Finish surface of cement treated base shall be as specified in Section 27 of Caltrans Standard Specifications.

H. Do not project the finish surface of aggregate subbase above the design subgrade.

I. Finish grade tolerance at completion of base installation: +0.05

1.7 PROJECT CONDITIONS

A. Protect open excavations, trenches, and the like with fences, covers and railings to maintain safe pedestrian and vehicular traffic passage.

B. Temporarily stockpile material in an orderly and safe manner and in a location approved by the Owner.

C. Provide dust and noise control in conformance with Division 1 General Requirements.

PART 2 PRODUCTS

2.1 AGGREGATE SUBBASE


1. Class 1, 2, or 3: Section 25-1.02B.
2. Class 4: Section 25-1.02B.
3. Class 5: Section 25-1.02C.

2.2 AGGREGATE BASE
   1. Class 2, 1-1/2-inch Maximum: Section 26-1.02B.
   2. Class 2, 3/4-inch Maximum: Section 26-1.02B.
   3. Class 3: Section 26-1.02C.

2.3 CEMENT TREATED BASE

PART 3 EXECUTION

3.1 GENERAL
A. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

3.2 WET WEATHER CONDITIONS
A. Do not place or compact subgrade if moisture content is higher than recommended by the Geotechnical Consultant or too high to achieve proper compaction.
B. If the Geotechnical Consultant allows work to continue during wet weather conditions, conform to supplemental recommendations provided by the Geotechnical Consultant.

3.3 AGGREGATE SUBBASE
A. Spreading and Compacting: Sections 25-1.03D and 25-1.03E of Caltrans Standard Specifications.

3.4 AGGREGATE BASE
A. Watering, Spreading and Compacting: Section 26-1.03D and 26-1.03E of Caltrans Standard Specifications.

3.5 CEMENT TREATED BASE
A. Cement treated base shall be as follows: Proportioning and Mixing Plant-Mixed: Section 27 of Caltrans Standard Specifications.

3.6 LIME STABILIZATION
A. Performing the stabilization shall conform to the project Geotechnical Report or Section 24 of Caltrans Standard Specifications and the following:
   1. Add lime in the amount specified by the Geotechnical Consultant.
   2. Lime treat subgrade soils from back of curb to back of curb to a depth specified by the Geotechnical Consultant.
3. Mix in two mixing periods, both with the tines lowered to the same depth. Both mixing periods shall be monitored and verified by a Geotechnical Consultant. The second mixing shall occur at about 24 hours after the initial mixing.

4. Compact and grade the lime mixed subgrade immediately after the second mixing.

5. Compact the lime treated subgrade to a minimum of 90 percent at least 3 percent over optimum moisture content as determined by ASTM D1557.

6. After application of the curing seal, do not allow traffic on the lime treated material for a period of 7 days in lieu of the 3 days specified in Section 24-1.03 of Caltrans Standard Specifications.

7. Proof-roll the stabilized subgrade after compacting to confirm that a non-yielding surface has been achieved. Yielding areas, if any, shall be mitigated. Mitigation could consist of over-excavation, utilization of stabilization fabric, or chemical treatment. Each case shall be addressed individually in the field by the Geotechnical Consultant.

3.7 DISPOSAL

A. Lawfully dispose of all unsuitable and excess or surplus material off-site at no cost to the Owner.

END OF SECTION
SECTION 32 12 00
FLEXIBLE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tack coat.
B. asphaltic concrete paving.
C. asphaltic concrete overlay.
D. slurry seals.
E. speed bumps.
F. asphalt curbs.
G. pavement grinding.

1.2 RELATED SECTIONS

A. Section 31 31 19 – Vegetation Control.
B. Section 32 11 00 – Base Courses.

1.3 RELATED DOCUMENTS

A. Geotechnical Report.
B. ASTM:
C. Caltrans Standard Specifications.
   1. Section 37: Bituminous Seals.
2. Section 39: Asphalt Concrete.
5. Section 94: Asphaltic Emulsions.

D. California Building Code:
   1. Chapter 11B – Accessibility to Public Buildings.
   2. Section 1127B – Exterior Routes of Travel.

1.4 DEFINITIONS

1.5 QUALITY ASSURANCE
A. Testing Agency: Owner will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
   1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.
B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
C. Thickness of Asphaltic Concrete: In-place compacted thickness of asphalt courses will be determined according to ASTM D 3549.
D. Surface Smoothness: Finished surface of each asphalt course will be tested for compliance with smoothness tolerances.
E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to ASTM D 979.
   1. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
   2. In-place density of compacted pavement may be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
      a. One core sample may be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
      b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
1.6 **SUBMITTALS**

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Job-Mix Designs: Certificates signed by manufacturers certifying that each asphaltic concrete mix complies with requirements.

C. Material Certificates: Certificates signed by manufacturers certifying that each material complies with requirements.

1.7 **PROJECT CONDITIONS**

A. Environmental Limitations:
   1. Tack Coat: Minimum surface temperature of 60 deg F at application.
   2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at application.
   3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at application.
   4. Reinforcing Fabric: Air temperature is 50 deg F and rising and pavement temperature is 40 deg F and rising.

**PART 2 PRODUCTS**

2.1 **ASPHALTIC CONCRETE**

A. Caltrans Standard Specifications Section 39, Type A.

B. Asphalt Materials:

      a. Asphalt Curbs: use grade PG 70-10
      b. All other asphalt products: use grade PG 64-10.


   3. Asphaltic Emulsion: Caltrans Standard Specification Section 94, quick-setting type, Grade QS1h anionic or CQS1h cationic.

C. Aggregates: Conform to Caltrans Standard Specification Sections 37 as applicable.


E. Pavement Reinforcing Fabric (If indicated on drawings): Caltrans Standard Specification Section 96.

F. Sand: ASTM D 1073, Grade No. 2 or 3.
PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Owner in writing of any unsatisfactory conditions. Do not begin paving until these conditions have been satisfactorily corrected.

3.2 PAVEMENT GRINDING

A. Clean existing paving surface of loose or deleterious material immediately before pavement grinding.

B. Grind conforms as indicated.

3.3 SOIL STERILANT

A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.4 SURFACE PREPARATION FOR AGGREGATE BASE MATERIALS

A. General: Immediately before placing asphalt materials remove loose and deleterious material from substrate surfaces and ensure that prepared subgrade is ready to receive paving according to the Caltrans Standard Specification Section 39-4.01.

B. Tack Coat: Apply uniformly to all vertical surfaces against which asphaltic concrete is to be placed, including existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new asphalt pavement, according to the Caltrans Standard Specification Section 39-4.02.

1. Allow tack coat to cure undisturbed before paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 SURFACE PREPARATION FOR PAVEMENT AT ASPHALTIC CONCRETE OVERLAYS AND SLURRY SEALS

A. Pavement Irregularities: Level with asphaltic concrete, Type B, No. 4 maximum.

B. Pavement Cracks:

1. Less than ¼-inch wide: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion.

2. Wider than ¼-inch: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion and skin patch.

C. Clean surface of all material, such as leaves, dirt, sand, gravel, water and vegetation prior to applying binder of paving asphalt to existing surface.
3.6 PAVEMENT REINFORCING FABRIC
A. Protect from exposure to ultraviolet rays until placed.
B. Reject rolls with broken or damaged cores, or factory wrinkled fabric that prevents wrinkle free placement.
C. Place with binder of paving asphalt in accordance with Section 39-4.03 of Caltrans Standard Specifications.

3.7 ASPHALTIC CONCRETE SPREADING AND COMPACTING EQUIPMENT
A. Spreading Equipment: Caltrans Standard Specification Section 39-5.01.

3.8 ASPHALTIC CONCRETE PLACEMENT
A. Place, spread and compact asphaltic concrete to required grade, cross section, and thickness according to the Caltrans Standard Specification Sections 39.
B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.9 JOINTS
A. Construct joints to ensure continuous bond between adjoining paving sections according to the Caltrans Standard Specification Sections 39.
   1. Construct joints free of depressions with same texture and smoothness as other sections of asphalt course.
   2. Clean contact surfaces and apply tack coat.
   3. Offset longitudinal joints in successive courses a minimum of 6 inches.
   4. Offset transverse joints in successive courses a minimum of 24 inches.
   5. Compact joints as soon as asphaltic concrete will bear roller weight without excessive displacement.

3.10 COMPACTION
A. General: As specified within the project Geotechnical Report.
B. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact according to the Caltrans Standard Specification Sections 39.
C. Compaction Requirements: Average Density to be 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
D. Finish Rolling: Finish roll paved surfaces to remove roller marks while asphalt is still warm.
E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.11 ASPHALT CURBS

A. Construction: Place over compacted surfaces according to Caltrans Standard Specification Section 39-7.01 as specified for dikes. Apply a light tack coat prior to construction, unless pavement surface is still tacky and free of dust.

B. Shape: Place asphaltic concrete to curb cross section indicated.

3.12 SPEED BUMPS

A. Construct speed bumps over compacted pavement surfaces according to Caltrans Standard Specification Section 39-6. Apply a light tack coat prior to construction, unless pavement surface is still tacky and free of dust.

B. Place asphaltic concrete by hand using a template/screed designed to result in speed bump cross-section indicated after compaction.

C. Compact speed bumps with 8-ton static roller.

3.13 INSTALLATION TOLERANCES

A. Asphalt Pavement:

1. Course thickness and surface smoothness within the tolerances in the Caltrans Standard Specification Sections 39.

2. Total Thickness: Not less than indicated.

B. Trench Patch:

1. Compacted surface: Within 0.01 foot of adjacent pavement.

2. Do not create ponding.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnishing, placing, spreading, compacting and shaping portland cement concrete pavement with undoweled transverse weakened plane joints, for vehicular traffic.

B. Form construction and use in placing portland cement concrete pavement.

C. Joints for portland cement concrete pavement.

D. Finishing portland cement concrete pavement.

E. Curing and protecting portland cement concrete pavement.

1.2 RELATED SECTIONS

A. Section 31 31 19 – Vegetation Control (Increment 1).

B. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

1.3 RELATED DOCUMENTS

A. Geotechnical Report.

B. AASHTO Standard Specifications
   1. T 53: Softening Point of Bitumen (Ring-and-Ball Apparatus).

C. ASTM Standards
   1. A 615: Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   2. A 775: Epoxy Coated Reinforcing Steel Bars.
   3. A 934: Epoxy-Coated Prefabricated Steel Reinforcing Bars.
   6. D 2835: Lubricant for Installation of Preformed Compression Seals in Concrete Pavements.
   7. D 3405: Joint Sealants , Hot Poured , for Concrete and Asphalt Pavements.
   8. D 3963: Fabrication and Jobsite Handling of Epoxy-Coated Reinforcing Steel.

D. Caltrans Standard Specifications:

   1. Section 40, Concrete Pavement.
   2. Section 52, Reinforcement.
   3. Section 90, Concrete.
   4. Section 95, Epoxy.
E. Caltrans Standard Plans:
   2. Plan A35C: Portland Cement Concrete Pavement Joint and End Anchor Details.

1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.


1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer must be certified according to the National Ready Mix Concrete Plant Certification Program.

B. Installer Qualification: An experienced installer who has completed pavement work similar in material, design and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer’s plant and each aggregate from one source.

1.6 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements.
   1. Cementitious materials and aggregates.
   2. Steel reinforcement and reinforcement accessories.
   3. Admixtures.
   4. Curing compound.
   5. Applied finish material.
   7. Joint filler.
   10. Epoxy.
PART 2  PRODUCTS

2.1  PORTLAND CEMENT CONCRETE

A. General: Conform to Caltrans Standard Specifications, Section 90. Use Class A Concrete.

2.2  TIE BARS

A. Deformed reinforcing steel bars conforming to the requirements of ASTM Designation A 615/A (615M), Grade 40 or 60 (Grade 300 or 420).

B. Epoxy-coat in conformance with the provisions in Section 52-1.02B of Caltrans Standard Specifications, except that references made to ASTM Designation D 3963/D 3963M shall be deemed to mean ASTM Designation A 934/A 934M or A 775/775M.

C. Do not bend tie bars.

2.3  EPOXY

A. Bond tie bars to existing concrete with epoxy resin conforming to Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete," of the Caltrans Standard Specifications.

2.4  SILICONE JOINT SEALANT

A. Furnish low modulus silicone joint sealant in a one-part silicone formulation. Do not use acid cure sealants. Compound to be compatible with the surface to which it is applied and conform to the following requirements:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile stress, 150% elongation, 7-day cure at 25°C ± 1°C and 45% to 55% R.H.⁶</td>
<td>ASTM D 412 (Die C)</td>
<td>310 kPa max.</td>
</tr>
<tr>
<td>Flow at 25°C ± 1°C</td>
<td>ASTM C 639a</td>
<td>Shall not flow from channel</td>
</tr>
<tr>
<td>Extrusion Rate at 25°C ± 1°C</td>
<td>ASTM C 603b</td>
<td>75-250 g/min.</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>ASTM D 792 Method A</td>
<td>1.01 to 1.51</td>
</tr>
<tr>
<td>Durometer Hardness, at -18°C, Shore A, cured 7 days at 25°C ± 1°C</td>
<td>ASTM C 661</td>
<td>10 to 25</td>
</tr>
<tr>
<td>Ozone and Ultraviolet Resistance, after 5000 hours</td>
<td>ASTM C 793</td>
<td>No chalking, cracking or bond loss</td>
</tr>
<tr>
<td>Tack free at 25°C ± 1°C and 45% to 55% R.H.⁶</td>
<td>ASTM C 679</td>
<td>Less than 75 minutes</td>
</tr>
<tr>
<td>Elongation, 7 day cure at 25°C ± 1°C and 45% to 55% R.H.⁶</td>
<td>ASTM D 412 (Die C)</td>
<td>500 percent min.</td>
</tr>
<tr>
<td>Set to Touch, at 25°C ± 1°C and 45% to 55% R.H.⁶</td>
<td>ASTM D 1640</td>
<td>Less than 75 minutes</td>
</tr>
<tr>
<td>Shelf Life, from date of shipment</td>
<td>—</td>
<td>6 months min.</td>
</tr>
<tr>
<td>Bond, to concrete mortar-concrete briquets, air cured 7 days at 25°C ± 1°C</td>
<td>AASHTO T 132c</td>
<td>345 kPa min.</td>
</tr>
</tbody>
</table>
Movement Capability and Adhesion: 100% extension at -18°C after, air cured 7 days at 25° ± 1°C, and followed by 7 days in water at 25° ± 1°C

<table>
<thead>
<tr>
<th>ASTM</th>
<th>No adhesive or cohesive failure after 5 cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>C 719d</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

ASTM Designation: C 639 Modified (15 percent slope channel A).
ASTM Designation: C 603, through 3-mm opening at 345 kPa.
Mold briquets in conformance with the requirements in AASHTO Designation: T 132, sawed in half and bonded with a 1.5 mm maximum thickness of sealant and tested in conformance with the requirements in AASHTO Designation: T 132.
Briquets shall be dried to constant mass at 100 ± 5°C.
Movement Capability and Adhesion: Prepare 305 mm x 25 mm x 75 mm concrete blocks in conformance with the requirements in ASTM Designation: C 719. A sawed face shall be used for bond surface. Seal 50 mm of block leaving 12.5 mm on each end of specimen unsealed. The depth of sealant shall be 9.5 mm and the width 12.5 mm.

e. R.H. equals relative humidity.

B. Formulate the silicon joint sealant to cure rapidly enough to prevent flow after application on grades of up to 15 percent.

C. Furnish to the Owner a Certificate of Compliance. Accompany certificate with a certified test report of the results of the required tests performed on the sealant material within the previous 12 months prior to proposed use. Provide the certificate and accompanying test report for each lot of silicone joint sealant prior to use on the project.

2.5 ASPHALT RUBBER JOINT SEALANT

A. Conform to the requirements of ASTM Designation: D 3405 as modified herein or to the following:

1. Provide a mixture of paving asphalt and ground rubber. Ground rubber to be vulcanized or a combination of vulcanized and de-vulcanized materials ground so that 100 percent will pass a 2.36-mm sieve and contain not less than 22 percent ground rubber, by mass. Modifiers may be used to facilitate blending.

2. The Ring and Ball softening point shall be 57°C minimum, when tested in conformance with the requirements in AASHTO Designation: T 53.

3. Provide asphalt rubber sealant material capable of being melted and applied to cracks and joints at temperatures below 204°C.

B. The penetration requirement of Section 4.2 of ASTM Designation: D 3405 do not apply. The required penetration at 25°C, 150g, 5s, shall not exceed 120.

C. The resilience requirement of Section 4.5 of ASTM Designation: D 3405 do not apply. The required resilience, when tested at 25°C, shall have a minimum of 50 percent recovery.

D. Accompany each lot of asphalt rubber joint sealant shipped to the job site, whether as specified herein or conforming to the requirements of ASTM Designation D 3405, as modified herein, by a Certificate of Compliance, storage and heating instructions and precautionary instructions for use.

E. Heat and place in conformance with the manufacturer's written instructions and the details shown on the plans. Provide manufacturer's instructions to the Owner. Do not place when the pavement surface temperature is below 10°C.

2.6 PREFORMED COMPRESSION JOINT SEALANT

1. Number of cells: 5 or 6.


3. Install compression seals along with lubricant adhesive according to the manufacturer's recommendations. Submit manufacture's recommendations to the Owner's Representative.

   B. Accompany each lot of compression seal and lubricant adhesive by a Certificate of Compliance, storage instructions and precautionary instructions for use. Also submit the manufacturer's data sheet with installation instructions and recommended model or type of preformed compression seal for the joint size and depth as shown on the plans. Show evidence that the selected seal is being compressed at level between 20 and 50 percent at all times for the joint width and depth shown on the plans.

2.7 BACKER RODS

   A. Provide backer rods that have a diameter prior to placement at least 25 percent greater than the width of the saw cut after sawing and are expanded, crosslinked, closed-cell polyethylene foam that is compatible with the joint sealant so that no bond, adverse reaction occurs between the rod and sealant. In no case use a hot pour sealant that will melt the backer rod. Submit a manufacturer's data sheet verifying that the backer rod is compatible with the sealant to be used.

PART 3 EXECUTION

3.1 WATER SUPPLY

   A. Conform to Section 40 of Caltrans Standard Specifications.

3.2 SUBGRADE

   A. Conform to Section 40 of Caltrans Standard Specifications.

3.3 SOIL STERILANT

   A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.4 PLACING

   A. Conform to Section 40 of Caltrans Standard Specifications.
3.5 SPREADING COMPACTING AND SHAPING

A. Conform to Section 40-1.03F of Caltrans Standard Specifications.

1. Stationary Side Form Construction: Section 40-1.03F of Caltrans Standard Specifications.

2. Slip Form Construction: Section 40-1.03F of Caltrans Standard Specifications.

3.6 INSTALLING TIE BARS

A. Install at longitudinal contact joints, longitudinal weakened plane joints, and transverse contact joints as shown on the plans. In no case, shall any consecutive width of new portland cement concrete pavement tied together with tie bars exceed 15 meters. In no case shall tie bars be used at a joint where portland cement concrete and asphalt concrete pavements abut.

B. Tie bars shall be installed at longitudinal joints by one of the 3 following methods:

1. Drilling and bonding in conformance with the details shown on the plans. Provide a two-component, epoxy-resin, conforming to the requirements of ASTM Designation: C 881, Type V. Grade 3 (Non-Sagging), Class shall be as follows:

<table>
<thead>
<tr>
<th>Temperature of Concrete</th>
<th>Required Class of Epoxy Resin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower than 40° F (4.5 °C)</td>
<td>A</td>
</tr>
<tr>
<td>40° F (4.5° C) through 60° F (15.5° C)</td>
<td>B</td>
</tr>
<tr>
<td>Above 60° F (15.5° C)</td>
<td>C</td>
</tr>
</tbody>
</table>

2. Provide, at least 7 days prior to start of work, a Certificate of compliance and a copy of the manufacturer's recommended installation procedure. The drilled holes shall be cleaned in accordance with the epoxy manufacturer's instructions and shall be dry at the time of placing the epoxy and tie bars. Immediately after inserting the tie bars into the epoxy, the tie bars shall be supported as necessary to prevent movement during the curing and shall remain undisturbed until the epoxy has cured a minimum time as specified by the manufacturer. Tie bars that are improperly bonded, as determined by the Owner, will be rejected. If rejected, adjacent new holes shall be drilled, as directed by the Owner, and new tie bars shall be placed and securely bonded to the concrete. All work necessary to correct improperly bonded tie bars shall be performed at the Contractor's expense.

3. Insert the tie bars into the plastic slip-formed concrete before finishing the concrete. Inserted tie bars shall have full contact between the bar and the concrete. When tie bars are inserted through the pavement surface, the concrete over the tie bars shall be reworked and refininished to such an extent that there is no evidence on the surface of the completed pavement that there has been any insertion performed. Any loose tie bars shall be replaced by drilling and grouting into place with epoxy as described in method 1 above at the Contractor's expense.

4. By using threaded dowel splice couplers fabricated from deformed bar reinforcement material, free of external welding or machining. Threaded dowel splice couplers shall be accompanied by a Certificate of Compliance and installation instructions. Installation of threaded dowel splice couplers shall conform to the requirements of the manufacturer's recommendations.
3.7 JOINTS
A. Conform to Section 40-2.038 of Caltrans Standard Specifications, Except that tie bars shall be as specified under Part 2, Products.

1. Transverse Contact Joints: Section 40-2.03 of Caltrans Standard Specifications.
   a. Construct a transverse contact (construction) joint at the end of each day's work, or where concrete placement is interrupted for more than 30 minutes, to coincide with the next weakened plane joint location.
   
   b. If sufficient concrete has not been mixed to form a slab to match the next weakened plane joint, when an interruption occurs, the excess concrete shall be removed and disposed of back to the last preceding joint. The cost of removing and disposing of any excess concrete shall be at the Contractor's expense. Any excess material shall be become the property of the Contractor and shall be properly disposed of.
   
   c. A metal or wooden bulkhead (header) shall be used to form the joint. The bulkhead shall be designed to accommodate the installation of tie bars.

2. Weakened Plane Joints: Section 40-1.08B, except that the insert method of forming joints in pavement shall not be used.

3.8 FINISHING
A. Conform to Sections 40-1.03H of Caltrans Standard Specifications.

3.9 CURING
A. Conform to Section 40-1.03I of Caltrans Standard Specifications.

3.10 SEALING JOINTS
A. Liquid Joint Sealant Installation.

1. The joint sealant detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Construct weakened plane joints by the sawing method. Should grinding or grooving be required over or adjacent to any joint after sealant has been placed, completely remove the joint material and disposed of, and replace at the Contractor's expense. Recess sealant below the final finished surface as shown on the plans.

2. At the Contractor's option, transverse weakened plane joints shall be either Type DSC or Type SSC as shown on the plans. Longitudinal weakened plane joints shall be Type SSC only as shown on the plans.

3. Seven days after the concrete pavement placement and not more than 4 hours before placing backer rods and joint sealant materials, clean the joint walls by the dry sandblast method and other means as necessary to completely remove from the joint all objectionable material such as soil, asphalt, curing compound, paint and rust. After cleaning the joint, remove all traces of sand, dust and loose material from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Remove surface moisture at the joints by means of compressed air or moderate hot compressed air or other means approved means. Do not use drying procedures that leave a residue or film on the joint wall. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 mm and a minimum pressure of 0.62-MPa.

4. Install backer rod as shown on the plans. Provide an expanded, closed-cell polyethylene foam backer rod that is compatible with the joint sealant so that no bond or adverse reaction
occurs between the rod and sealant. Install backer rod when the temperature of the portland cement concrete pavement is above the dew point of the air and when the air temperature is 4°C or above. Install backer rod when the joints to be sealed have been properly patched, cleaned and dried. Do not use a method of placing backer rod that leave a residue or film on the joint walls.

5. Immediately after placement of the backer rod, place the joint sealant in the clean, dry, prepared joints as shown on the plans. Apply the joint sealant by a mechanical device with a nozzle shaped to fit inside the joint to introduce the sealant from inside the joint. Apply adequate pressure to the sealant to ensure that the sealant material is extruded evenly and that full continuous contact is made with the joint walls. After application of the sealant recess the surface of the sealant as shown on the plans.

6. Any failure of the joint material in either adhesion or cohesion of the material will be cause for rejection of the joint. Conform the finished surface of joint sealant to the dimensions and allowable tolerances shown on the plans. Rejected joint materials or joint material whose finished surface does not conform to the dimensions shown on the plans shall be repaired or replaced, at the Contractor's expense, with joint material that conforms to the requirements.

7. After each joint is sealed, remove all surplus joint sealer on the pavement surface. Traffic shall not be permitted over the sealed joints until the sealant is tack free and set sufficiently to prevent embedment of roadway debris into the sealant.

B. Preformed Compression Joint Seal Installation

1. The compression seal alternative joint detail for transverse and longitudinal joints, as shown on the plans, shall apply only to weakened plane joints. Construct weakened plane joints by the sawing method. Should grinding or grooving be required over or adjacent to any joint after the compression seal has been placed, completely remove the joint materials and disposed of, and replace at the Contractor's expense. Compression seal shall be recessed below the final finished surface as shown on the plans.

2. At the Contractor's option, transverse weakened plane joints shall be either Type DSC or Type SSC as shown on the plans. Longitudinal weakened plane joints shall be Type SSC only as shown on the plans.

3. Seven days after the concrete pavement placement and not more than 4 hours before placing preformed compression joint seals, the joint walls by the dry sand blast method and other means as necessary to completely remove from the joint all objectionable material such as soil, asphalt, curing compound, paint and rust. After cleaning the joint, remove all traces of sand, dust and loose material from and near the joint for a distance along the pavement surfaces of at least 50 mm on each side of the joint by the use of a vacuum device. Remove surface moisture at the joints by means of compressed air or moderate hot compressed air or other means. Do not use drying procedures that leave a residue or film on the joint wall. Sandblasting equipment shall have a maximum nozzle diameter size of 6 ± 1 mm and a minimum pressure of 0.62-MPa.

3.11 PROTECTING CONCRETE PAVEMENT

A. Conform to Section 40 of Caltrans Standard Specifications.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Portland Cement Concrete curbs and gutters.

1.2 RELATED SECTIONS
A. Section 31 23 00 – Excavation and Fill.
B. Section 31 31 19 – Vegetation Control (Increment 1).
C. Section 32 11 00 – Base Courses.
D. Section 32 13 00 – Rigid Paving.
E. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

1.3 RELATED DOCUMENTS
A. American Concrete Institute (ACI):
   1. ACI 301 - Specifications for Structural Concrete for Buildings.
   2. ACI 308 - Standard Practice for Curing Concrete.
B. American society for Testing and Materials (ASTM):
   1. ASTM A 185 - Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
   2. ASTM A 615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
C. Caltrans Standard Specifications:
   1. Section 73: Concrete Curbs and Sidewalks.
   2. Section 90: Concrete.

1.4 DEFINITIONS
A. ASTM: American Society for Testing Materials

1.5 SUBMITTALS
A. Submittal procedures shall be as outlined in Section 01 33 00 – Submittal Procedures.
B. Concrete Mix Design: Have all concrete mixes designed by a testing laboratory and approved by the Owner. Conform all mixes to the applicable building code requirement, regardless of other minimum requirements listed herein or on the drawings. Submit mix designs for review before use. Show proportions and specific gravities of cement, fine and coarse aggregate, and water and gradation of combined aggregates.
1.6 QUALITY ASSURANCE

A. Concrete shall be subject to quality assurance in accordance with Section 90 of the Standard Specifications.

B. Certifications:

1. Provide Owner at the time of delivery with certificates of compliance signed by both Contractor and Supplier containing the following statements:

   a. Materials contained comply with the requirements of the Contract Documents in all respects.
   
   b. Proportions and mixing comply with the design mix approved by the Consulting Engineer. Design mix shall have been field tested in accordance with the herein requirements of the Caltrans Standard Specifications and produces the required compressive strength under like conditions.
   
   c. Statement of type and amount of any admixtures.

2. Provide Owner, at time of delivery, with certified delivery ticket stating volume of concrete delivered and time of mixing, or time of load-out in case of transit mixers.

C. Conform to the applicable provisions of Section 51, 73 and 90 of the Caltrans Standard Specification and these Technical Specifications.

   1. Conform construction of portland cement concrete surface improvements (including curbs, gutters, medians, valley gutters, walks) to the requirements of Section 73 of the Caltrans Standard Specifications unless otherwise required in these Technical Specifications or shown on the Plans.

   2. Construct "V" ditches in accordance with Section 72-4 of the Standard Specifications; except that finishing shall be in accordance with Standard Specification Section 73 instead of 53, or as otherwise required in these Technical Specifications or shown on the Plans.

1.7 DESIGNATION

A. General: Whenever the 28-day compressive strength is designated herein or on the Plans is 3,500 psi or greater, the concrete shall considered to be designated by compressive strength. The 28-day compressive strength shown herein or on the plans which are less than 3,500 psi are shown for design information only and are not considered a requirement for acceptance of the concrete. Whenever the concrete is designated by class or as minor concrete herein or on the Plans, the concrete shall contain the cement per cubic yard shown in Section 90-1.01 of the Caltrans Standard Specifications.

PART 2 PRODUCTS

2.1 GENERAL

A. Comply with requirements of Section 32 05 23 – Cement and Concrete for Exterior Improvements.

2.2 PORTLAND CEMENT CONCRETE

A. Unless specified otherwise herein or on the Plans, Portland Cement Concrete for items in this section shall be Minor Concrete as specified in Section 90-1.01 of the Caltrans Standard Specifications.

2.3 CURBS AND GUTTERS FORMS
A. Use flexible spring-steel forms or laminated boards to form radius bends. Tolerance: Not to deviate more than 1/4 inch in 10 feet in grade and alignment.

2.4 EXPANSION JOINT MATERIAL

A. Material for expansion joints in portland cement concrete improvements shall be premolded expansion joint fillers conforming to the requirements of ASTM Designation D 1751. Expansion joint material shall be shaped to fit the cross section of the concrete prior to being placed. Suppliers certificates showing conformance with this specification shall be delivered with each shipment of materials delivered to the job site.

B. Unless noted otherwise herein or on the Plans expansion joint thickness shall be as follows:


PART 3 EXECUTION

3.1 GENERAL

A. Comply with requirements of Section 32 05 23 – Cement and Concrete for Exterior Improvements.

B. Form, place and finish concrete walkways, island paving, valley gutters and driveway approaches in conformance with the applicable requirements of Section 73-1.04 and 73-1.06 of the Caltrans Standard Specifications as modified herein.

C. Construct new concrete curb, curb and gutter and valley gutters against existing asphalt concrete by removing a minimum of 12-inches of the asphalt concrete to allow placement of curb or gutter forms. Patch pavement with a 6-inch deep lift of asphalt concrete after gutter form is removed.

3.2 SUBGRADE

A. Conform to Section 40 of Caltrans Standard Specifications.

3.3 SOIL STERILANT

A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.4 PLACING CONCRETE FORMS

A. Form concrete improvements with a smooth and true upper edge. Side of the form with a smooth finish shall be placed next to concrete. Construct forms rigid enough to withstand the pressure of the fresh concrete to be placed without any distortion.

B. Thoroughly clean all forms prior to placement and coat forms with an approved form oil in sufficient quantity to prevent adherence of concrete prior to placing concrete.

C. Carefully set forms to the alignment and grade established and conform to the required dimensions. Rigidly hold forms in place by stakes set at satisfactory intervals. Provide sufficient clamps, spreaders and braces to insure the rigidity of the forms.

D. Provide forms for back and face of curbs, lip of gutters and edge of walks, valley gutters or other surface slabs that are equal to the full depth of the concrete as shown, noted or called for on the Plans. On curves and curb returns provide composite forms made from benders or thin planks of sufficient ply to ensure rigidity of the form.

3.5 PLACING STEEL REINFORCEMENT
A. Bars shall be free of mortar, oil, dirt, excessive mill scale and scabby rust and other coatings of any character that would destroy or reduce the bond.

B. Accurately place reinforcement as shown on the plans and hold firmly and securely in position by wiring at intersections and splices, and by providing precast mortar blocks or ferrous metal chairs, spacers, metal hangers, supporting wires, and other approved devices of sufficient strength to resist crushing under applied loads. Provide supports and ties of such strength and density to permit walking on reinforcing without undue displacement.

C. Place reinforcing to provide the following minimum concrete cover:
   1. Surfaces exposed to water: 4-inches.
   2. Surfaces poured against earth: 3-inches.
   3. Formed surfaces exposed to earth or weather: 2-inches.
   4. Slabs, walls, not exposed to weather or earth: 1-inch.

D. Minimum spacing, center of parallel bars shall be two and one half (2-1/2) times the diameter of the larger sized bar. Accurately tie reinforcing securely in place prior to pouring concrete. Placing of dowels or other reinforcing in the wet concrete is not permitted.

3.6 PLACING PORTLAND CEMENT CONCRETE
A. Thoroughly wet subgrade when concrete is placed directly on soil. Remove all standing water prior to placing concrete.

B. Do not place concrete until the subgrade and the forms have been approved.

C. Convey concrete from mixer to final location as rapidly as possible by methods that prevent separation of the ingredients. Deposit concrete as nearly as possible in final position to avoid re-handling.

D. Place and solidify concrete in forms without segregation by means of mechanical vibration or by other means as approved by the Owner. Continue vibration until the material is sufficiently consolidated and absent of all voids without causing segregation of material. The use of vibrators for extensive shifting of fresh concrete will not be permitted.

E. Concrete in certain locations may be pumped into place upon prior approval by the Owner. When this procedure requires redesign of the mix, such redesign shall be submitted for approval in the same manner as herein specified for approval of design mixes.

3.7 EXPANSION JOINTS
A. Construct expansion joints incorporating premolded joint fillers at twenty (20) foot intervals in all concrete curbs, gutters, median/island paving, valley gutters, driveway approaches and at the ends of all returns. At each expansion joint install one-half inch by twelve inch (1/2" x 12") smooth slip dowels in the positions shown or noted on the detail drawings.

3.8 WEAKENED PLANE JOINTS
A. Construct weakened plane joints in concrete curbs, gutters, median/island paving and valley gutters between expansion joints at ten (10) foot intervals throughout, or as otherwise indicated. Depth of joint score depth to be one-fourth (25%) the thickness of the concrete.

B. Grooved Joints: Form weakened plane joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch. Repeat grooving of weakened plane joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
3.9 FINISHING CONCRETE

A. Finish curb and gutter in conformance with the applicable requirements of Section 73-1.04 and 73-1.05A of the Caltrans Standard Specifications as modified herein.

B. Where monolithic curb, gutter and sidewalk is specified, separate concrete pours will not be allowed.

C. Provide a medium broom finish to all horizontal surfaces unless otherwise shown.

3.10 FORM REMOVAL

A. Remove forms without damage to the concrete. Remove all shores and braces below the ground surface, before backfilling.

B. Do not backfill against concrete until the concrete has developed sufficient strength to prevent damage.

C. Leave edge forms in place at least 24 hours after pouring.

3.11 CONNECTING TO EXISTING CONCRETE IMPROVEMENTS

A. New curb or gutter is to connect to existing improvements to remain by saw cutting to existing sound concrete at the nearest score line, expansion joint or control joint. Drill and insert ½-inch diameter by 12-inch long dowels at 24-inches on center into existing improvements. Install pre-molded expansion joint filler at the matching joint.

B. A cold joint to the existing curb is not acceptable.

3.12 FIELD QUALITY CONTROL

A. Conform the finish grade at top of curb, flow line of gutter, and the finish cross section of concrete improvements to the design grades and cross sections.

B. Variation of concrete improvements from design grade and cross section as shown or called for on the plans shall not exceed the tolerances established in Sections 73-1.05 and/or 73-1.06 of the Caltrans Standard Specifications.

3.13 RESTORATION OF EXISTING IMPROVEMENTS

A. Replace in kind all pavement or other improvements removed or damaged due to the installation of concrete improvements.

B. Remove, landscaping or plantings damaged or disturbed due to the installation of concrete improvements. Replace in kind.

END OF SECTION
SECTION 32 17 23
PAVEMENT MARKINGS

PART 1  GENERAL

1.1  SECTION INCLUDES

A. Removal of existing traffic stripes and pavement markers.
B. Removal of existing signs.
C. Cleaning and sweeping of streets before application of traffic stripes and pavement markings.
D. Materials and application for traffic stripes and pavement markings.
E. Materials and application for pavement markers.
F. Traffic control signs and street name signs.
G. Object markers.
H. Survey monuments.

1.2  RELATED SECTIONS

A. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

1.3  RELATED DOCUMENTS

A. Caltrans Standard Specifications:
   1. Section 56, Overhead Sign Structures, Standards and Poles.
   2. Section 81, Misc. Traffic Control Devices.
   3. Section 82, Signs and Markers.
   4. Section 84, Markings.
B. Caltrans Standard Plans:
   7. Plan A73B: Markers.
C. The Manual of Uniform Traffic Control Devices (MUTCD), and the California Supplement to the MUTCD, the editions in effect at time of date on plans.

D. The regulations, standards, and tests of the State of California Department of Transportation Materials and Research Division, edition in effect at time of date on plans.

1.4 QUALITY ASSURANCE

A. Deliver certificates showing conformance with this specification to the Owner with each shipment of materials and equipment to the Project site.

1.5 PROJECT CONDITIONS

A. Do not apply traffic striping or pavement markings to the pavement until after approval to proceed has been given by the Owner.

B. Thoroughly cure new asphalt concrete and portland cement concrete before application of stripes, markings or markers.

PART 2 PRODUCTS

2.1 GENERAL

A. For products to be installed within the jurisdiction of a local, state or federal agency, product(s) shall conform to the agency’s standard specifications.

2.2 THERMOPLASTIC STRIPES AND MARKING

A. Conform thermoplastic striping and marking materials to Section 84-2.02B of Caltrans Standard Specifications, unless noted otherwise herein or on the Plans.

2.3 PAINTED STRIPES AND MARKINGS

A. Conform painted striping and marking materials to Section 84-2.02C of Caltrans Standard Specifications, unless noted otherwise herein or on the Plans.

2.4 PAVEMENT MARKERS

A. Types: Section 81-3 of Caltrans Standard Specifications and as indicated.

B. Sampling, Tolerances and Packaging: Section 81-3 of Caltrans Standard Specifications.

C. Material


2.5 TRAFFIC CONTROL SIGNS

A. General: Section 82 of the Caltrans Standard Specifications.

B. Sign Panels: Conform type (regulatory or warning), size, shape and pattern to the State of California, Department of Transportation, Traffic Manual, edition in effect at the date of the Plans. Sign faces to be of reflectorized porcelain enamel.

C. Posts:
1. Metal: Two (2) inch inside diameter steel pipe. Conform to Section 82-3.02B of Caltrans Standard Specifications, unless otherwise specified.

2. Wood: Conform to Section 82-3.02C.

D. Mounting Hardware: Section 82-3.02E of Caltrans Standard Specifications, unless otherwise specified.


2.6 REFLECTORIZED OBJECT MARKERS

A. Reflectorized Metal Object Markers: Conform to the applicable requirements of Section 82 of Caltrans Standard Specifications for target plates and reflectors, and Caltrans Standard Plan A73A for type L-1 or L-2 object markers.

B. Posts: Metal posts conforming to the applicable requirements of Section 82-3.02B of Caltrans Standard Specifications and Caltrans Standard Plan A73B.

C. Mounting Hardware: Conform to the applicable requirements of Section 82-3.02E of Caltrans Standard Specifications.

PART 3 EXECUTION

3.1 REMOVAL OF TRAFFIC STRIPES, PAVEMENT MARKINGS AND PAVEMENT MARKERS

A. Where blast cleaning is used for the removal of painted traffic stripes and pavement markings, or for removal of objectionable material, remove the residue, including dust and water, immediately after contact with the surface being treated. Remove by a vacuum attachment operating concurrently with the blast cleaning operation.

B. Where grinding is used for the removal of thermoplastic traffic stripes and pavement markings; remove the residue by means of a vacuum attachment to the grinding machine. Do not allow the residue to flow across or be left on, the pavement.

C. Where markings are to be removed by blast cleaning or by grinding, the removed area shall be approximately rectangular so that no imprint of the removed marking remains on the pavement.

D. Contractor will be responsible for repairing any damage to the pavement during removal of pavement markers. Damage to the pavement, resulting from removal of pavement markers, shall be considered as any depression more than 1/4-inch deep.

3.2 TEMPORARY PAVEMENT MARKERS

A. If permanent pavement markers cannot be installed immediately, and the street or road is to be placed in service, install short term, temporary pavement markers on the new pavement prior to opening the street or road to traffic.

B. Place markers, at a minimum, of 24 feet on centers or as required by the governmental agency having jurisdiction, in the appropriate colors to delineate centerlines and travel lanes on multi-lane roadways.
3.3 **THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS**

A. Apply in conformance with the manufacturer's instructions and the applicable requirements of Section 84-2.02B of Caltrans Standard Specifications and Caltrans Standard Plans A20A through A20D, and A24A through A24E.

3.4 **PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS**

A. Apply in conformance with the manufacturer's instructions and the applicable requirements of Section 84-2.02C of Caltrans Standard Specifications and Caltrans Standard Plans A20A through A20D, and A24A through A24E.

3.5 **PAVEMENT MARKERS**

A. Place in conformance with the requirements of Section 81.3 of the Caltrans Standard Specifications.

B. Pavement recesses are not required. Markers shall be installed accurately to the line established by the Engineer. No markers shall be installed until the surface has been approved by the Owner.

3.6 **TRAFFIC CONTROL SIGNS**

A. Install in conformance with Sections 82 of Caltrans Standard Specifications, Caltrans Standard Plan RS1, the applicable requirements of the State of California Department of Transportation Maintenance Manual and the details shown on the Plans. The horizontal locations shown on Caltrans Standard Plan RS1 shall not be applicable, the horizontal location shall be as shown on the Plans.

B. Portland cement concrete for post foundations shall be of the configuration shown on the Plans.

C. After erection, damage to traffic sign faces shall be touched up or the sign replaced.

3.7 **STREET NAME SIGNS**

A. Install in accordance with the manufacturer’s instructions and as shown on the Plans.

B. Horizontal location shall be as shown on the Plans.

C. Portland cement concrete for post foundations shall be of the configuration shown on the Plans.

3.8 **REFLECTORIZED OBJECT MARKERS**

A. Install in conformance with the requirements of Section 82 of Caltrans Standard Specifications, except that the metal marker posts shall not be driven in place without prior approval of the Owner.

B. Install at locations shown on the Plans.

3.9 **STREET SURVEY MONUMENTS**

A. General: Conform to Section 82 of Caltrans Standard Specifications and Caltrans Standard Plan A74, except that the marker disk will not be furnished. Exact point in marker to be determined by an accurate survey and clearly punched in top of marker together with California Registered Civil Engineer’s or California Licensed Land Surveyor’s license number.
3.10 PROTECTION

A. Protect the newly installed and traffic stripes and pavement markings from damage until the material has cured.

B. Replace any traffic stripes or pavement markings or markers broken, misaligned or otherwise disturbed prior to opening roadway to traffic.

3.11 RESTORATION OF EXISTING IMPROVEMENTS

A. Existing signs striping or other markings removed or damaged due to the installation of new facilities shall be replaced in kind.

B. Existing landscaping or planting removed, damaged or disturbed due to the installation of traffic control signs or street name signs shall be replaced in kind.

END OF SECTION
SECTION 32 1726
TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.02 RELATED REQUIREMENTS
A. Section 32 05 23 - Cement and Concrete for Exterior Improvements.
B. Section 32 1723.13 - Painted Pavement Markings: Crosswalk and curb markings.
C. Section 32 17 23 - Pavement Markings: Crosswalk and curb markings.

1.03 REFERENCE STANDARDS
B. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA); current edition.
E. FED-STD-595C - Colors Used in Government Procurement (Fan Deck); 2008 (Chg Notice 1).

1.04 SUBMITTALS
A. See Section 01 3300 - Submittal Procedures.
B. Samples: For each product specified provide two samples, 8 inches square, minimum; show actual product, color, and patterns.
C. Shop Drawings: Submit plan and detail drawings. Indicate:
   1. Locations on project site. Demonstrate compliance with referenced accessibility standards.
   2. Sizes and layout.
   3. Pattern spacing and orientation.
   4. Attachment and fastener details, if applicable
D. Warranty: Submit manufacturer warranty; complete forms in Owner's name and register with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.
B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F.

1.06 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Plastic Tiles: Provide manufacturer's standard five year warranty against manufacturing defects, breakage or deformation.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Plastic Tactile and Detectable Warning Surface Tiles:
   2. ADA Solutions, Inc; _______: www.adatile.com.
   4. Substitutions: See Section 01 2500 - Substitution Requirements.
2.02 TACTILE AND DETECTABLE WARNING DEVICES
   A. Plastic Tactile and Detectable Warning Tiles: ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory applied removable protective sheeting.
      1. Installation Method: Cast in place.
      2. Shape: Rectangular.
      3. Pattern: In-line pattern of truncated domes complying with ADA Standards.
      4. Edge: Square.

2.03 ACCESSORIES
   A. Adhesive: Provide single component polyurethane or polyether structural adhesive; approved by tile manufacturer.

PART 3 EXECUTION
3.01 EXAMINATION
   A. When installation location is near site boundary or property line, verify required location using property survey.
   B. Verify that work area is ready to receive work:
      1. If existing conditions are not as required to properly complete the work of this section, notify Architect.
      2. Do not proceed with installation until deficiencies in existing conditions have been corrected.
   C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 INSTALLATION, GENERAL
   A. Install in accordance with manufacturer's written instructions.
      1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.
      2. Do not install when ambient or substrate temperature has been below 40 degrees F during the preceding 8 daylight hours.
   B. Field Adjustment:
      1. Do not cut plastic tiles to less than 9 inches wide in any direction.
      2. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.
      3. Orient so dome pattern is aligned with the direction of ramp.
      4. Align truncated dome pattern between adjacent units.
   C. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.03 INSTALLATION, CAST IN PLACE PLASTIC TILES
   A. Concrete:
      1. See Section 03 3000.
      2. Slump: 4 to 7 percent.
   B. Tamp and vibrate units as recommended by manufacturer.
   C. Place and position weights on units while concrete cures as recommended by manufacturer. Ensure no voids or air pockets exist between top surface of concrete and underside of units.

3.04 INSTALLATION, SURFACE APPLIED PLASTIC TILES
   A. Cure concrete surfaces for a minimum of 4 days before installing units.
   B. Mechanically roughen surface as required to remove contaminants and prepare surface for adhesive and sealant application.
   C. When installing multiple adjacent units, leave a 1/8 inch gap between tiles to allow for expansion.
D. Drill fastener holes straight, true and to depth recommended by manufacturer.
E. Apply adhesive to back of unit as recommended by manufacturer.
F. Mechanically fasten to substrate. Avoid striking or damaging the unit itself during installation.
G. Apply sealant to edges in cove profile.

3.05 CLEANING PLASTIC UNITS
A. Remove protective plastic sheeting within 24 hours of installation.
B. Remove excess sealant or adhesive from joints and edges.
C. Clean four days prior to date of scheduled inspection.

3.06 PROTECTION
A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.
B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION
PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Benches.
   B. Bike Rack.
   C. Waste receptacles.
1.02 RELATED REQUIREMENTS
   A. Section 32 0523 - Cement and Concrete for Exterior Improvements: Anchorage of outdoor furniture.
1.03 REFERENCE STANDARDS
   D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
1.04 SUBMITTALS
   A. See Section 01330 - Submittal Procedures, for submittal procedures.
   B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.
   C. Samples: Submit two sets of manufacturer's available colors for metal furnishings.
1.05 WARRANTY
   A. See Section 01330 - Submittal Procedures, for additional warranty requirements.
   B. Provide manufacturer's warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Metal Furnishings:
2.02 METAL FURNISHINGS
   A. Benches: Metal frame and seat section with back.
      1. Frame: Steel.
      2. Finish: Factory powder coat; Color: Dark Bronze.
      4. Length: 75 inches.
      5. Mounting: Surface.
      6. Products:
         a. Wabash Valley Model CN530P
         b. Substitutions: See Section 01330 - Submittal Procedures.
   B. Waste Receptacles: Dispatch Litter and Recycling Receptacle, steel frame with perforated steel outer shell; cast aluminum flare top, no lid; with side opening.
      2. Shape: Cylindrical with flared top.
5. Mounting: Surface.
6. Products:
   a. Wabash Valley Model FR500P.
   b. Substitutions: See Section 01330 - Submittal Procedures.

C. Bike Racks: hoop style.
   1. Finish: Powder coat.
   2. Color: Blue
   3. Size: 37 inches high x 42 inches wide.
   4. Mounting: Surface with 1/4” x 6” diameter steel base plates.
   5. Products:
      a. Ultra Site Model 5000SM
      b. Substitutions: See Section 01330 - Submittal Procedures.

**PART 3 EXECUTION**

3.01 EXAMINATION
   A. Verify that mounting surfaces, preinstalled anchor bolts, or other mounting devices are properly installed; and ready to receive site furnishing items.
   B. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION
   A. Install site furnishings in accordance with approved shop drawings, and manufacturer's installation instructions.
   B. Provide level mounting surfaces for site furnishing items.

**END OF SECTION**
SECTION 32 3113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Fence framework, fabric, and accessories.
B. Excavation for post bases; concrete foundation for posts.
C. Manual gates and related hardware.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

1.04 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 MATERIALS AND COMPONENTS
A. Materials and Components: Conform to CLFMI CLF 2445.

2.03 COMPONENTS
A. Unless noted otherwise on drawings, provide:
   1. Line Posts: 2.38 inch diameter.
   2. Corner and Terminal Posts: 2.88 inch.
   3. Gate Posts: 3.5 inch diameter.
   4. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.
   5. Gate Frame: 2.38 inch diameter for welded fabrication.
   6. Fabric: 1 inch diamond mesh interwoven wire, 9 gage, 0.1144 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
   7. Tension Wire: 6 gage, 0.1620 inch thick steel, single strand.

2.04 ACCESSORIES
A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.
B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
C. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; welded 10 gauge galvanized box to accommodate cylinder lockset; keeper to hold gate in fully open position.
   1. Russwin Corbin Vandal Resistant Storeroom Lock: CL3157 626.
2.05 FINISHES
A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 1.7 oz/sq ft.
B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.
C. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install framework, fabric, accessories and gates in accordance with ASTM F567.
B. Place fabric on outside of posts and rails.
C. Set intermediate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
D. Line Post Footing Depth Below Finish Grade: 4 feet, unless noted otherwise.
E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 4 feet, unless noted otherwise.
F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
G. Provide top rail through line post tops and splice with 6 inch long rail sleeves.
H. Install center brace rail on corner gate leaves.
I. Do not stretch fabric until concrete foundation has cured 28 days.
J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
K. Position bottom of fabric 2 inches above finished grade.
L. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
N. Install bottom tension wire stretched taut between terminal posts.
O. Do not attach the hinged side of gate to building wall; provide gate posts.
P. Install hardware and gate with fabric to match fence.

3.02 TOLERANCES
A. Maximum Variation From Plumb: 1/4 inch.
B. Maximum Offset From True Position: 1 inch.
C. Components shall not infringe adjacent property lines.

END OF SECTION
SECTION 32 3132
VEHICULAR GATE OPERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Electric swing gate operators.
   B. Electric slide gate operators.
   C. Sensors and controls.

1.02 RELATED SECTIONS
   A. Section 32 3113 - Chain Link Fences and Gates: Adjoining fences and gates.
   B. Section 03 3000 - Cast-in-Place Concrete: Concrete mounting pads.
   C. Division 26 - Requirements for electrical connections.

1.03 REFERENCES

1.04 SUBMITTALS
   A. Submit under provisions of Section 01330 - Submittal Procedures.
   B. Product Data: Manufacturers data sheets on each product to be used, including:
      1. Preparation instructions and recommendations.
      2. Storage and handling requirements.
      3. Installation methods.
   C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, edge connections, and accessories.
      1. Operation, installation, and maintenance manuals including wire diagrams.
      2. Risers, layouts, and special wiring diagrams showing any changes to standard drawings.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. Deliver, store, and handle materials and products in strict compliance with manufacturer’s instructions and industry standards.
   B. Store products indoors in manufacturer’s original containers and packaging with labels clearly identifying product name and manufacturer. Protect from damage.

1.06 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Substantial transformation and final assembly shall occur in the United States of America per Section 1605 of the ARRA-09.
   B. Installer Qualifications: Installation performed by factory authorized dealer contractor specifically trained in gate operator systems of the type found within this section.
      1. Provide documentation of maintenance and repair service availability for emergency conditions.
      2. Provide quarterly maintenance for one year following Substantial Completion of the Project.

1.07 WARRANTY
   A. Manufacturers standard five (5) year warranty.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: DoorKing, Inc.; 120 S. Glasgow Ave; Inglewood, CA 90301; Toll-Free Tel: 800-826-7493; Tel: 310-645-0023;

B. Requests for substitutions will be considered in accordance with provisions of Section 01330 - Submittal Procedures.

2.02 SWINGING GATE OPERATORS

A. Basis of Design: DoorKing Model 6500.

B. Microprocessor based solid-state control board interacting with card readers, RF transmitters, access control systems, ticket machines, other activating devices as required, external devices (photo-eyes, contact edges) for entrainment protection and vehicle (loop) sensing systems. Control board shall include built-in close timer (1-25 seconds), dual-gate overlap feature, built-in ports for two (2) plug-in loop detectors, programming switches to set various operating modes, inherent magnetic pulse obstruction sensing reverse system. System shall employ Fail-Safe operation upon primary (AC) power outage.

1. Compliance: Compliant to UL 325, UL 991 and CSA C22.2 No. 247 and listed by Intertek Testing Laboratories NA, Inc. (ETL), a Nationally Recognized Testing Laboratory.
   a. This model is intended for use in Class I, II, III and IV vehicular swing gate applications.

2. Warranty: Five (5) year manufacturer’s standard warranty.

3. Maximum Gate length:
   a. 18-feet with 1/2 HP motor.

4. Maximum Gate Weight:
   a. 700 Lbs. with 1/2 HP motor.

5. Operator speed: 90-degrees in approximately 12-14 seconds.


8. Configuration: Left or right hand mount.

9. Mounting:
   a. Pad Mount.

10. Electrical Power Requirements: 115VAC.

   a. 1/2 HP

12. Primary Reduction: 60:1 gear reduction, single cog belt drive train.

13. Magnetic Limit Switches: No mechanical switches to set, wear out or break.

14. Operating Switches: Built-in power (on-off), reset and operating switches.

15. Convenience Outlets: Two (2) 115 VAC for accessory transformers.

16. Entrapment Protection
   a. Photo-electric eye (non-contact sensor).
   b. Sensing edge (contact sensor).

17. Accessories: Provide the optional accessories listed below.
   a. Plug-in loop detectors.
   b. Electric reversing edge - reverses direction of gate on contact with an obstruction.
   c. Photo-electric beams - reverses direction of gate if the light beam is obstructed.
   d. Gate Tracker Expansion - provides time and date stamped electronic record of cycles, input errors, loop detector input errors, obstruction hits and power cycles.
   1) Requires companion DoorKing 1830 Series access controller.
   e. Backup power inverter - allows system to remain operation upon loss of primary (AC) power.

2.03 SLIDING GATE OPERATORS

A. Basis of Design: DoorKing Model 9100.
B. Microprocessor based solid-state control board interacting with card readers, RF transmitters, access control systems, ticket machines, other activating devices as required, external devices (photo-eyes, contact edges) for entrapment protection and vehicle (loop) sensing systems. Control board shall include built-in close timer (1-25 seconds), built-in ports for two (2) plug-in loop detectors, partial open input, programming switches to set various operating modes, inherent magnetic pulse obstruction sensing reverse system. System shall employ Fail-Safe operation upon primary (AC) power outage.

1. Compliance: Compliant to UL 325, UL 991 and CSA C22.2 No. 247 and listed by Intertek Testing Laboratories NA, Inc. (ETL), a Nationally Recognized Testing Laboratory.
   a. This model is intended for use in Class I, II, III and IV vehicular slide gate applications.
2. Warranty: Five (5) year manufacturer’s standard warranty.
3. Maximum Gate Length: 30-feet.
4. Maximum Gate Weight: 1000 Lbs.
5. Operator speed: approximately 11-inches per second.
6. Enclosure: 12 gage, 0.108 inch (2.6 mm) G90 hot-dipped galvanized steel, finished with polyester powdercoat, exterior grade semi-gloss texture gray.
7. Configuration: Left or right hand mount; front, center or rear mounting configurations.
8. Mounting: Pad or post mount.
9. Electrical Power Requirements: 115 VAC.
10. Motor: 1/2 HP, continuous duty.
11. Dead Bolt Lock: Solenoid dead bolt engages if an attempt is made to force the gate open.
12. Fail-Safe Operation: Upon loss of primary (AC) power, system shall automatically be transferred to a fail-safe mode allowing the gate to be pushed open without the use of special knowledge, keys or other releasing mechanisms.
13. Primary Reduction: Adjustable clutch, single cog belt drive train.
14. Pulling Medium: #40 roller chain
15. Magnetic Limit Switches: Automatic setting with no mechanical switches to set, wear out or break.
16. Operating Switches: Built-in power (on-off), reset and operating switches.
17. Convenience Outlets: Two (2) 115 VAC for accessory transformers.
18. Entrapment Protection
   a. Photo-electric eye (non-contact sensor).
   b. Sensing edge (contact sensor).
19. Accessories: Provide the optional accessories listed below.
   a. Chain tray kit - to support roller chain on long gates.
   b. Fail-Secure Lock Kit - requires a key lock to open the gate upon primary (AC) power loss.
   c. Plug-in loop detectors.
   d. Electric reversing edge - reverses direction of gate on contact with an obstruction.
   e. Photo-electric beams - reverses direction of gate if the light beam is obstructed.
   f. Gate Tracker Expansion - provides time and date stamped electronic record of cycles, input errors, loop detector input errors, obstruction hits and power cycles.
      1) Requires companion DoorKing 1830 Series access controller.
   g. Backup power inverter - allows system to remain operation upon loss of primary (AC) power.

PART 3 EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving the best results for the substrates under project conditions.

B. Do not begin installation until substrates have been properly cleaned and prepared. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
3.02 INSTALLATION
   A. Install in accordance with manufacturer’s installation instructions. Test for proper operation and adjust until satisfactory results are obtained.

3.03 PROTECTION
   A. Protect installed products until completion of products.
   B. Touch-up, repair or replace damaged products before Substantial Completion.

3.04 MAINTENANCE
   A. Provide owner with two (2) copies of operation, installation and maintenance manuals including typical wiring diagrams.
   B. Provide owner with two (2) copies of risers, layouts, and special wiring diagrams showing any changes to standard wiring diagrams.

END OF SECTION
SECTION 32 8400
PLANTING IRRIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

1.02 DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND DIVISION 01 SPECIFICATION SECTIONS, APPLY TO THIS SECTION.

1.03 SECTION INCLUDES:

A. Backfill
B. Pipes and fittings
C. Pipe sleeves
D. Valves
E. Remote control valves
F. Miscellaneous piping specialties
G. Sprinklers and bubblers
H. Quick couplers
I. Drip irrigation
J. Controllers and enclosure
K. Electrical conduit, wiring, and water proof wire connectors
L. Boxes for valves and wiring
M. Marking and identification products
N. Maintenance period
O. Irrigation audit

1.04 DESCRIPTION OF WORK

A. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty.
B. Connect electrical power supply and data lines to irrigation controller.
C. Testing of the irrigation system to assure proper operation. Programming of controller and set-up and testing of sensors.
D. All necessary parts that are required to complete, modify, repair, and restore either existing and/or new irrigation system shall be furnished and installed. All new and existing systems shall meet industry standards and be in operating order at the completion of maintenance period.
E. Maintain and repair irrigation system as needed during maintenance period.
F. Related Sections:
   1. Division 01 - Section "Tree and Plant Protection"
   2. Division 03 - Section "Cast-in-Place Concrete"
   3. Division 31 - Section "Earth Moving"
   4. Division 32 - Section "Portland Cement Concrete Paving"
   5. Division 32 - Section "Planting"

1.05 SUBMITTALS

A. Materials list:
   1. Contractor shall submit to Landscape Architect complete list of all irrigation system materials and processes proposed to be furnished and installed as part of contract. List shall be provided and approved by Landscape Architect before ordering irrigation system materials.
2. Submittals shall have the following information:
   a. The catalog cut sheets shall identify product from the most recent manufacturer's catalog or from manufacturer's web-site.
   b. The catalog cut sheets shall clearly indicate the manufacturer's name and item model number. The model number, specified options and specified size shall be clearly indicated on catalog cut sheets.
   c. Submittal format requirements:
      1) Title Sheet with job name, contractor's name, contractor address and telephone number, submittal date, and submittal number.
      2) Submittals shall be provided as one complete package for the project
      3) Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing. Submittal maybe sent as a single .pdf file and electronically transmitted.
      4) Submittal package shall have all pages numbered in the lower right hand corner.
   d. The Landscape Architect will allow no substitution without prior written acceptance.
   e. The Landscape Architect will not review the submittal package unless provided in the format described above.

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
   B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.07 PROJECT CONDITIONS
   A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then, only after arranging to provide temporary water service according to requirements indicated:
      1. Notify Owner no fewer than 7 days in advance of proposed interruption of water service.
      2. Do not proceed with interruption of water service without Owner's written permission.

1.08 TESTS AND INSPECTIONS
   A. The Contractor is responsible for notifying the Landscape Architect for site visits to review work as follows. Provide Landscape Architect 48 hours minimum notice to schedule these visits.
      1. Pre-construction conference with general contractor, grading contractor, landscape contractor, and landscape architect.
      2. Mainline Pressure/Leak Test: After installation of mainline pipe, valves, and remote control valves.
         a. Perform test after welded plastic pipe joints have cured at least 24 hours, or longer if manufacturer of solvent cement requires.
         b. Leak Test procedures:
            1) Charge system slowly to avoid water hammer.
            2) Bleed system to remove air from pipes.
            3) Maintain pressure in mainline pipe for 24 hour duration
            4) Pressurize system to 125% of design pressure for one hour using hydraulic pump or other safe method.
            5) Visually inspect all parts of irrigation system while the system is pressurized.
            6) Repair any leaks found in mainline irrigation system.
      3. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
         a. If operation test presents problems contractor shall contact a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
      4. Coverage Test: After completion of irrigation system a coverage test shall be performed to determine uniform and complete coverage of landscape area.
         a. 24 hours before test, run irrigation system at least once in all landscape planters.
b. Landscape Architect shall review and approve all planters before plant material, bark
mulch, gravel, or decomposed granite is installed.
5. Test and adjust controller and irrigation equipment. Replace damaged and malfunctioning
irrigation components and equipment.
6. Irrigation Audit: Irrigation system is designed in accordance with the MWELO. Landscape and irrigation installation shall meet or exceed the MWELO, and shall pass an irrigation water audit.

1.09 PROJECT WARRANTY
A. Contractor to furnish and install all work free of defects in materials and workmanship for period
of 1-year from start of Maintenance Period per Div. 32- Section "Planting". Contractor to warranty all work furnished in accordance to the drawings and specifications. Ordinary wear and tear, neglect from maintenance, abuse, and vandalism are exempt from the contractor warranty. Repair and replacement of defective work and material will be done by the contractor at no cost to the owner. Repairs and replacement shall be conducted within 48 hours of notification to contractor.

PART 2 - PRODUCTS

2.01 QUALITY ASSURANCE
A. Materials used in the system shall be new and free of flaws and defects of any type.

2.02 BACKFILL MATERIAL
A. Backfill shall be either screened on-site material or imported.
B. Backfill material shall be free of organic materials, large clods of earth or rocks larger than one (1) inch diameter, trash, construction debris, asphalt, or concrete.
C. Imported material shall be a clean loam soil.

2.03 PIPE AND FITTINGS
A. Comply with requirements in the drawing for applications of pipe and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
B. Use a dielectric union wherever a copper-based metal (copper, brass, bronze) is joined to an iron-based metal (iron, galvanized steel, stainless steel).
C. Assemblies calling for threaded pipe connections shall utilize PVC Schedule 80 nipples and PVC Schedule 80 threaded fittings.
D. Joint sealant: Use only Teflon-type tape pipe joint sealant on plastic threads. Use non-hardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.
E. PVC Pipe: ASTM D 1785, PVC 1120 compound, Class 315, schedule 40, schedule 80, with integral belled end.
   1. PVC Socket Fittings: ASTM D 2466, Schedule 80.
   2. PVC Threaded Fittings: ASTM D 2464, Schedule 80.
   3. Use Schedule 40 and SCH 80, Type 1, PVC solvent weld fittings conforming to ASTM Standards D2466 and D1784. Use primer approved by the pipe manufacturer. Solvent cement to conform to ASTM Standard D2564.
F. PVC Threaded Nipples: PVC Schedule 80 nipples shall be extruded. PVC Schedule 80 nipples shall be made from NSF approved PVC compound conforming to ASTM D1784, Cell Classification 12454B.
G. Mainline detection tape:
   1. Manufacturer: Christy. Model# TA.DT.2.BI. 5 mil (.005") thick tape with aluminum foil core and polyethylene backing, 2" width, and shall say "Caution Irrigation Line Buried Below".
2.04 IRRIGATION PIPE SLEEVE
   A. Corrugated HDPE with dual wall construction for irrigation sleeves eight (8) inches and larger.
   B. PVC schedule 40 for irrigation sleeves six (6) inches and smaller.

2.05 REMOTE CONTROL VALVES
   A. Manufacturers: Refer to drawings for manufacturer, model, and size of remote control valves.
   B. Remote control valve to be in normally closed position.
   C. Remote control drip zone shall have forty psi pressure regulator and a filter cartridge with a minimum of 120 mesh. Size valve, pressure regulator and filter for drip zone flow rate.

2.06 QUICK COUPLERS
   A. Manufacturers: Refer to drawings for manufacturer, model, and size of quick coupler.
   B. Description: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, locking rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

2.07 SPRINKLERS AND BUBBLERS
   A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.
   B. Plastic, Pop-up Spray Sprinklers:
      1. Refer to drawings for manufacturer, model, and size of pop-up spray sprinklers and bubblers.

2.08 DRIP IRRIGATION SYSTEM
   A. Manufacturers: Refer to drawings for manufacturer, model, and size of drip irrigation system and associated components.
   B. Drip Tubes with Inline Emitters:
      1. Tubing: Flexible Polyethylene tubing.
      2. Emitter spacing: 12", 18", or 24" on center as specified on drawings.
      3. Emitters: Check valve and pressure compensation.
   C. Fittings: Drip tubing fittings shall be per manufacturer's specifications.
   D. Filter Units: Plastic housing, with corrosion-resistant internal parts; of size and capacity required for devices downstream from unit.
   E. Air Relief Valves: Plastic housing, with corrosion-resistant internal parts.
   F. Vacuum Relief Valves: Plastic housing, with corrosion-resistant internal parts.

2.09 IDENTIFICATION PRODUCTS
   A. Remote control valve tags:
      1. Manufacturer: TChristy. Model# ID.STD.Y1. Plastic tag attached by nylon tie to valve, hot stamped lettering, tag color: yellow. Tag to identify valve based on drawings controller letter and valve numbering.
   B. Backflow History Tag
      1. Manufacturer: TChristy. Model# ID.BFHT.1. Plastic tag attached directly and permanently to backflow.

2.10 AUTOMATIC IRRIGATION CONTROLLERS
   A. Manufacturer: Refer to drawings for manufacturer and model of automatic irrigation controller.
   B. ET Sensor Manufacturer: Refer to drawings for manufacturer and model of ET sensor.
   C. Remote control. Refer to drawings for manufacturer and model of hand held remote control.
   D. Enclosure Manufacturer: Strong Box Model# SB-18SS.
      1. Stainless steel locking enclosure, 18" wide x 36" high x 12" deep.
2. Waterproof enclosure, with locking cover and matching keys; refer to drawings and manufacturer's grounding requirements.

E. Two Wire Cable
2. Decoder to Solenoid wire use 14 gauge solid copper insulated wire, parallel wire held by webbing, in various color. Paige Electric Co., model ICD.
3. Where spliced wires are required, splices shall be housed in a grey plastic electric pull box.

2.11 CONDUIT
A. All conduit and fittings to be PVC schedule 40, color: grey.
B. Pull tape manufacturer: Fibertek, Inc. Model# WP1250.
   1. Electrical pull tape to be 1/2” woven polyester tape with a minimum of 1250 pounds tensile strength and less than 0.10 coefficient of friction.
   2. All pull tape to be continuous with out slicing or knots.
   3. Provide couplers or bushings on cut pipe end to prevent damage to wires.

2.12 GROUNDING
A. Earth grounding for irrigation equipment shall meet or exceed article 250 of National Electrical Code (NEC) and be UL listed.
B. Grounding rod shall be minimum copper clad 5/8” diameter by 10 feet long.
C. OR Grounding plate
D. Bare Copper Wire shall be minimum 6 gauge soft-annealed uncoated wire.
E. Grounding rod connection to be exothermic weld or clamp.
   1. Grounding rod clamp shall be brass and must securely attach grounding rod and wire.
F. Grounding to have a resistance of 25 ohms or less.
G. Back fill shall be highly conductive material. Where needed use electrical grounding backfill products like Powerfill by Loresco.

2.13 BOXES VALVES AND ELECTRICAL PULL
A. Electrical Pull Box:
   1. Manufacturer: Carson. Body model# 910-10 and lid model# 910-4B. Bolt down kit, T-cover lid, body and lid color: grey.
   2. Or equal
B. Remote Control Valve:
   1. Manufacturer: Carson. Body model# 1220-12 and lid model# 1220-4B. Bolt down kit, T-cover lid, body and lid color: green.
C. Quick coupler:
   1. Manufacturer: Rainbird. Body model# VB-STD. Bolt down kit, T-cover lid, body color: black and lid color: green.
D. Isolation Valve:
   1. Manufacturer: Rainbird. Body model# VB-10RND. Bolt down kit, T-cover lid, body color: black and lid color: green.
E. Flush Valve:
   1. Manufacturer: Rainbird. Body model# VB-10RND. Bolt down kit, T-cover lid, body color: black and lid color: green.
F. Air/ Vacuum Relief Valve:
   1. Manufacturer: Rainbird. Body model# VB-7RND. T-cover lid, body color: black and lid color: green.
G. Subterranean Drip Emitter Box:
1. Manufacturer: Rainbird. Body model#: SEB 7XB. T-cover lid, body color black and lid color: green.

H. Drain rock shall be 3/4" washed crushed rock.

I. Hardware cloth shall be galvanized 16 gauge 1/4" mesh.

J. Use valve box extension where needed to install boxes at proper height.

PART 3 - EXECUTION

3.01 GENERAL

A. Irrigation system shall meet all federal, state, and local codes, regulations and ordinances.

B. Verify all underground utilities by contacting Common Ground Alliance (C.G.A.) at 811 a minimum of 2 working days before any excavation work begins on site.

C. If contractor finds utilities on site that are not shown on plans, contractor shall contact Landscape Architect. Found utilities that cross irrigation lines shall be shown on Record Drawings.

D. Verify water pressure and available flow prior to construction. Notify Landscape Architect if water pressure or flow will prevent the irrigation system from functioning properly.

3.02 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 - Section "Earth Moving."

B. Install warning tape directly above pressure piping, 12" below finished grades and above irrigation pipe.

3.03 PREPARATION

A. Set stakes to identify locations of proposed point of connection, backflow preventer, master valve and flow sensor assembly, controller, quick coupler, remote control valves, isolation valves, and mainline pipe. Contact Landscape Architect within 48 hours for approval before excavation.

3.04 WATER, ELECTRICAL, & COMMUNICATION CONNECTIONS

A. Water Supply
   1. Contact the Owner a minimum of five (5) working days before beginning any work that will disrupt existing irrigation system.

B. Electrical Supply
   1. Contractor is responsible for coordination of electrical supply connection to controller enclosure.
   2. Electrical work shall be performed by licensed electrical contractor. Material and workmanship for electrical service shall meet all federal, state, and local codes, regulations and ordinances.

C. Communication
   1. Contractor is responsible for coordination of data line connection to controller enclosure.

3.05 PIPING INSTALLATION

A. Install piping free of sags and bends. Lay piping on solid sub-base, uniformly sloped without humps or depressions.

B. Install groups of pipes parallel to each other and with a minimum of 4" of separation. Pipes shall not lie on top of another pipe.

C. Install fittings for changes in direction and branch connections.

D. Install PVC piping in dry weather when temperature is above 40 deg F. Allow joints to cure at least 24 hours at temperatures above 40 deg F before testing.

E. Install piping in sleeves under parking lots, roadways, and sidewalks.

F. Remove all rough edges and burrs from PVC pipe by reaming cut ends. All irrigation pipe cuts shall be square. Remove all debris from pipe before installing.
G. PVC pipe shall not lie on top of another pipe. All pipe should have 4” separation between pipes.

H. Cap all pipe ends during construction to prevent debris from entering pipe.

I. Snake pipe in trench one (1) foot per every one hundred (100) feet for thermal expansion.

J. Mainline changes in depth and direction shall be done with 45 degree fittings.

3.06 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Join pipe fittings and valves as follows:
   1. Apply appropriate PTFE/Teflon tape or thread compound to external pipe threads. Provide three wraps around male thread.
   2. Tighten joints to hand tight, plus one turn with a strap wrench
   3. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

C. PVC Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC P Piping: Join schedule number, ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672
   3. Allow 30 minute cure time for handling and 24 hours of cure time before allowing water in the pipe.

3.07 CONDUIT

A. Remove all rough edges or burrs from conduit pipe by reaming cut ends. All conduit cuts shall be square.

B. Install coupler or bushing on cut pipe ends.

C. All 2-wire cable shall be in PVC conduit.

3.08 SLEEVES

A. Install sleeve in all locations where irrigation pipe and controller wire cross beneath pavement or other hardscape elements.

B. Irrigation controller wire shall not share sleeve with 120 volt and higher voltage wire.

C. Contractor shall coordinate the installation of sleeves with other trades.

D. Sleeves shall have minimum of 25% void space. Contractor is responsible for sizing sleeve based on field conditions. Size sleeve based on conduit and irrigation pipe size.

3.09 BACKFILLING

A. Backfill shall be of approved screen material.

B. With the exception of center loading, irrigation trenches shall not be backfilled until completion and passing of tests.

C. Trench should be cleaned of debris before backfilling.

D. Backfill shall be compacted in 6” lifts using vibrating plate. Compaction of backfill shall be equal to adjacent undisturbed soil.

E. Contractor shall correct any settling with more backfill and compaction.

3.10 REMOTE CONTROL VALVES

A. Flush mainline before installing remote control valves

B. Install valves in landscape planter. Do not install valves in roadways or paved areas.

C. Group remote control valves and other valves whenever possible.

D. Install per drawings and manufacturer's specifications.
E. Install valve in valve box to provide proper operation and maintenance of valve.
F. First downstream fitting past valve shall be located min. 18" from valve.

3.11 SPRINKLER INSTALLATION
A. Install sprinklers after hydrostatic testing is completed.
B. Flush lateral pipe before installing sprinklers.
C. Set sprinklers perpendicular to finish grade.
D. Install sprinklers at manufacturer’s recommended heights.
E. Locate part-circle sprinklers to maintain a minimum distance of 4 inches from walls and 2 inches from other boundaries unless otherwise indicated.
F. Adjust the radius and throw of each sprinkler for best performance. Minimum of 70% low quarter distribution uniformity (DULQ) of spray irrigation. Post-installation irrigation audit may be conducted to confirm (DULQ) of spray irrigation.
G. Install per drawings and manufacturer’s specifications.

3.12 DRIP IRRIGATION
A. Flush lateral before installing drip tubing.
B. Install drip tubing on uniformly prepared bed. Drip tubing emitters should be offset to create a triangular spacing.
C. Install fitting for all 90 degree changes of direction in line.
D. Use 6" wire staples every three (3) feet to secure drip tubing.
E. Install air relief and vacuum relief valves in valve boxes, at highest point of landscape planter.
F. Install automatic flush and ball valves at drip exhaust header. Refer to drawings for location of flush valves.
G. The pressure at the end of the drip tubing should have a maximum of 20% drop in pressure from the beginning of the drip line.
H. Install per drawings and manufacturer’s specifications.

3.13 AUTOMATIC IRRIGATION CONTROLLER
A. Equipment Pedestal Mounting: Install on 6" thick concrete pad. Refer to drawings for location.
   1. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor bolts for proper attachment to supported equipment.
   3. Orient enclosure to provide access to controller.
B. Provide connection to electrical power supply and data line as required by controller.
C. All remote control valves, master valves, and flow sensors to be connected to controller.
D. Install all ET sensor, weather stations, and rain/ freeze sensor equipment. Contractor to program and fine tune controller to operate with sensor equipment during maintenance period. Fine tuning of schedule and ET sensor should be completed at the end of maintenance period.
E. Irrigation schedule shall not exceed water budget established for project. Water budget and irrigation schedule shown on plans.
F. Install per drawings and manufacturer’s specifications.

3.14 FIELD QUALITY CONTROL
A. Contractor to make adjustments to irrigation components to provide optimum performance of system. Adjust irrigation components to prevent excessive watering onto paved surfaces, windows, and building walls.
B. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than 1/2" above, finish grade or compacted mulch.
C. Any irrigation product will be considered defective if it does not pass tests and inspections.
D. Improperly installed equipment shall be reinstalled or replaced to meet Construction Documents.

3.15 CLEANING
   A. Flush dirt and debris from piping before installing sprinklers and other devices.
   B. Upon completion of work, remove all site machinery, tools, construction material, and any rubbish.

3.16 MAINTENANCE
   A. Provide maintenance as per Division 32 - Section "Planting"

3.17 RECORD DRAWINGS
   A. Prior to Pre-Maintenance Review, obtain from the Owner's Authorized Representative a reproducible copy of the Drawings. Using computer aided drafting, duplicate information contained on the Record Drawings maintained on site.
   B. Label each sheet "Record Drawing".
   C. Record pipe and wiring network alterations. Record work which is installed differently than shown on the construction drawings. Record accurate reference dimensions, measured from at least two permanent reference points, of each irrigation system valve, each backflow prevention device, each controller or control unit, each sleeve end, and other irrigation components enclosed within a valve box.

3.18 ITEMS FURNISHED TO OWNER
   A. The following items to be furnished to the Owner by the contractor at the completion of the project:
      1. Two (2) keys to the control and enclosure
      2. Two (2) quick coupler keys and hose swivels
      3. One (1) isolation valve opening key
      4. One (1) hand held remote control for controller, if specified.
      5. One (1) of each specialized tool used to adjust irrigation equipment
      6. All manuals for irrigation equipment
      7. One (1) copy of irrigation schedule
      8. One (1) copy of the approved irrigation submittal.

3.19 CONTROLLER CHARTS
   A. Prior to completion of the maintenance period, prepare a reduced copy of the as-built plans, with valve numbering/zones clearly highlighted at the reduced scale. The reduced plan shall be sized to fit flat within the controller, laminated in plastic, and placed in the controller.

3.20 IRRIGATION WATER AUDIT
   A. An irrigation audit is required, per AB 1881. Irrigation audit shall be conducted by a certified landscape irrigation auditor.

3.21 IRRIGATION DESIGN
   A. As designed, the irrigation system is compliant with AB1881. The installation and tuning of the irrigation system shall also meet the requirements for a compliant irrigation audit.

3.22 AUDIT ATTENDEES
   A. At a minimum the following people shall be in attendance at the time of the Irrigation Audit: A certified landscape irrigation auditor, an Owner's representative, a landscape contractor who is knowledgeable of the irrigation design and installation, and who has access to the irrigation controller, and tune or repair the irrigation system if necessary during the audit.

3.23 AUDIT PROCEDURE
   A. Audit may only be performed after the completion of irrigation and landscape irrigation. No other irrigation water may be in use at time of irrigation audit. A project with spray irrigation cannot be audited when winds exceed 5 mph.
B. Inspection - Prior to start of audit, inspect and confirm installation meets design intent of irrigation drawings. Inspect irrigation controller installation and programmed schedule, and ET sensor.

C. Measurement - Measure static and dynamic pressure at irrigation point of connection.

D. Sample areas - Audit shall include a representative sample of each type of irrigation (spray, drip) on each type of hydrozone. Linking of irrigation stations is allowed.

E. Spray irrigation - Auditing of spray irrigation valves shall measure:
   1. Pressure at first and last spray head
   2. Flow rate of station
   3. Distribution uniformity

F. Drip irrigation - Auditing of drip irrigation valves shall measure:
   1. Pressure in dripline at supply and exhaust
   2. Flow rate of station.

END OF SECTION
PART 1 GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY
A. Provide all labor, material, equipment and services necessary to provide all landscape planting, complete in place, as shown and specified.
B. Section Includes:
   1. Planting and landscape areas.
   2. Landscape fabric.
   3. Landscape edgings.
   4. Tree stabilization.
   5. Decomposed granite.
C. Subgrade Elevations
   1. Excavation filling and grading required to establish elevations is shown on drawings. Coordinate all work with grading contractor in order to arrive at rough grades that will allow tolerance for topsoil in planting areas, soil amendments and ornamental mulch as required in other sections of this specification. Contractor to assume tolerance of rough grades established at +/- .1 feet (1 tenth of a foot).
D. Related Sections:
   1. Division 01 Section "Tree and Plant Protection" for protection of existing trees and plant materials.
   2. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   3. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
   4. Division 32 Section "Planting Irrigation" for irrigation.
   5. Division 33 Section "Subdrainage" for subsurface drainage.

1.03 SUBMITTALS
A. Informational submittals shall include but not be limited to the following:
   1. Pesticides and herbicides: Include product label and manufacturer's application instructions specific to this Project.
   2. Soil Fertility and Agricultural (Horticultural) Suitability Analysis.
      a. After completion of rough grading and prior to soil preparation, the Contractor shall obtain agronomic soils tests for planting areas. A minimum of two (2) samples of planting areas shall be required. Tests shall be performed by an approved agronomic soils testing laboratory and shall include a complete soil suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioner, application rates for soil preparation, and post-maintenance fertilizer program.
      b. The soils report recommendations shall take precedence over the minimum soil amendment and fertilizer application rates, as specified, when they exceed the specified minimums.
      c. The Soil Analysis report shall be submitted to the Landscape Architect in a timely manner to make necessary adjustments to the project documents.
      d. The Soil Analysis report shall be submitted to the Landscape Architect as part of the Certificate of Completion requirements. The Landscape Architect shall submit documentation verifying implementation of the soil analysis report recommendation to the local agency with the Certificate of Completion.
e. Fertilizer: Chemical and percentage composition, and manufacturers or vendor’s certified analysis.

f. Plant materials: Include botanical and common name, quantities, sizes, quality, and sources for all plant materials.

g. Landscape fabric.

h. Landscape edgings (except concrete): Type, size, manufacturer, required stakes (if any).

i. Tree staking.

j. Submit other data substantiating that materials comply with specified requirements. Such certificates may be tags, labels, and/or manufacturers literature. All submittals shall be reviewed and accepted by Landscape Architect before contractor begins work.

k. Planting schedule: Submit proposed planting schedule at least two weeks prior to planting any materials, indicating dates for each type of landscape work during normal seasons for such work in areas of the site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. If dates need to be revised after acceptance of planting schedule, document reasons for delays and submit for acceptance.

B. Material submittals shall include but not be limited to the following:

1. Soil amendments: Type, size, composition, and manufacturers or vendor’s certified analysis. 1-pint in sealed labeled plastic bag.


3. Landscape fabric: 8”x8” square

4. Cobble/Rock: Type and size. 1-pint, or as required to accommodate representative sample in sealed labeled plastic bag.

1.04 SITE VISITS

A. The Contractor is responsible for notifying the Landscape Architect for site visits to review work as follows. Provide Landscape Architect 48 hours minimum notice to schedule these visits, unless otherwise indicated.

1. Pre-construction conference with general contractor, grading contractor, landscape contractor, and landscape architect, at project site. 7 days minimum notice. The purpose of this conference will include:

a. Review of Contractor's questions regarding project.

b. Review of administrative and inspection procedures that will occur during construction.

c. Review of Contractor's work schedule for project.

d. Tour, inspect, and discuss site conditions (if necessary).

e. Review of planting stock at nursery, or upon arrival on site.

f. Review of all landscape areas in preparation for planting.
   1) All landscape areas have been cleaned of all construction debris, including gravel, concrete, concrete washout, cement plaster, paint, asphalt, etc.
   2) Fine grading- allow for inclusion of all amendments, settling, etc.
   3) Irrigation coverage.
   4) Review of base preparation and edging for synthetic turf.

   g. Review of plant material locations.
      1) The Landscape Architect may adjust locations of any plant materials prior to installation.

h. Punch list at substantial completion (prior to installation of bark mulch). 7 days minimum notice.

i. Final completion. Final review of entire project, including grading, irrigation, planting and completion of all punch list items (to begin Maintenance Period). 7 days minimum notice.

j. Final acceptance of project (at end of Maintenance Period). 7 days minimum notice.
1) Final application shall have been made to all landscape areas with slow-release maintenance fertilizer.

1.05 QUALITY ASSURANCE

A. Subcontract: Subcontract landscape work to a single firm specializing in commercial landscape installation.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
   1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
   2. The Landscape Architect shall oversee soil sampling, with depth, location, and number of samples to be taken. A minimum of two representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
      a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Source Quality Control:
   1. General: Comply with regulations applicable to shipping of landscape materials.
   2. Analysis and Standards: All materials shall be of standard, approved and first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer’s guaranteed analysis. The Contractor shall supply the Landscape Architect with analytical data from an approved laboratory source illustrating compliance of bearing the manufacturer’s guaranteed analysis of all supplied materials.

E. Topsoil: Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4”; do not obtain from bogs or marshes. The Landscape Architect reserves right to have topsoil tested and analyzed by an independent laboratory before delivery to site.

F. Trees, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1-1980 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nurseries in accordance with good horticultural practice and free of disease, insects, insect eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, overlapping surface roots, or disfigurement. Central leaders of all trees shall be intact, undamaged, with evenly spaced lateral branches.

G. The contractor is responsible for ordering and reserving plant materials immediately upon bid award to insure plant materials meet size and quality requirements as specified herein. Plant material of substandard size will be rejected.

H. Label at least one tree and one shrub of each variety in each grouping with a securely attached waterproof tag bearing legible designation of botanical and common name. Where formal arrangements and consecutive order of trees is shown, select stock for uniform height/spread, and label with number to assure symmetry in planting.
I. Stock review: The Landscape Architect will review all plant materials either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size and quality. Landscape Architect retains right to further review trees and shrubs for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of the work. Remove rejected vegetation immediately from project site. Contractor shall request review of such stock by Landscape Architect by delivering notice in writing 48 hours in advance.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable. Protect materials from deterioration during delivery, and while stored on site.

B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

C. Trees and Shrubs: Do not prune prior to delivery. Do not bend or bind trees or shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery, and provide protection on site from traffic, pedestrians, and deleterious effects of climate while planting operations are in progress. Dropped or damaged stock will not be accepted.

D. Deliver trees and shrubs after preparations for planting have been completed and plant immediately after approval of plant materials locations. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture. Do not remove container grown stock from containers until planting time.

E. Plant material shall not be stored on the jobsite for more than 48 hours before planting. Contractor shall schedule nursery deliveries in sub-groups as necessary to comply with this requirement. Plant materials that have been damaged in any way will be discarded and if installed, shall be replaced with undamaged materials at the Contractor’s expense.

1.07 PROJECT CONDITIONS

A. Proceed with and complete landscape work as rapidly as portions of site become available, working within seasonal limitations for each kind of landscape work required.

B. Contractor shall verify locations of all existing utilities, whether shown on plans or not. The Contractor shall call 811 two (2) working days in advance of performing any excavation work.

C. After determining location of underground utilities, perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

D. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

E. No landscape materials may be planted before an irrigation operation and coverage test is completed and approved by the Landscape Architect.

F. No landscape materials may be planted before finish grade is inspected and approved by the Landscape Architect.

G. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required.
H. Coordination with Lawns: Plant trees and shrubs after final grades are established, after irrigation system is operable, and prior to planting of lawns, unless otherwise acceptable to Landscape Architect. If planting of trees and shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

I. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.08 SPECIAL PROJECT WARRANTY

A. Warranty all plant materials and other materials installed under the Contract for a period of one year (from beginning of maintenance period) against defects including death and unsatisfactory growth, or faulty performance, inferior materials and/or workmanship or improper maintenance resulting from neglect, abuse or damage by others, as determined by the Landscape Architect. Materials shall be replaced at the Contractor's expense.

B. Synthetic Turf: Contractor shall provide a warranty to Owner covering defects in materials and workmanship for a period of eight (8) years from the date of substantial completion. Turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear, and damage caused from UV degradation. The warranty excludes vandalism.

C. Replacement: Any materials found to be dead, missing, or not in a satisfactory or healthy condition during the maintenance period shall be replaced immediately. The Landscape Architect shall be sole judge as to the condition of material. Material to be replaced within the guarantee period shall be replaced by the Contractor within five (5) days of written notification by the Landscape Architect. All replacement materials and installations shall comply to the Plans and Specifications. Any plant missing due to suspected theft shall be replaced by the Contractor. If the Contractor suspects that theft may be a problem, the Contractor shall provide written documentation to the Landscape Architect that security on this site needs to be intensified. The Contractor may relieve himself of theft responsibility if after the security notice, with no result, a written notice to the Landscape Architect shall be given that plant material will not be replaced for theft or vandalism due to lack of site security being maintained. This procedure may take place only during the Landscape Maintenance Period.

1.09 MAINTENANCE SERVICE

A. General: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3.

B. Continuously maintain entire project area during the progress of the work and during the ninety (90) calendar day maintenance period until final acceptance of the project by the Landscape Architect.

C. Maintenance period shall not start until Final Completion, when all elements of construction, planting and irrigation for the entire project are in accordance with Plans and Specifications. A prime requirement is that all turf grass and landscape areas shall be planted, and that all turf grass areas shall show an even, healthy stand of grass seedlings and which shall have been mown twice. If such criteria are met to the satisfaction of the Landscape Architect, a written notification shall be issued to the Owner establishing the effective beginning date of maintenance period.

D. Any day of improper maintenance, as determined by the Landscape Architect, shall not be credited as an acceptable maintenance period day. The maintenance period shall be extended on a daily basis if the work is not in accordance to the Plans and Specifications. Project shall not be segmented into maintenance areas or phases, unless authorization of the Landscape Architect is obtained.

E. Maintenance shall continue beyond the ninety (90) day maintenance period, as required, until final acceptance is given by the Landscape Architect.

F. Contractor shall provide protection to the project site during the maintenance period.
PART 2  PRODUCTS

2.01  GENERAL

A. The following organic amendments and fertilizers are to be used for bid price basis only. Specific amendments and fertilizers specification shall be made after rough grading operations are complete and soil samples are tested by the Contractor and approved by the Landscape Architect. The amounts listed in the Preparation section are considered minimum amounts for the project unless directed otherwise by the Landscape Architect.

2.02  ORGANIC SOIL AMENDMENTS

A. Organic amendment shall be nitrogen stabilized wood residual containing 0.56 to 0.84% N based on dry weight.
B. Particle Size:
   1. 95-100% passing 6.35 mm standard sieve
   2. 80-100% passing 2.33 mm standard sieve
C. Salinity: The saturation extract conductivity shall not exceed 3.5 milliohms/centimeter at 25 degrees centigrade as determined by the saturation extract method.
D. Iron content: Minimum 0.08% dilute acid soluble Fe on dry weight basis.
E. Ash: 0-6.0% (dry weight).
F. As available from:
   1. Redi-Grow Corporation
      8909 Elder Creek Road
      Sacramento, CA 95828
      (916) 381-6063
      (800) 654-4358
   OR
   2. Cascade Rock, Inc.
      8585 Kiefer Boulevard
      Sacramento, CA 95826-3990
      (916) 383-1300

2.03  SOIL AMENDMENTS

A. Soil Sulfur: Agricultural grade sulfur containing a minimum of 99% sulfur (expressed as elemental).
B. Iron Sulfate: 20% Iron (expressed as metallic iron), derived from ferric and ferrous sulphate, 10% sulfur (expressed as elemental).
C. Calcium Carbonate: 95% lime as derived from oyster shells.
D. Gypsum: Agricultural grade product containing 98% minimum calcium sulphate.

2.04  FERTILIZERS

A. Retain 1 bag of each type fertilizer on-site for inspection by Landscape Architect prior to disposal.
B. Planting Fertilizer: Pelleted or granular form shall consist of the following percentages by weight and shall be mixed by commercial fertilizer supplier:
   1. 16% nitrogen, 6% phosphoric acid, 8% potash
C. Planting Tablets:
   1. Shall be slow-release type with potential acidity of not more than 5% by weight containing the following percentages of nutrients by weight:
      2. 16% nitrogen
         a. 6% phosphoric acid
         b. 8% potash
         c. 2.6% combined calcium
         d. 1.6% combined sulfur
e. 0.35% iron (elemental) from ferrous sulfate
f. Planting tablets shall be one of the following:
   1) 21 gram tablets as manufactured by Agriform
   2) Best Tabs 7 gram tablets as manufactured by GroPower

g. Planting tablets shall be applied per manufacturer’s instructions.

D. Sulphate of Potash: 0-0-50.

E. Single Super phosphate: Commercial product containing 18-20% available Phosphoric Pentoxide, or equal.

F. Urea Formaldehyde: 38-0-0.

G. Slow-release maintenance landscape fertilizer shall be “GroPower Controlled Release Nitrogen 12-8-8” 6-8 month formulation:
   1. 12% nitrogen, 8% phosphoric acid, 8% potash

2.05 SOIL

A. Topsoil: Site to be rough graded to elevations shown on Civil Drawings. Top soil is required behind curb areas. Top soil is required in all planting areas to a minimum depth of 9”. Provide on-site, import, or non-processed topsoil in planting areas as needed to complete rough grading which is fertile, friable and natural. Topsoil shall be from agricultural sources, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1” in any dimension, and other extraneous or toxic matter harmful to plant growth.

B. All topsoil to be used for planting, regardless of whether import or on-site in origin, shall be tested as described in this Section.

C. Import Topsoil: ASTM D 5268 topsoil, with pH range of 5.5 to 7.5, a minimum of 4 percent organic material content. Mix topsoil with the following soil amendments in the following quantities to produce planting soil:
   1. Coarse Sand:
      Particle Size Range: 0.5-2.0 mm
      Max. % weight: 15
      Min. % weight: 0
   2. Silt Plus Clay
      Particle Size Range: <0.05 mm
      Max. % weight: 50
      Min. % weight: 25
   3. Silt
      Particle Size Range: 002-0.05 mm
      Max. % weight: 30
      Min. % weight: 10
   4. Clay
      Particle Size Range: 0-.002 mm
      Max. % weight: 25
      Min. % weight: 10
   5. Gravel
      Particle Size Range: 2-13 mm
      Max. % weight: 15
      Min. % weight: 0
   6. Rock
      Particle Size Range: >1/2 inch
      Max. % weight: 10% by volume; None > 1 inch
      Min. % weight: 0
   7. Organic Matter
      Particle Size Range: n/a
      Max. % weight: 15
2.06 MULCH
A. Mulch shall be walk-on shredded fir bark mulch.
B. Physical properties:
   1. Percent Passing  
      Sieve Size
      90-100  1" Dia.
      80-100  ½" Dia.
C. Chemistry:
   Acid in reaction, max. pH 5.0
   Maximum ash Chemistry: 7% based on dry weight.
   Minimum moisture 35% at time of delivery based on fresh weight.

2.07 HERBICIDES
A. General: Herbicide, registered and approved by EPA, acceptable to authorities having 
   jurisdiction, and of type recommended by manufacturer for each specific problem and as 
   required for project conditions and application. Do not use restricted herbicides unless 
   authorized in writing by authorities having jurisdiction.
B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination 
   or growth of weeds within planted areas at the soil level directly below the mulch layer.
C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth 
   that has already germinated.
   1. Roundup (Glyphosate)
   2. Approved Equal

2.08 PLANT MATERIAL
A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, 
   shearing, and other features shown Drawings and complying with ANSI Z60.1 and in 
   accordance with California State Department of Agricultural regulations for nursery inspections, 
   rules and ratings; and with healthy root systems. Provide well-shaped, fully branched, healthy, 
   vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and 
   defects such as knots, sun scald, injuries, abrasions, and disfigurement.
   1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is 
      squeezed between two branches or between branch and trunk ("included bark"); crossing 
      trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be 
      rejected.
   2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an 
      established landscape planting, or not grown in a nursery unless otherwise indicated.
   3. Plants of a larger size may be used if acceptable to Landscape Architect, with a 
      proportionate increase in size of roots or balls.
B. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, 
   waterproof tag bearing legible designation of common name and full scientific name, including 
   genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the 
   plant as shown on Drawings.
C. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for 
   uniform height and spread, and number the labels to assure symmetry in planting.
D. The minimum acceptable planted height of 15 gallon trees is 6'-6".
E. Provide single stem trees except where special forms are shown or listed.

2.09 LANDSCAPE FABRIC
A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3.5oz./sq. yd. minimum, 
   composed of fibers formed into a stable network so that fibers retain their relative position.
Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

2.10 LANDSCAPE EDGINGS

A. Metal Edging: Standard commercial edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
   1. Manufacturers: Provide products by one of the following:
      b. Collier Metal Specialties, Inc.
      c. Russell, J. D. Company (The).
      e. Edging Size: [1/4 inch wide by 5 inches deep] [1/8 inch wide by 6 inches deep].
      f. Stakes: Tapered steel, a minimum of [12 inches] [15 inches] long.
      g. Accessories: Standard tapered ends, corners, and splicers.
      h. Finish: [Zinc coated].

2.11 TREE STABILIZATION

A. Tree stakes
   1. Sound new lodge pole pine 2" minimum diameter with minimum height (above ground) of 6'-0" for 5 gallon container and 8'-0" for 15 gallon container. Stakes shall have been treated with copper napthanate to a minimum wood depth of 1/16". All stakes shall be free of knots larger then 1/2" in diameter, holes and other defects.
      a. Tree Straps: VIT "Cinch-tie" tree straps. Tree straps shall be attached to tree stake as shown in staking detail on the plans.

2.12 COBBLE/ROCK

A. Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
   1. Type: Salt and pepper cobble, rounded riverbed or smooth-faced stone.
   2. Size Range: 1.5"-3"
   3. Color: Tan, cream, gray, white.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect adjacent and adjoining areas from hydroseeding overspray.
   2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Soil Preparation
   1. All planting areas shall have a minimum of nine inches of clean topsoil. Soil shall be cleared of all stones, stumps, debris, etc. larger than 1 inch in diameter, that are brought to the surface as a result of cultivation.
      a. Cultivation shall be by rototilling or ripping equipment.
      b. After approximate finished grades have been established, soil shall be conditioned and fertilized in the following manner:
         1) Amendments shall be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top six inches of soil.
         2) The following organic soil amendments and fertilizer rates, and quantities are minimums and are to be used for bid basis only. Specific rates and quantities will be made after rough grading operations are complete and soil samples are tested by the Contractor and approved by the Landscape Architect.
         3) Application rates: (Per 1,000 square feet)
(a) Organic amendment- six cubic yards for groundcover and shrub areas; 
three cubic yards for lawn areas.
(b) Fertilizer- 15 lbs.
(c) Gypsum- 200 lbs.
(d) Soil sulphur- 20 lbs.
(e) Iron- 2 lbs.
(f) Calcium carbonate- 2 lbs.

D. Loosen subgrade of planting areas to a minimum depth of 9 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them offsite.

E. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that will be planted within 24 hours.

F. Final Grades:
   1. The following areas shall be graded so that the final grades shall be established below adjacent paved areas, sidewalks, valve boxes, headers, clean outs, drains, manholes, etc. as follows:
      a. Shrub/groundcover areas: 2-1/2 inches.
      b. Surface drainage shall be away from all building foundations, 2% minimum.
      c. Legally dispose of excess or unacceptable soil from the site at no expense to the Owner.

G. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.02 PRE-PLANT WEED CONTROL
A. Irrigate all areas to be planted for 7 days to achieve weed germination.
B. Spray all weeds with a non-selective systemic contact herbicide, as recommended and applied by and approved licensed landscape pest control advisor and applicator. Leaved sprayed plants intact for at least fourteen days. Continue to irrigate during this period, after the initial 48 hours. Clear and remove these existing weeds by grubbing off all plant parts at least a 1/4 inch below the soil surface in the entire area to be planted.
C. Apply a second application of herbicide to remaining weeds.
D. Planting may begin 24 hours after the second application has been completed.

3.03 EXCAVATION FOR TREES AND SHRUBS
A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
B. Planting Pits and Trenches: Excavate circular planting pits. Create a roughened edge along the inside walls of the planting pit. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling.
   1. Excavate approximately three times as wide as ball diameter.
   2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
   3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
C. Subsoil and topsoil removed from excavations may be used as planting soil, provided they meet the requirements of planting soil noted above.
D. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
E. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.04 PLANTING

A. Set plant plumb and in center of planting pit or trench with root flare 1-inch above adjacent finish grades shrubs, vines and groundcover; 2- inches at trees.
   1. Use planting soil for backfill.
   2. Carefully remove root ball from container without damaging root ball or plant.
   3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
   4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
   5. Continue backfilling process. Water again after placing and tamping final layer of soil.

B. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

C. After installation and before Substantial Completion, remove all nursery tags, tie tape, labels, wire, and other debris from plant material, planting areas, and project site.

3.05 TREE STABILIZATION

A. Staking
   1. Stake trees of 2- through 5-inch caliper. Use stake of required length to penetrate at least 18 inches below bottom of backfilled excavation. Set stake to avoid penetrating root balls or root masses.
   2. Support trees with tree straps. Allow enough slack to avoid rigid restraint of tree.

3.06 LANDSCAPE FABRIC

A. Place fabric below cobble/rock mulch or as indicated on drawings. Overlap all seams 12" minimum and pin down every 36".

3.07 MULCHING

A. Mulch all planting areas (except turf) to depth of 3".
   1. Do not place mulch within 3 inches of trunks or stems.

3.08 EDGING INSTALLATION

A. Metal Edging: Install metal edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.

3.09 HERBICIDE APPLICATION

A. Apply herbicide and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Non-Selective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
   1. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.
3.10 MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

B. Thoroughly water to insure vigorous and healthy growth until work is accepted. Water in a manner to prevent erosion due to application of excessive quantities of water.

C. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

D. Weeding
   1. Keep plant basins and areas between plants free of weeds. Control weeds with pre-emergent herbicides. If weeds develop, use legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Weeding also shall be included in all paved areas including public or private sidewalks.
   2. Apply a final application of pre-emergent herbicide at the end of the Maintenance Period, just prior to final acceptance.
   3. Pruning
      a. Trees: Prune trees to select and develop permanent scaffold branches; to eliminate narrow V-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain a natural appearance and to balance crown with roots. All trees shall be maintained and pruned in accordance with the accepted practices of the International Society of Arboriculture (ISA). Prune only as directed by the Landscape Architect.
      b. Shrubs: Same objectives as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the landscape plans. All pruning cuts shall be made to lateral branches, buds or flush with the trunk. Stubbing and heading shall not be permitted.
      c. Only skilled workers shall perform pruning work in accordance with standard horticultural pruning practices. Remove from the project all pruned branches and material. Remove and replace any plant material excessively pruned or malformed resulting from improper pruning practices at no additional costs to the owner.

E. Staking: Stakes shall remain in place through the guarantee period and shall be inspected and adjusted to prevent rubbing that causes bark wounds. Remove nursery stakes from all trees just prior to end of Maintenance Period, unless otherwise noted.
   1. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

F. Fertilization: Fertilize all planting areas, just prior to end of maintenance period with slow release maintenance fertilizer at manufacturer's recommended rate.

3.11 IRRIGATION SYSTEM

A. System Observation: The Contractor shall check all systems for proper operation. Lateral lines shall be flushed out after removing the last sprinkler head or two at each end of the lateral. All heads are to be adjusted as necessary for unimpeded head to head coverage.

B. Controllers: Set and program automatic controllers for seasonal water requirements. Give the Owner's Representative instructions on how to turn off system in case of emergency.

C. Repairs: Repair all damages to irrigation system at the Contractor's expense. Repairs shall be made within twenty-four (24) hours.
3.12 CLEANUP AND PROTECTION
A. Promptly remove soil and debris from paved and vertical surfaces. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
   1. Erect temporary fencing, barricades and/or warning signs as required protecting newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established. Treat, repair, or replace damaged plantings.
   2. Remove non-degradable erosion-control measures after grass establishment period.
   3. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
   4. Trash: Remove trash weekly in all planted areas, pedestrian walkways and parking areas.

3.13 FINAL ACCEPTANCE
A. Work under this section will be accepted by the Landscape Architect upon satisfactory completion of all work (including maintenance). Upon final acceptance, and written notification, the Owner will assume responsibility for maintenance of the work.

END OF SECTION
PART 1 GENERAL

1.1 SECTION INCLUDES
A. Adjusting manholes, valves, monument covers and other structures to grade.

1.2 RELATED SECTIONS
A. Section 32 12 00 – Flexible Paving.

1.3 DEFINITIONS

1.4 SUBMITTALS
A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

1.5 RELATED DOCUMENTS
A. California Building Code: Section 1127B – Exterior Routes of Travel.

PART 2 PRODUCTS
NOT USED

PART 3 EXECUTION

3.1 ADJUSTING MANHOLES, VALVES, MONUMENT COVERS AND OTHER STRUCTURES TO GRADE
A. Remove pavement, using vertical cuts, as needed to remove frame and provide for concrete collar. Do not damage adjacent pavement.
   1. Circular Covers: Cut circle with radius 6 inches larger than cover and concentric with cover.
   2. Rectangular Covers: Cut rectangle 6 inches larger than cover on all sides.
B. Install grade rings or blocking as needed to raise cover to finish grade.
C. Pour concrete collar:
   1. Bottom of Collar: Top of existing collar or 6 inches below top of proposed collar, whichever is at a higher elevation.
   2. Top of Collar: Bottom of existing asphalt pavement.
   3. Apply tack coat to all exposed surfaces.
   4. Fill excavation with asphalitic concrete and, while still hot, compact flush with adjacent surface.

3.2 INSTALLATION TOLERANCES
A. Adjust Covers:
1. Compacted surface: Up to 0.01 foot higher, and no lower, than adjacent pavement.
2. Do not create ponding.

END OF SECTION
1.1 SECTION INCLUDES
A. Manhole structures for gravity storm drain and sanitary sewer utilities.

1.2 RELATED SECTIONS
A. Section 31 23 33 – Trenching and Backfilling.

1.3 RELATED DOCUMENTS
A. AASHTO:
   1. M 199: Precast Reinforced Concrete Manhole Sections.
B. ASTM:
   1. A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
   2. C 478: Precast Reinforced Concrete Manhole Sections.
   3. C 1244: Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test.
C. Caltrans Standard Specifications.
   1. Section 51, Concrete Structures.
   2. Section 75, Miscellaneous Metal.
D. California Building Code.
   1. Section 1172B – Exterior Routes of Travel.

1.4 DEFINITIONS
A. AASHTO: American Association of State Highway and Transportation Officials.

1.5 SUBMITTALS
A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
B. Product data for the following:
   1. Cleanout plugs or caps.
C. Shop drawings: Include plans, elevations, details and attachments for the following:
   1. Precast concrete manholes, frames and covers.
   2. Precast concrete clean out boxes and box covers.
D. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
E. Field Test Reports: Indicate and interpret test results for compliance with performance.

1.6 DELIVERY, STORAGE AND HANDLING

A. Handle precast concrete manholes according to manufacturer’s written instructions.
B. Protect imported bedding and backfill material from contamination by other materials.

PART 2 PRODUCTS

2.1 CLEANOUTS

A. Piping: Same as utility line if possible.
B. Top Cap: Threaded and of same material as piping if possible.
C. Box Size: As required to provide access and allow easy removal and reinstallation of cap.
D. Box Types:
   1. Landscape Areas: Portland cement concrete box and box cover (bolt-down), light duty.
   2. Traffic Areas: Portland cement concrete box and box cover or steel or cast iron cover, heavy duty, both box and cover (bolt down) to be rated for AASHTO H20 loading.
   3. Pedestrian Areas: Same as traffic area, with ADA-Compliant cover.
E. Box Cover Markings: “S.D.” for storm drain cleanouts, “S.S.” for sanitary sewer cleanouts, unless otherwise specified.
F. Available Manufacturers: Subject to compliance with requirements, box manufacturers offering products that may be incorporated into the Project include, but are not limited to the following:
   1. Brooks Products Inc. (El Monte, California) (Tel. 818-443-3017).
   2. Christy Concrete Products, Inc. (Fremont, California) (Tel. 800-486 7070).

2.2 MANHOLES

A. General: Size, shape, configuration, depth, etc. of manhole and frame and cover shall be as indicated.
B. Portland Cement Concrete and Reinforcing:
   1. Cast-In-Place Portion: Use Class A Concrete per Caltrans Standard Specification Section 90, and ASTM A615 Grade 60 reinforcing steel bars.
   2. Precast Portion: ASTM C 478. Rate for AASHTO H20 loading in traffic areas.
C. Frames and Covers: As indicated and in accordance with Caltrans Standard Specification Section 75-1.02.
D. Steps: ASTM C 478 or AASHTO M 199. Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A 615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091) or equal.

2.3 JOINT SEALANT FOR STRUCTURES AND MANHOLES

1. Use to seal around pipes at connections to structures and manholes. Also use to seal joints between precast sections of structures and manholes.

B. Gaskets: Preformed flexible rubber or plastic gasket.

2. Plastic Gaskets: Federal Specification SS-S-00210 (GSA-FSS), Type I, Rope Form; or alternate standard which may exist. Acceptable material is “Ram-Nek,” as manufactured by the K. T. Snyder Company (Houston TX), or equal.

PART 3 EXECUTION

3.1 CLEANOUT INSTALLATION

A. General: Install as indicated.

3.2 MANHOLE INSTALLATION

A. General: Install as indicated.

3.3 TESTING OF MANHOLES ON GRAVITY LINES

A. At the option of the Contractor, either the following hydrostatic or vacuum test shall be performed.

B. Hydrostatic Test:

1. Insert inflatable plugs in all sewer inlets and outlets.
2. Fill the manhole with water to a point six inches below the base of the manhole frame.
3. Maintain the water at this point for one hour to allow time for absorption.
4. Begin one-hour test period. Measure the amount of water added in one-hour period to maintain the water level at six inches below the base of the manhole frame. Do not allow water level to drop more than 25% of the manhole depth.
5. Determine the allowable leakage by the following formula.
6. \[ L = 0.0002 \times D \times H^{1/2} \]
7. \( L \) = Allowable leakage, gallons per minute.
8. \( D \) = Depth of manhole from top to bottom, feet.
9. \( H \) = Head of water in feet as measured from the surface of the water in the manhole to the sewer line invert or to the prevailing ground water surface outside the manhole. The lesser height governs.
10. If the leakage exceeds the allowable, determine the cause, take remedial action and re-test the manhole. If the leakage is less than the allowable and leaks are observed, repair the leaks.

C. Vacuum Test:

1. General: Test in accordance with ASTM C 1244.
2. Test prior to backfilling around the manhole.
3. Test Preparation: Plug all lift holes and pipes entering or exiting the manhole.

4. Place test head inside the top section of the manhole’s cone section and inflate in accordance with the manufacturer’s instructions.

5. Draw a vacuum of 10-inches of mercury and shut the pump off.

6. With the valve closed, the time for the vacuum to drop 9-inches shall be measured.

7. The manhole shall pass the test if the time is greater than 60 seconds for a 48-inch diameter manhole, 75 seconds for a 60-inch diameter manhole and 90 seconds for a 72-inch diameter manhole.

8. If the manhole fails the initial test, make necessary repairs with a non-shrink grout while the vacuum is still being drawn. Retest until a satisfactory test is obtained.

END OF SECTION
SECTION 33 10 00
WATER UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site water distribution system for domestic and fire protection services up to 5 feet of any on-site building being served.

B. Domestic water and fire protection water transmission or distribution system within a roadway or street right-of-way.

1.2 RELATED SECTIONS

A. Section 31 23 33 – Trenching and Backfilling.

1.3 RELATED DOCUMENTS

A. ASTM:

2. B 88: Specifications for Seamless Copper Water Tube.
3. D 1785: Specifications for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

B. AWWA:

3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.
9. C200: Steel Water Pipe-6 In. (150 mm) and larger.
12. C207: Steel Pipe Flanges for Waterworks Service-Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).


19. C219: Bolted, Sleeve-type Couplings for Plain-End Pipe.


24. C507: Ball Valves 6 In. Through 8 In. (150 mm Through 1,200 mm).

25. C508: Swing-check Valves for Waterworks Service, 2 In. (50mm) Through 24 In. (600 mm) NPS.


27. C510: Double Check Valve Backflow-Prevention Assembly.

28. C511: Reduced-Pressure Principle Backflow-Prevention Assembly.


33. C606: Grooved and Shouldered Joints.

34. C651: Disinfecting Water Mains.


36. C900: Polyvinyl Chloride (PVC) Pressure Pipe and Fittings, 4 In. Through 12 In. (100mm Through 300mm) for Water Distribution.

37. C901: Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13mm) Through 3 In. (76mm) for Water Service.

38. C905: Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm) for Water Transmission and Distribution.

39. C906: Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) through 63 In (1,575 mm), for Water Distribution and Transmission.
40. C907: Polyvinyl Chloride (PVC) Pressure Fittings for Water – 4 In. through 8 In. (100 mm Through 200 mm).


44. M41: Ductile-Iron Pipe and Fittings.

1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.


C. AWWA: American Waterworks Association

D. DI: Ductile iron.

E. DIP: Ductile iron pipe.

F. FM: Factory Mutual.


H. NSF: National Sanitation Foundation.


J. PE: Polyethylene.

K. PVC: Polyvinyl Chloride.

L. UL: Underwriters Laboratory.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

A. Minimum Internal Pressures: As indicated on plans.

B. External Load: Earth load indicated by depth of cover plus AASHTO H20 live load unless indicated otherwise.

1.6 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Product Data: For the following:
   
   1. Piping materials and fittings.
   
   2. Pipe couplings.
   
   3. Flexible pipe fittings.
   
   4. Restrained pipe fittings.
   
   5. High deflection fittings/ball joints.
   
7. Flexible expansion joints.
8. Gate valves.
10. Check valves.
11. Air and vacuum relief valves.
13. Pressure reducing valves.
14. Pressure sustaining valves.
15. Ball valves.
16. Fire hydrants.
17. Post indicator valves.
18. Fire department connections.
20. Precast valve boxes and box covers.

C. Shop drawings: Include plans, elevations, details and attachments.
   1. Precast and cast in-place vaults and covers.
   2. Wiring diagrams for alarm devices.

D. Field test reports: Indicate and interpret test results for compliance with the Project requirements.

1.7 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water. Do not operate existing valves or tap existing piping without written permission and/or presence of utility company representative.

B. Comply with the following requirements and standards:

C. Provide listing/approval stamp, label, or other marking on piping and specialties made to a specified standard.

1.8 MATERIAL DELIVERY, STORAGE AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
   1. Ensure that valves are dry and internally protected against rust and corrosion.
   2. Protect valves against damage to threaded ends and flange faces.

B. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage and handling to prevent pipe end damage and to prevent entrance of dirt, debris and moisture.

C. Handling: Use slings to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. During Storage: Use precautions for valves, including fire hydrants according to the following.
   1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
   2. Protection from Weather: Store indoors and maintain temperature higher than ambient dew-point temperature. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

E. Do not store plastic pipe and fittings in direct sunlight.

F. Protect pipe, fittings, flanges, seals and specialties from moisture, dirt and damage.

G. Protect linings and coatings from damage.

H. Handle precast boxes, vaults and other precast structures according to manufacturer’s written instructions.

I. Protect imported bedding and backfill material from contamination by other materials.

1.9 COORDINATION

A. Coordinate connection to existing water mains with water utility supplying water.

B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building domestic water distribution piping and fire protection piping.

PART 2 PRODUCTS

2.1 GENERAL

A. Products and Materials listed below are acceptable unless otherwise specified within the construction documents.

2.2 SMALL-SIZE SERVICE PIPES

A. Copper Pipe: Sizes ¾-inch through 2-inch.
   2. Joints: Restrain by couplings.

B. PVC Pipe: Sizes ½-inch to 3-inch

C. PE Plastic Pipe: Sizes ½-inch through 3-inch.
1. Pipe and Fittings: AWWA C901.

2. Joints: Restrain with clamps or heat-fusion.

2.3 LARGE-SIZE SERVICE AND DISTRIBUTION PIPES

A. DIP: Sizes 4-inch through 48-inch.


2. Fittings
   a. Standard: AWWA C110, sizes 4-inch through 48-inch.
   b. Compact: AWWA C153, sizes 4-inch through 24-inch.

3. Pipe and Fitting Lining: Cement Mortar, AWWA C104.

4. Pipe and Fitting Coating: Asphaltic, AWWA C151 or C115.


6. Unrestrained Joints:
   a. Push-On Bell and Spigot Joint: AWWA C111.
   b. Mechanical Joint: AWWA C111.

7. Restrained Joints:
   a. Flanged Joint: AWWA C115.
   b. Push-On Bell and Spigot Joint: AWWA C111 with "Field Lok Gasket," sizes 4-inch through 24-inch; "TR Flex," sizes 4-inch through 64-inch; both by U. S. Pipe (Birmingham AL) (Tel. 205-254-7442) or approved equal. "Megalug" restraint harness, Ebaa Iron (Eastland TX) (Tel 800-443-1716) or approved equal.
   c. Mechanical Joint: AWWA C111 with "Mega Lug," sizes 3-inch through 48-inch. Ebaa Iron (Eastland TX) (Tel 800-443-1716) or approved equal.
   d. Grooved and Shouldered Joints: AWWA C150, AWWA C151 and AWWA C606. 24-inch maximum size.

8. Couplings:
   a. Plain End Pipe to Plain End Pipe: Ductile iron or steel bolted couplings, manufacturer’s shop coating with low alloy steel bolts and nuts. Steel couplings to conform to AWWA C219. Smith-Blair, Inc, (Texarkana, AR) (Tel. 501-773-5127), Dresser (Bradford, PA) (Tel.-814-368-3131) or approved equal.
   b. Plain End Pipe to Flanged Pipe: 1) Ductile iron or steel bolted flanged coupling adapters, manufacturer’s shop coating with low alloy steel bolts and nuts. Steel flanged couplings to conform to AWWA C219. Smith-Blair, Inc, (Texarkana, AR) (Tel. 501-773-5127), Dresser (Bradford, PA) (Tel.-814-368-3131) or approved equal; or 2) restrained flange adapter, “Megaflange,” sizes 3-inch through 36 inch, Ebaa Iron (Eastland TX) (Tel 800-443-1716) or approved equal.

B. PE Pipe: Sizes 4-inch through 64-inch.

1. Pipe and Fittings: AWWA C906.
2. Joints:
   a. Thermal Butt Fusion: AWWA C906 and pipe manufacturer’s recommendations.
   b. Flanged joining: AWWA C906 and pipe manufacturer’s recommendations.
   c. Other: Check with pipe manufacturer.

C. PVC Pipe: Sizes 4-inch through 48-inch.

1. Pipe:
   a. 4-inch through 12-inch: AWWA C900, Class 200.
   b. 14-inch through 48-inch: AWWA C905.

2. Fittings: DI conforming to 2.2A above.

3. Unrestrained Joints:

4. Restrained Joints:
   a. Push-On Bell and Spigot Joint: Harness assembly as manufactured by Ebaa Iron
      (Eastland, Tx) (Tel. 800-433-1716) or approved equal.
   b. Plain End PVC to DI Mechanical Joint: Ebaa Iron (Eastland, Tx) (Tel. 800-433-1716) or
      approved equal.

5. Steel or Ductile Iron Couplings:
   a. Plain End Pipe to Plain End Pipe: Ductile iron or steel bolted couplings, manufacturer’s
      shop coating with low alloy steel bolts and nuts. Steel couplings to conform to AWWA
      C219. Smith-Blair, Inc, (Texarkana, AR) (Tel. 501-773-5127), Dresser (Bradford, PA)
      (Tel.-814-368-3131) or approved equal.
   b. Plain End Pipe to DI or Steel Flanged Pipe: Ductile iron or steel bolted flanged coupling
      adapters, manufacturer’s shop coating with low alloy steel bolts and nuts. Steel flanged
      couplings to conform to AWWA C219. Smith-Blair, Inc, (Texarkana, AR) (Tel. 501-773-
      5127), Dresser (Bradford, PA) (Tel.-814-368-3131) or approved equal.

6. PVC Couplings
   a. Unrestrained Plain End to Plain End Pipe: AWWA C900, as manufactured by
      CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal.
   b. Restrained Plain End to Plain End Pipe: AWWA C900, “Certa-Lock” as manufactured by
      CertainTeed (Valley Forge, PA) (Tel. 610 341-6820) or approved equal.

D. Cement Mortar Lined and Coated Steel Pipe: 6-inch and larger.

1. Pipe: AWWA C200 and AWWA M11.

2. Special Sections and Fittings: AWWA C200, C207, C208 and AWWA M11 for all bends,
   tees, nozzles, closures, etc.


4. Linings and Coatings for Pipe, Special Sections and Fittings: Cement Mortar Lining and
   Coating: AWWA C205.

b. Fusion Bonded Epoxy Lining and Coating: AWWA C213.

c. Coal-Tar Lining and Coating: AWWA C203.


e. Cold-Applied Tape Coatings, Specials, Connection and Fittings: AWWA C209.

f. Cold Applied Petrolatum Tape and Petroleum Wax Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Buried or Submerged Steel Water Pipelines.

g. Aboveground Pipe Coatings: AWWA C218.


   a. Rubber Gasket: Carnegie-shape rubber gasket as indicated.

6. Restrained Joints: AWWA M11. Where a flanged joint, butt strap or coupling are not indicated, either restrained joint a, or b, as follows, is acceptable, but the selected joint shall be used throughout the project.

   a. Rubber Gasket: Carnegie-shape rubber gasket with field welded restraint bar as indicated.

   b. Field Lap Welded Slip Joint: As indicated.

   c. Field Welded Butt Strap: As indicated.

   d. Flanged Joint: AWWA C207 with Type 316L stainless steel bolts and nuts as indicated.

7. Joint Coating for Cement Mortar Lined and Coated Steel Pipe:

   a. Field Joint Encasement: Cement mortar contained in fabric lined with closed cell polyethylene foam as indicated. Attach fabric to pipe with Type 316L stainless steel straps as indicated. Closed cell polyethylene foam encasement shall be by Industrial Specialties (Fullerton, CA) (Tel. 800-638-8127) or approved equal.

8. Non-Restrained Flexible Couplings: AWWA C219, Smith Blair, Inc (Texarkana, TX) (Tel. 501-773-5127), Number 411 or approved equal, with factory applied fusion-bond epoxy coating and Type 316L stainless steel bolts and nuts.

9. Restrained Flexible Couplings: Non-restrained flexible coupling supplemented with a restraining harness as indicated and as follows:

   a. Restraining harness design by Contractor’s pipe manufacturer using criteria presented in Section 13.10 of AWWA M11.

   b. Space harness-lugs and tie bolts equally around the pipe.

   c. Type 316L stainless steel harness tie bolts and nuts.

   d. Design and dimensions of harness lugs to be modified from that shown in AWWA M11, as necessary, to provide additional height to clear the coupling.

10. Field Coating of Coupling Assemblies: Apply either of the following flexible tape and mastic or putty coating systems to the all non-restrained or restrained flexible steel couplings.

2.4 HIGH DEFLECTION FITTINGS/BALL JOINTS
   A. Plain End Pipe: Xtra Flex Restrained Joint High Deflection Fittings, 4-inch through 24-inch, U. S. Pipe, (Birmingham, AL) (Tel. 205-254-7442) or approved equal.
   B. Mechanical or Flanged Joint: Flex 900, 4-inch through 12-inch, Ebaa Iron Sales, (Eastland, TX) (Tel. 800-433-1716) or approved equal.

2.5 EXPANSION JOINTS
   A. TR Flex Joints: TR Flex Telescoping Sleeve, 4-inch through 64 inch, U. S. Pipe, (Birmingham, AL) (Tel. 205-254-7442).
   B. Mechanical or Flanged Joint: Ex-Tend 200, 4-inch through 36-inch, EBAA Iron Sales, (Eastland, TX) (Tel. 800-433-1716) or approved equal.

2.6 FLEXIBLE EXPANSION JOINTS
   A. Plain End to Plain End Pipe: “Xtra Flex,” sizes 4-inch through 24-inch, U. S. Pipe, (Birmingham AL) (Tel. 205-254-7442) or equal.
   B. Flanged or mechanical Joint: “Flex-Tend,” sizes 3-inch through 48-inch, Ebaa Iron (Eastland TX) (Tel. 800-433-1716) or equal.
   C. Flanged Joint: Starflex, Series 500, Star Pipe Products, (Tel. 800-999-3009) or equal.

2.7 GATE VALVES
   A. Provide on lines 10-inch and smaller.
   B. Valves, 3-Inch through 20-Inch: AWWA C509, resilient-seated, non-rising stem, gray or ductile-iron body and bonnet, with bronze or gray or ductile-iron gate, bronze stem and square stem operating nut unless noted otherwise. All bolts, nuts and washers, except operating nut, shall be stainless steel. Stem operating nut to be 2-inches square and open counter-clockwise. Stem extensions shall be installed to bring the stem operating nut to within 2-feet of finish grade where the depth from finish grade to the stem operating nut exceeds 4-feet. Equip valves in pump stations and other interior or vault installations with hand-wheels. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer’s recommendations.
   C. Service Line Valves and Fittings, 2-Inch and Smaller: AWWA C800
   D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
      1. Mueller Company (Decatur, IL) (Tel.800-423-1323).
   E. Valve Box and Cover: 9-inch minimum diameter PCC box with extensions of length required for depth of bury of valve, and cast iron or ductile iron cover with lettering “WATER”. Both the box and the cover shall be rated for AASHTO H20 loading.

2.8 BUTTERFLY VALVES
   A. Provide on lines larger than 10-inch.
B. Valves, 3-Inch through 72-Inch: AWWA C 504, rubber seated, Class 150B cast iron body, cast or ductile iron discs, stainless steel shafts, adjustable field replaceable rubber seats mating against stainless steel seat rings and field-replaceable seals. Flanged or mechanical joint end connections. No wafer type valves allowed. Traveling nut type valve actuators designed for buried service unless noted otherwise. All bolts, nuts and washers, except wrench nut, shall be stainless steel. Wrench nut to be 2-inches square and open counter-clockwise. Stem extensions shall be installed to bring the wrench nut to within 2-feet of finish grade where the depth from finish grade to the wrench nut exceeds 4-feet. Equip valves in pump stations and other interior or vault installations with hand-wheels. Provide protective epoxy interior and exterior coating according to AWWA C550 and manufacturer’s recommendations.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Mueller Company (Decatur, IL) (Tel. 800-423-1323).

D. Valve Box and Cover: 9-inch minimum diameter PCC box with extensions of length required for depth of bury of valve, and cast iron or ductile iron cover with lettering “WATER”. Both the box and the cover shall be rated for AASHTO H20 loading.

2.9 AIR RELEASE, AIR/VACUUM AND COMBINATION AIR VALVES

A. AWWA C512, specific type of valve, size, details and valve box as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Apco Valves, Valve and Primer Corporation (Schaumburg, IL) (Tel. 708-529-9000).
2. Crispin Valve (Berwick, PA) (Tel. 800-247-8258).

2.10 BLOW-OFF VALVES

A. Blow-off valve assemblies, details and boxes as indicated.

2.11 SWING CHECK VALVES

A. Valves 2-Inch through 24-Inch: AWWA C508, details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. Mueller Company (Decatur, IL) (Tel. 800-423-1323).

2.12 BALL VALVES

A. Valves 6-Inch through 48-Inch: AWWA C507, details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:


2.13 PRESSURE-REGULATING VALVES
A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250-psi working-pressure, bronze pressure-reducing pilot valve and tubing, and means for discharge pressure adjustment. Details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
   2. Bermad (Porterville, CA) (Tel. 209-781-6630).
   3. Ames Company (Woodland, CA) (Tel. 916-666-2493).

2.14 FLOW-REGULATING VALVES

A. Valve: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. 250-psi working-pressure, bronze pressure-reducing pilot valve and tubing, and means for flow adjustment. Details as indicated.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
   2. Bermad (Porterville, CA) (Tel. 209-781-6630).
   3. Ames Company (Woodland, CA) (Tel. 916-666-2493).

2.15 SERVICE CONNECTIONS AND WATER METERS

A. Service connections and water meter details and boxes as indicated.

2.16 FIRE HYDRANTS

A. Wet Barrel: AWWA C503, details as indicated.

B. Dry Barrel: AWWA C502, details as indicated.

2.17 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

A. Provide as indicated and as required by State or local agency.

B. General: AWWA C511, with OS gate valve on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air gap fitting located between 2 positive-seating check valves for continuous-pressure application.

C. Body:
   1. 2-Inch and Smaller: Bronze with threaded ends.
   2. 2-1/2-Inch and Larger: Bronze, cast iron steel, or stainless steel with flanged ends.

D. Interior Lining: AWWA C550, epoxy coating for cast iron or steel bodies.

E. Interior Components: Corrosion-resistant materials.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
2. Ames Company (Woodland, CA) (Tel. 916-666-2493).
3. Febco, CMB Industries, Inc. (Fresno, CA) (Tel. 559-252-0791).
4. Hersey Products, Inc. (Dedham, MA) (Tel. 617-326-9400).

2.18 DOUBLE CHECK DETECTOR ASSEMBLY

A. FM approved or UL listed, with OS&Y gate valve on inlet and outlet, and strainer on inlet. Include two positive-seating check valves and test cocks, and bypass with displacement-type water meter, valves, and double-check backflow preventer, for continuous pressure application.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Cla-Val Company (Newport Beach, CA) (Tel. 714-548-2201).
   2. Ames Company (Woodland, CA) (Tel. 916-666-2493).
   3. Febco, CMB Industries, Inc. (Fresno, CA) (Tel. 559-252-0791).
   4. Hersey Products, Inc. (Dedham, MA) (Tel. 617-326-9400).

2.19 POST INDICATOR VALVE

A. General: UL 789, FM approved, vertical-type, cast-iron body with operating wrench extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve. Review fire department connection with agency having jurisdiction. Check hose threads and all sizes with fire department.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
   1. Mueller Co. (Decatur, IL) (Tel. 800-423-1323).
   2. Clow Corporation (Oskaloosa, IA).

2.20 FIRE DEPARTMENT CONNECTION

A. Exposed, Freestanding Fire Department Connection: UL 405, cast brass body with threaded inlets according to NFPA 1963 and matching local fire department hose threads and threaded bottom outlet. Include lugged caps, gaskets and chains; lugged swivel connections and drop clapper for each hose-connection inlet.

2.21 UNDERGROUND VAULTS/PITS

A. General: Portland cement concrete, precast or cast-in-place as indicated.

B. Portland Cement Concrete and Reinforcing Steel: Section 32 05 23 – Cement and Concrete for Exterior Improvements.

C. Access Openings: As indicated.

D. External Load: Earth load plus AASHTO H20 live load if located in paved areas.

E. Lids: Bolt down type.

2.22 TRACER WIRE

A. General: Minimum #12 AWG stranded copper wire with blue THW, THWN, or THHN rated insulation.
2.23 WARNING TAPE

A. General: Non-detectable 3-inch warning tape made of solid blue film with continuously printed black-letter message reading “CAUTION—WATER LINE BURIED BELOW.”

2.24 PCC THRUST BLOCKS

A. Portland Cement Concrete and Reinforcing Steel: Section 32 05 23 – Cement and Concrete for Exterior Improvements.

PART 3 EXECUTION

3.1 PIPE INSTALLATION

A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer’s instructions, and in accordance with the following:

1. DIP: AWWA M41 and AWWA C600.
2. PVC pipe: AWWA M23 and AWWA C605.

B. Pipe Depth and Trench Configuration: Conform to elevations, profiles and typical trench section(s) indicated.

C. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Trenching and Backfilling.

D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer’s recommendations.

E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Lay pipe on a bed of bedding material specified and prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.

F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. If necessary, use shorter than the standard lengths of pipe to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

G. Closure: Close open ends of pipes and appurtenance openings at the end of each days work or when work is not in progress.

3.2 CONNECTING TO EXISTING MAINS

A. Pressure Tap Connections: Perform in accordance with the requirements of the owner of the system being tapped. Maintain a positive pressure flow from the main being tapped to the tapping device to flush plastic chips, metal ribbons, etc. into the tapping devise and not into the pipe being tapped.

B. Other Connections: As indicated and in accordance with the requirements of the owner of the line being connected to.
3.3 ANCHORAGE INSTALLATION
A. Mechanically Restrained Joints: Install where indicated for lengths indicated in accordance with manufacturer’s instructions.

B. PCC Thrust Blocks: Install where required and as indicated. Bearing area indicated is to be against undisturbed earth. Allow a minimum of 24-hours curing time before introducing water into the pipeline and allow a minimum of 7-days curing time before pressure testing.

3.4 HIGH DEFLECTION FITTINGS/BALL JOINTS, EXPANSION JOINTS, AND FLEXIBLE EXPANSION JOINTS
A. Install as indicated and in accordance with the manufacturers recommendations.

3.5 VALVE INSTALLATION
A. Install all valves in accordance with the manufacturer’s instructions and the following:
   1. General:
      a. Gate Valves: Appendix A of AWWA C509.
   2. Joints:
      b. Valves on Steel Pipe: As indicated for buried locations. Flanged-end valves for installation in vaults/pits.

3.6 SERVICE CONNECTIONS INSTALLATION
A. Install as indicated and in accordance with the requirements of the owner of the system.

3.7 WATER METER INSTALLATION
A. Install as indicated and in accordance with the requirements of the owner of the system.

3.8 FIRE HYDRANT INSTALLATION
A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.9 REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER INSTALLATION
A. Install as indicated and in accordance with the requirements of the owner of the system and the local health department requirements.

3.10 DOUBLE CHECK DETECTOR ASSEMBLY INSTALLATION
A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.11 POST INDICATOR VALVE INSTALLATION
A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.12 FIRE DEPARTMENT CONNECTION INSTALLATION
A. Install as indicated and in accordance with the requirements of the owner of the system and the fire department.

3.13 UNDERGROUND VAULT/PIT INSTALLATION

A. Install as indicated.

B. Excavation and Backfill: Section 31 23 33 – Trenching and Backfilling.

3.14 TRACER WIRE INSTALLATION

A. Install on trench bottom under the vertical projection of the pipe to protect it in all installations.

B. Form a mechanically and electrically continuous line throughout the pipeline, extending to the nearest valve or other pipeline appurtenance designated by the owner of the system or the Owner. Extend the wire up the outside of the valve box/riser and cut a hole that is 8-inches from the top, extend a 12-inch wire lead to the inside of the box. At other pipeline appurtenances, designated by the owner of the system or the Owner, terminate the 12-inch wire lead inside the enclosure.

C. Splice wire with a splicing device consisting of and electro-tin plated seamless copper sleeve conductor. Install as recommended by the manufacturer. Wrap splices and damaged insulation with electrician’s tape.

3.15 WARNING TAPE INSTALLATION

A. Install tape approximately 1-foot above and along the centerline of the pipe.

B. Where tape is not continuous, lap tape ends a minimum of 2-feet.

3.16 HYDROSTATIC PRESSURE AND LEAKAGE TEST

A. General:

1. Provide all necessary materials and equipment, including water.

2. Backfill all trenches sufficient to hold pipe firmly in position.

3. Allow time for thrust blocks to cure prior to testing.

4. Flush all pipes prior to testing to remove all foreign material.

5. Perform pressure and leakage test concurrently.

6. Test pressure: See Subsection titled “System Performance Requirements.”

7. Apply test pressure by means of a pump connected to the pipe.

8. Base test pressure on the elevation of the lowest point in the line.

9. Fill each closed valve section or bulk-headed section slowly. Expel air from section being tested by means of permanent air vents installed at high points or by means of temporary corporation cocks installed at such points. Remove and plug the temporary corporation cocks at the conclusion of the test.

10. Allow water to stand in the pipe for 24 hours before test pressure is applied.

11. Allow the system to stabilize at the test pressure before conducting the leakage test.

12. Do not operate valves in either the opening or closing direction at differential pressures above the valves rated pressure.
13. Maintain test pressure as specified for type of pipe being tested.

14. Pressure Test: Examine any exposed pipe, fittings, valves, hydrants and joints during the test, if no leaks are observed the section of line has passed the pressure test. If leaks are observed, repair any damaged or defective pipe, fittings, valves, or hydrants, and repeat the pressure test.

15. Leakage Test: Perform as specified hereafter for the type of pipe being installed.

B. DIP Leakage Test: Perform in accordance with AWWA C600. Selected requirements of AWWA C600 are repeated as follows:

1. Maintain the test pressure, +/- 5 psi, for a minimum of two hours.

2. No piping will be accepted if the leakage is greater than that determined by the following formula:

\[ L = \frac{S \times D \times P}{133,200} \]

3. \( L \) = Allowable leakage, gallons per hour.

4. \( S \) = Length of pipe tested, feet.

5. \( D \) = Nominal diameter of pipe, inches.

6. \( P \) = Average test pressure during the leakage test, pounds per square inch (gauge).

C. PE Pipe Leakage Test:

1. Apply the test pressure and allow the pipe to stand, without makeup pressure, for sufficient time to allow for diametric expansion or pipe stretching to stabilize, approximately two to three hours.

2. After the above stabilization has occurred, return the section being tested to the test pressure. Hold the test pressure for one to three hours. If the pressure in the test section drops, and it is determined the drop may be the result of expansion resulting from increasing temperature, a limited amount of additional water may be added to bring the pressure back to the test pressure. Allowable amounts of make-up water, to compensate for expansion due to increasing temperature, are as shown in the following table. Make-up water is only allowed during this final test period and not during the initial stabilization described in the previous paragraph. If the additional water added is less than the allowable shown in the table and there are no visual leaks or significant pressure drops, the tested section passes the test.

<table>
<thead>
<tr>
<th>Nominal Size (in.)</th>
<th>Test 1-Hour (U.S. Gals./100 Feet of Pipe)</th>
<th>Test 2-Hour</th>
<th>Test 3-Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.10</td>
<td>0.15</td>
<td>0.25</td>
</tr>
<tr>
<td>4</td>
<td>0.13</td>
<td>0.25</td>
<td>0.40</td>
</tr>
<tr>
<td>6</td>
<td>0.30</td>
<td>0.60</td>
<td>0.90</td>
</tr>
<tr>
<td>8</td>
<td>0.50</td>
<td>1.0</td>
<td>1.50</td>
</tr>
<tr>
<td>10</td>
<td>0.75</td>
<td>1.3</td>
<td>2.1</td>
</tr>
<tr>
<td>11</td>
<td>1.0</td>
<td>2.0</td>
<td>3.0</td>
</tr>
<tr>
<td>12</td>
<td>1.1</td>
<td>2.3</td>
<td>3.4</td>
</tr>
<tr>
<td>14</td>
<td>1.4</td>
<td>2.8</td>
<td>4.2</td>
</tr>
<tr>
<td>16</td>
<td>1.7</td>
<td>3.3</td>
<td>5.0</td>
</tr>
<tr>
<td>18</td>
<td>2.2</td>
<td>4.3</td>
<td>6.5</td>
</tr>
<tr>
<td>20</td>
<td>2.8</td>
<td>5.5</td>
<td>8.0</td>
</tr>
</tbody>
</table>
D. PVC Pipe Leakage Test: Perform in accordance with AWWA M23. Selected requirements of AWWA M23 are repeated as follows:

1. Maintain the test pressure, +/- 5 psi, for a minimum of two hours.
2. No piping will be accepted if the leakage is greater than that determined by the following formula:
   \[ L = \frac{(N \times D \times P^{1/2})}{7,400} \]
   where:
   - \( L \) = Allowable leakage, gallons per hour.
   - \( N \) = Number of joints in the length of the pipeline tested.
   - \( D \) = Nominal diameter of pipe, inches.
   - \( P \) = Average test pressure during the leakage test, pounds per square inch (gauge).

E. Cement Mortar Lined and Coated Steel Pipe Leakage Test: Perform in accordance with AWWA M11. Selected requirements of AWWA M11 are repeated as follows:

1. Maintain the test pressure, +/- 5 psi, for a minimum of two hours.
2. There shall be no significant leakage for pipe with welded joints or mechanical couplings.
3. For pipe joined with O-ring rubber gaskets, a leakage of 25 gallons per inch of diameter per mile per 24-hours is allowed.

3.17 FLUSHING

A. Following assembly and testing and prior to disinfection & final acceptance, all potable water pipelines installed under this section must be flushed with water and all accumulated construction debris and other foreign matter removed. Use only potable water for flushing potable water pipelines. Flushing velocities must be a minimum of 2.5-feet per second. Cone strainers must be inserted in the connections to attached equipment and left there until cleaning has been accomplished to the satisfaction of the CDCR Representative. Accumulated debris must be removed through drains two inches and larger or by dropping spools and valves.

3.18 DISINFECTION

A. All New Pipelines shall be disinfected in accordance with one of the three methods specified in AWWA C651 and the following:

1. Disinfect after pressure and leakage test have been performed and accepted and after flushing.
2. The method used shall be at the Contractor’s option, unless specified by the owner of the water system.
3. Engage the services of a commercial testing laboratory, approved by the owner of the water system, to perform the bacteriological tests specified in Section 5.1 of AWWA C651.
the testing laboratory to send the original report of the bacteriological testing to the owner of the water system. Should the laboratory report show that any sample taken was not acceptable, repeat the sterilization process shall until a satisfactory sterilization is accomplished.

4. Lawfully dispose of the chlorinated water.

END OF SECTION
SECTION 33 30 00
SANITARY SEWERAGE UTILITIES

PART 1  GENERAL

1.1  SECTION INCLUDES

   A. Roadway and/or site sanitary gravity sewers and force mains up to 5 feet of any on-site building.

1.2  RELATED SECTIONS

   A. Section 31 23 33 – Trenching and Backfilling.
   B. Section 33 05 16 – Utility Structures.

1.3  RELATED DOCUMENTS

   A. AASHTO:
      1. M 252: Corrugated Polyethylene Drainage Tubing.
      2. M 294: Corrugated Polyethylene Pipe, 12 to 24-inch Diameter.

   B. ASTM:
      1. A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
      2. A 674 Practice for Polyethylene Encasement for Ductile Iron Pipe for Water and Other Liquids.
      5. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
     10. D 3034: Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
     15. F-1336: Poly(Vinyl Chloride) (PVC) Gasket Sewer Fittings.
C. AWWA:
   3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.

D. Caltrans Standard Specifications.
   1. Section 65, Reinforced Concrete Pipe.

E. California Building Code.

F. Section 1806A.11 – Pipes and Trenches.

G. California Plumbing Code.

1.4 DEFINITIONS

A. AASHTO: American Association of State Highway and Transportation Officials.


E. HDPE: High-density polyethylene.

F. PE: Polyethylene.

G. DIP: Ductile iron pipe.

H. PVC: Polyvinyl Chloride.

I. RCP: Reinforced concrete pipe.

J. NPS: Nominal pipe size.

1.5 SUBMITTALS

A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.

B. Product data for the following:
   1. Piping materials and fittings.
   2. Special pipe couplings.
4. Sewage air relief valves.

C. Shop drawings: Include plans, elevations, details and attachments for the following:
   1. Force main piping access openings.

D. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

E. Field Test Reports: Indicate and interpret test results for compliance with performance.

1.6 DELIVERY, STORAGE AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, fittings, and seals from dirt and damage.

C. Handle precast concrete pipe and other precast structures according to manufacturer’s written instructions.

D. Protect imported bedding and backfill material from contamination by other materials.

PART 2 PRODUCTS

2.1 GENERAL

A. Products and materials listed are acceptable unless otherwise specified within the construction documents.

2.2 PIPING MATERIALS FOR GRAVITY FLOW

A. DIP: Sizes 4-inch through 48-inch.
   2. Pressure Class: Minimum pressure class for size indicated.
   3. Fittings
      a. Standard: AWWA C110, sizes 4-inch through 48-inch.
      b. Compact: AWWA C153, sizes 4-inch through 24-inch.
   4. Pipe and Fitting Lining: Cement Mortar, AWWA C104.
   5. Pipe and Fitting Coating: Asphalitic, AWWA C151 or C115.
   7. Joints:
      a. Push-On Bell and Spigot Joint: AWWA C111.
      b. Mechanical Joint: AWWA C111.
      c. Flanged joint. AWWA C115.

B. PVC Pipe and Fittings: 4-inch through 15-inch, SDR 26, ASTM D 3034. Bell and spigot joints.

2. Fittings: ASTM F 1336.

2.3 PIPING MATERIALS FOR FORCE MAINS
A. DIP: See Section 33 10 00 – Water Utilities.
B. PE Pipe: See Section 33 10 00 – Water Utilities.

2.4 SPECIAL PIPE COUPLINGS
A. Gravity Piping: ASTM C 1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.
B. Force Main piping: See Section 33 10 00 – Water Utilities.

2.5 MANHOLES AND CLEANOUTS
A. See Section 33 05 16 – Utility Structures.

2.6 SEWAGE AIR RELIEF VALVE ASSEMBLY FOR FORCE MAINS
A. General: As indicated.

2.7 THRUST BLOCKS FOR FORCE MAINS
A. General: Location, configuration bearing area, etc. as indicated.
B. Portland Cement Concrete: Section 32 05 23 – Cement and Concrete for Exterior Improvements.

PART 3 EXECUTION

3.1 GRAVITY PIPE INSTALLATION
A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer’s instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-1.07 for reinforced concrete pipe and chapter 11.3.3 of AWWA M41 for ductile iron pipe.
B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.
C. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Trenching and Backfilling.
D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with the manufacturer’s recommendations.
E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold
pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.

F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

G. Closure: Close open ends of pipes and appurtenance at the end of each day's work or when work is not in progress.

3.2 SPECIAL PIPE COUPLINGS

A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

B. Installation: Per manufacturer's instructions.

3.3 AIR RELIEF VALVE ASSEMBLY INSTALLATION

A. General: Install as indicated.

3.4 TESTING OF GRAVITY PIPING MAINS

A. Obstructions: After backfilling and compacting, but before paving or other surface improvements, test sewer for obstructions either by rodding or by the sewer ball method. Provide for intercepting all grit, rocks and other flushed debris to keep debris from entering the existing system.

B. At the option of the Contractor, either the following hydrostatic or air test shall be performed.

C. Hydrostatic Test:

1. Test after backfilling to finish grade or pavement structural section subgrade in paved areas.

2. Test sewer mains between successive manholes by closing the lower end of the sewer main to be tested and the inlet sewer main of the upper manhole with stoppers.

3. Fill pipe and manholes with water to a point four feet below the ground surface of the upper manhole, but in no case less than four feet above the pipe invert. If ground water is present, the water surface at the upper manhole shall be at least four feet above the level of the ground water.

4. Fill piping at least one hour prior to testing.

5. Test piping at least two hours by maintaining the head specified above with measured additions of water. The sum of these additions of water, in the two-hour test period, shall be the leakage amount.

6. The maximum allowable head of water above any portion of sewer being tested shall be 15-feet. Where the difference in elevation between successive manholes exceeds 15-feet, a test tee shall be installed between manholes, and the testing shall be carried on between the tee and the manhole.

7. The allowable leakage shall not exceed 0.1-gallons per minute per inch diameter, per 1000-feet of sewer main being tested.
8. If the leakage exceeds the above amount, determine the cause and remedy it prior to retesting.

9. If the leakage is less than the allowable, but leaks are observed, repair the observed leaks.

D. Air Test:

1. Test after backfilling to finish grade or pavement structural section subgrade in paved areas.

2. Apply to each length between adjacent manholes.

3. Supply pressure gauge with minimum divisions of 0.10-psi and with an accuracy of +/- 0.04-psi. When requested by the Owner, provide certification that the gauge has been tested for accuracy within the last six months by a reliable testing firm.

4. Pressurize the test section to 3.5-psi, and then hold the pressure above 3.0-psi during a saturation period of at least 5 minutes. At the end of the saturation period, note the pressure, which must be a minimum of 3.0-psi, and begin the timed period. If the pressure drops 0.5-psi in less than the time given in the following table the section of pipe has not passed the test.

5. **Pipe Size** | **Minimum Time Allowed for Pressure to Drop 0.5-PSI**
---|---
4” | 125 seconds
6” | 185 seconds
8” | 245 seconds
10” | 310 seconds
12” | 370 seconds
15” | 460 seconds
18” | 555 seconds
21” | 10 minutes
24” | 12 minutes
27” | 14 minutes
30” | 16 minutes
36” | 18 minutes
42” | 20 minutes
48” | 23 minutes
54” | 26 minutes

6. If the time for the pressure to drop 0.5-psi is 125% or less of the time indicated, the line shall immediately be re-pressurized to 3.0-psi and the test repeated. If, during the 5-minute saturation period, the pressure drops less than 0.5-psi after the initial pressurization and air is not added, the section undergoing the test shall have passed.
7. If the test did not pass, find and repair the leak to the satisfaction of the Owner.

8. When the prevailing ground water is above the line being tested the air pressure shall be increased 0.43-psig for each foot the water table is above the invert of the pipe at the highest manhole.

3.5 TESTING OF LATERALS

A. At the option of the Contractor, either the following hydrostatic or air test shall be performed.

B. Hydrostatic Test:
   1. Test laterals before backfilling.
   2. Plug lateral at its ends and fill with water through the cleanouts.
   3. Maintain the water level in the cleanouts as high as possible throughout the test period.
   4. One hour after filling with water, examine the lateral for leakage.
   5. Repair all leaks to the satisfaction of the Owner.
   6. Do not backfill the trench until testing and repairs of the lateral are complete, and approved by the Owner.
   7. Following approval of the Owner, remove all plugs, dispose of the water and complete the connection to the main.

C. Air Test
   1. Test after backfilling to finish grade or pavement structural section subgrade in paved areas.
   2. Test in accordance with subsection above titled “Testing of Gravity Piping Mains,” paragraph titled “Air Test.”

3.6 HYDROSTATIC AND LEAKAGE TESTING OF FORCE MAINS

A. General: Perform hydrostatic and leakage test in accordance with Section 33 10 00 – Water Utilities.

3.7 FLUSHING

A. Following assembly and testing and prior to final acceptance, sewer pipelines must be flushed with water and all accumulated construction debris and other foreign matter removed. Flushing velocities must be a minimum of 2.5-feet per second. Cone strainers must be inserted in the connections to attached equipment and left there until cleaning has been accomplished to the satisfaction of the CDCR Representative. Accumulated debris must be removed through drains two inches and larger or by dropping spools and valves.

END OF SECTION
SECTION 33 40 00

STORM DRAINAGE UTILITIES

PART 1  GENERAL

1.1  SECTION INCLUDES

A. Roadway and/or site storm drainage up to 5-feet of any on-site building.

1.2  RELATED SECTIONS

A. Section 31 23 33 – Trenching and Backfilling.

1.3  RELATED DOCUMENTS

A. AASHTO:
   1. M 252: Corrugated Polyethylene Drainage Tubing.
   2. M 294: Corrugated Polyethylene Pipe, 12 to 24-inch Diameter.

B. ASTM:
   2. A 615/A615M: Deformed and Billet-Steel Bars for Concrete Reinforcement.
   6. D 1785: Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   11. D 3034: Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.
C. AWWA:
   3. C110: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm) for Water.

D. Caltrans Standard Specifications:
   1. Section 65, Reinforced Concrete Pipe.
   2. Section 66, Corrugated Metal Pipe.
   3. Section 70. Miscellaneous Facilities.
   4. Section 72, Slope Protection.

E. Caltrans Standard Plans:
   1. Plan D94A: Metal and Plastic Flared End Sections.
   2. Plan D94B: Concrete Flared End Sections.
   3. Plan D97A: Corrugated Metal Pipe Coupling Details No.1, Annular Coupling Band Bar and Strap and Angle Connection.
   4. Plan D97B: Corrugated Metal Pipe Coupling Details No. 2, Hat Band Coupler and Flange Details.
   5. Plan D97C: Corrugated Metal Pipe Coupling Details No. 3, Helical and Universal Couplers.
   6. Plan D97D: Corrugated Metal Pipe Coupling Details No. 4, Hugger Coupling Bands.
   7. Plan D97E: Corrugated Metal Pipe Coupling Details No. 5, Standard Joint.
   8. Plan D97F: Corrugated Metal Pipe Coupling Details No. 6, Positive Joint.
   11. Plan D98B: Slotted Corrugated Steel Pipe Drain Details.

F. California Building Code:

G. Section 1806A.11 – Pipes and Trenches.
H. Section 1133B.7.2 – Gratings.
I. California Plumbing Code.

1.4 DEFINITIONS
A. AASHTO: American Association of State Highway and Transportation Officials.
E. CMP: Corrugated metal pipe.
F. DIP: Ductile iron pipe.
G. HDPE: High-density polyethylene.
H. NPS: Nominal pipe size.
I. PE: Polyethylene.
J. PVC: Polyvinyl chloride.
K. RCP: Reinforced concrete pipe.

1.5 SUBMITTALS
A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
B. Product Data Shop Drawings, Etc.: For the following:
   1. Piping materials and fittings.
   2. Special pipe couplings.
   3. Polymer-concrete, channel drainage systems (trench drains).
   4. Joint sealants.
   5. Plastic area drains.
   6. Precast concrete catch basins, inlets, curb inlets, and area drains, including frames and grates.
   7. Concrete, metal and plastic flared end sections.
C. Design Mix Reports and Calculations: For each class of cast in place concrete.
D. Field Test Reports: Indicate and interpret test results for compliance with performance.

1.6 DELIVERY, STORAGE AND HANDLING
A. Do not store plastic structures, pipe and fittings in direct sunlight.
B. Protect pipe, fittings, and seals from dirt and damage.
C. Handle precast concrete pipe and other precast structures according to manufacturer’s written instructions.

D. Protect imported bedding and backfill material from contamination by other materials.

PART 2 PRODUCTS

2.1 GENERAL

A. Products and materials listed are acceptable unless otherwise specified within the construction documents.

2.2 PIPING MATERIALS

A. Reinforced Concrete Pipe: Designated by Class, rubber gasketed joints.
   2. Oval shaped (Elliptical) Reinforced Concrete Pipe: Caltrans Standard Specification Section 65-1.02B. Class HE-III and VE-III.
   3. Reinforced Concrete Pipe Arch: Caltrans Standard Specification Section 65-1.02C.

B. PE Pipe and Fittings: 4-inch through 10-inch, AASHTO M 252 Type S, smooth interior and corrugated exterior. Bell and spigot joints.
   2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.

   2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.

D. PVC Pipe and Fittings-Smaller than 4-Inch: ASTM D1785, Schedule 40.
   1. Joints: Solvent Cement, ASTM D 2564. Include primer according to ASTM F656.

E. PVC Pipe and Fittings, 4-Inch and Larger
   1. Pipe:
      a. 4-inch through 15-inch: ASTM D 3034, SDR 35. Bell and spigot joints.
      b. 18 inch through 36-inch: ASTM F 679, T-1 wall. Bell and spigot joints.
   2. Fittings:
      a. 4-inch through 27-inch: ASTM F 1336.
      b. 30-inch through 36-inch: ASTM D 3034, SDR 35

### 2.3 PIPE ANCHORS

A. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

### 2.4 SPECIAL PIPE COUPLINGS

A. Plastic, Cast Iron and Ductile Iron Pipe: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

B. Reinforced Concrete Pipe: Portland cement concrete collar as indicated.

C. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

### 2.5 CURB INLETS, CATCH BASINS, DROP INLETS, AREA DRAINS, ETC.

A. General: Size, shape, configuration, depth, etc. of structure and frame, grate, or cover shall be as indicated.

B. Section 32 05 23 – Cement and Concrete for Exterior Improvements.

C. Precast Structure: Rate for AASHTO H20 loading in paved areas.

D. Steps: ASTM C 478 or AASHTO M 199. Manufacture from deformed, ½-inch steel reinforcement rod complying with ASTM A 615 and encased in polypropylene complying with ASTM D4101. Include pattern designed to prevent lateral slippage off step. Acceptable manufacturer is Hanson Concrete Products, (Milpitas, CA) (Tel 408-262-1091).

E. Frames, Grates and Covers: Caltrans Standard Specification Section 75-1.02, 75-1.03 and 75-1.05.

   1. Galvanize steel frames, grates and covers.
   2. Grates and covers shall be non-rocking, bolt-down type.
   3. Rate for AASHTO H20 loading in paved areas.
   4. Provide ADA-compliant grate within pedestrian areas.

### 2.6 MANHOLES AND CLEANOUTS

A. See Section 33 05 16 – Utility Structures.

### 2.7 POLYMER-CONCRETE TRENCH DRAINS

A. General: Modular system of precast, polymer-concrete channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include number of units required to form total length required.

B. Include the following components:

   1. Channel Sections: Interlocking-joint, precast modular units with end caps. Inside width as indicated with deep, rounded bottom, with built in slope or flat invert as indicated and outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.
2. Frame and Grate: Gray iron, ductile iron or galvanized steel as indicated. Where drain is located in traffic areas, rate for AASHTO H20 loading.

C. Locking Mechanism: Manufacturer’s standard device for securing grates to channel sections.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:

1. “Polydrain” by ABT Inc. (Troutman, NC) (Tel 704-528-9806).

2. “ACO Drain” by ACO Polymer Products Inc. (Chardon, OH) (Tel. 800-543-4764).

PART 3 EXECUTION

3.1 PIPE INSTALLATION

A. General: Install pipe, fittings, and appurtenances utilizing best practices, manufacturer’s instructions, and in accordance with Section 6 and 7 of ASTM D 2321 for plastic pipe, Caltrans Standard Specification Section 65-1.07 for reinforced concrete pipe, Caltrans Standard Specification Sections 66-1.045 and 66-105 for corrugated metal pipe and chapter 11.3.3 of AWWA M41 for cast iron and ductile iron pipe.

B. Pipe Depth and Trench Configuration: Conform to typical trench section(s) indicated.

C. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Trenching and Backfilling.

D. Handling: Carefully handle during loading, hauling, unloading and placing operations to avoid breakage or damage. Use strap type slings for lifting and placing; no chains or hooks will be permitted. Comply with manufacturer’s recommendations.

E. Laying: Before lowering pipe into the trench, remove all stakes, debris, loose rock and other hard materials from the bottom of the trench. Lay accurately in conformance with lines and grades indicated. Start laying the pipeline at the low end and proceed upstream. Lay bell and spigot pipe with the bell end facing upstream. Lay pipe on a bed prepared by handwork, dug true to grade. Furnish firm bearing for pipe throughout its entire length with bell holes provided at the ends of each pipe length of sufficient size to permit making up the particular type of joint being used. Adjust pipe to line and grade by scraping away or filling and tamping material under the body of the pipe for the entire pipe length and not by blocking or wedging. After final positioning, hold pipe in place in trench with backfill material placed equally on both sides of the pipe at as many locations as required to hold the pipe section in place.

F. Curved Alignment: When necessary to conform to the alignment specifically indicated, lay pipe on a curved alignment by means of asymmetrical closure of joints or bending of the pipe barrel. Use shorter lengths of pipe than the standard length if necessary to achieve curvature specified. Do not exceed the recommendations of the pipe manufacture for deflections at the joints or pipe bending.

G. Closure: Close open ends of pipes and appurtenance openings at the end of each days work or when work is not in progress.

3.2 INSTALLATION OF PIPE ANCHORS

A. Install at location, configuration and details shown on the Plans.
3.3 SPECIAL PIPE COUPLINGS
A. General: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
B. Installation: Per manufacturer's instructions.

3.4 INSTALLATION OF CURB INLETS, CATCH BASINS, DROP INLETS, AREA DRAINS, ETC.
A. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Trenching and Backfilling.
B. Poured in Place Structures: Install as indicated and Caltrans Standard Specification Section 51.
   1. Shape bottoms to convey flows as indicated.
C. Precast Structures: Install as indicated.
   1. Seal all joints and pipe entrances and exits.
   2. Place concrete in bottom and shape to convey flows as indicated.

3.5 POLYMER-CONCRETE TRENCH DRAIN INSTALLATION
A. Excavation, Bedding, Backfill, and Compaction: Section 31 23 33 – Trenching and Backfilling.
B. Install: As indicated and in accordance with the manufacturer’s instructions.

3.6 TESTING
A. General: Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours advance notice.
   4. Submit separate reports for each test.
   5. Where authorities having jurisdiction do not have published procedures, perform tests in accordance with latest edition of the Uniform Plumbing Code (UPC) Section 1109.0, Testing.
   6. Leaks and loss in test pressure constitute defects that must be repaired.
   7. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION
SECTION 33 46 00
SUBDRAINAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Subdrains in trenches and subdrains or prefabricated composite drainage panels at walls or foundations.

B. Sand-Swale filters in parking lot areas.

1.2 RELATED SECTIONS

A. Section 31 23 33 – Trenching and Backfilling.

B. Section 33 05 16 – Utility Structures.

C. Section 33 40 00 – Storm Drainage Utilities.

1.3 RELATED DOCUMENTS

A. AASHTO:

1. M 252: Corrugated Polyethylene Drainage Tubing.


B. ASTM:


2. D 448: Classification for Sizes of Aggregate for Road and Bridge Construction.


4. D 1785: Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.


10. D 3034: Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.


C. Caltrans Standard Specifications:
   1. Section 68 Subsurface Drains
   2. Section 96 Geosynthetics

1.4 DEFINITIONS
A. AASHTO: American Association of State Highway and Transportation Officials.
B. ABS: Acylonitrile-Butadiene-Styrene.
E. HDPE: High-density polyethylene.
F. PE: Polyethylene.
G. PVC: Polyvinyl Chloride.

1.5 SUBMITTALS
A. Follow submittal procedures outlined in Section 01 33 00 – Submittal Procedures.
B. Product data for the following:
   1. Perforated pipe and fittings.
   2. Solid pipe and fittings.
   3. Prefabricated composite drainage panels.
C. Samples:
   1. Drainage Fill.

1.6 DELIVERY, STORAGE AND HANDLING
A. Do not store plastic structures, pipe, and fittings in direct sunlight.
B. Protect pipe, pipe-fittings, and seals from dirt and damage.
C. Protect permeable material from contamination by other materials.
PART 2 PRODUCTS

2.1 GENERAL

A. Products and materials listed are acceptable unless otherwise specified within the construction documents.

2.2 PERFORATED WALL AND SOLID WALL PIPE


B. ABS Pipe and Fittings: 4-inch through 12-inch, ASTM D 2751, SDR 35. Bell and spigot joints.

C. PE Pipe and Fittings (HDPE): 4-inch through 10-inch, AASHTO M252 Type S (Solid wall.) or SP (Perforated wall.), smooth interior and corrugated exterior. Bell and spigot joints.
   2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.

D. PE Pipe and Fittings (HDPE): 12-inch through 48-inch, AASHTO M 294.Type S (Solid Wall.) or Type SP (Perforated wall.), smooth interior and corrugated exterior. Bell and spigot joints.
   2. Couplings: AASHTO M 252, corrugated band type. Engage a minimum of 4 corrugations, 2 on each side of pipe joint.

   1. Solvent Cement: ASTM D 2564. Include primer according to ASTM F656.

F. PVC Pipe and Fittings:
   3. Fittings: ASTM F 1336.

2.3 SPECIAL PIPE COUPLINGS
A. Description: ASTM C 1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

2.4 CLEANOUTS
A. See 33 05 16 – Utility Structures.

2.5 PREFABRICATED COMPOSITE DRAINAGE PANELS
A. Description: Prefabricated composite panels, 36 to 60-inches wide and manufactured with geotextile facing laminated to molded drainage core.

B. Drainage Core: Three-dimensional, non-biodegradable, molded Polypropylene or Polystyrene.
1. Minimum Compressive Strength: 10,000-lbf./sq. ft. when tested according to ASTM D 1621.
2. Minimum Flow Rate: 7 gpm per foot at hydraulic gradient of 0.1 and compressive stress of 25 psig when tested according to ASTM D 4716.

C. Geotextile: Non-woven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with the following properties determined according to AASHTO M 288.
1. Survivability Class: 2.
2. Apparent Opening Size: No. 60 sieve maximum.
3. Permittivity: 0.2 per second, minimum.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Project include, but are not limited to, the following:
1. American Wick Drain Corporation (Matthews, NC).
2. Mirafi Inc. (Charlotte, NC) (Tel. 800-438-1855).
4. Phillips Fibers Corporation (Greenville, SC) (Tel. 800-845-5737).

2.6 DRAINAGE FILL MATERIAL
A. Caltrans Permeable Material: Conform to Section 68-2.02F of Caltrans Standard Specifications.
1. Class 2

B. Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate, Sieve No. 57, with 100 percent passing 1-1/2-inch sieve and not more than 5 percent passing No. 8 sieve.

C. Sand: Conform to Section 19-3.02F of Caltrans Standard Specifications.

2.7 FILTER FABRIC
A. When required, use filter fabric for encasing permeable material around subdrains.
2. Mirafi 140N (Mirafi Inc., Charlotte, NC) (Tel. 800-438-1855) or equal.
PART 3 EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

B. Install only after unsatisfactory conditions have been corrected.

3.2 PIPING APPLICATIONS

A. Refer to Plans for location, size, and material designation for individual subdrains.

3.3 INSTALLATION OF PERFORATED PORTIONS OF SUBDRAINS

A. Excavation: Section 6 of ASTM D 2321 and as indicated.

B. Subdrain Bedding: Place supporting layer of drainage fill over compacted subgrade to compacted depth indicated. If drainage fill requires encasement in filter fabric, lay filter fabric in trench and overlap trench sides before installing drainage fill.

C. Piping Installation: Install pipe in accordance with Section 7 of ASTM D 2321. Install piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert. Excavate recesses for bottoms of bell ends of pipe. Lay pipe with bells facing upslope and with spigot end centered fully into adjacent bell. Bed piping with full pipe bearing in drainage fill material. Lay perforated pipe with perforations down. Install gaskets, seals, sleeves, and couplings in accordance with manufacturers written instructions. Use increasers, reducers, and couplings made for different sizes of materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

D. Initial Subdrain Backfill: After installing drainage piping, add drainage fill up to top of pipe to perform tests.

E. Testing Subdrain: After installing drainage fill to top of pipe, test drain piping with water to ensure free flow before backfilling with drainage fill. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

F. Subsequent Subdrain Backfill: After satisfactory testing, cover piping with drainage fill to width and height indicated. Place drainage fill in layers not exceeding 3 inches in loose depth; compact each layer placed. If filter fabric is required complete the filter fabric encasement by bringing fabric to top and closing the encasement.

G. Fill to Grade: Place native fill material over compacted drainage fill to thickness indicated. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish elevations unless otherwise specified on the plans.

3.4 INSTALLATION OF NON-PERFORATED PORTIONS OF SUBDRAINS

A. Conform to Section 31 23 33 – Trenching and Backfilling, and Section 33 46 00 – Storm Drainage Utilities.

3.5 PREFABRICATED COMPOSITE DRAINAGE PANELS

A. Coordinate placement with other drainage materials.

B. Install prefabricated drainage panels in accordance with manufacturer’s instructions.
C. Place perforated drainage pipe at base of footing and attach to composite drainage panels in accordance with the manufacturer’s instructions.

3.6 JOINING PIPE

A. Join ABS and PVC pipe and fittings with elastomeric seals according to ASTM D 2321 or solvent cement.

B. Special pipe couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and that fit both pipe materials and dimensions.

3.7 CLEANING

A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION
CONTRA COSTA COLLEGE
Campus Safety Center
2600 MISSION BELL DRIVE, SAN PABLO, CA 94806

PROJECT NO: 985-0008
DATE: 09-22-2017

CALGREEN CHECKLIST

FILE NO. T-4

ARCHITECT'S STAMP
APPROVAL

CONSULTANT

CONSULTANT

PROJECT NO: 985-0008
DATE: 09-22-2017

SHRINT NO:

A0.52
CONTRA COSTA COLLEGE
C-4001 CAMPUS SAFETY CENTER
2600 MISSION BELL DRIVE
SAN PABLO, CA 94806

NOTE:
REFER TO ELECTRICAL PLANS GATE MOTOR INFORMATION.
ALL WELDS TO BE CONTINUOUS AND GROUND SMOOTH.
ALL METAL SURFACES TO GALVANIZED.
WELD TO BE PAINTED W/ TWO COATS OF ZINC PAINT

NOTE:
ARROW DIMENSION APPROX.

SITE DETAILS
1/4" = 1'-0"

PARKING DIRECTIONAL ARROWS STENCIL
STENCIL IN WHITE
12" WIDE WHITE STRIPE

CHAIN LINK VEHICLE GATE
3" HF40 POST W/ GUIDES
(2)
3" HF40 POST W/ GUIDES

SCALE: 1/4" = 1'-0"

REFERENCES
985-0008_A111

ARCHITECT'S STAMP
CONSULTANT
A1.12

NOTE:
"NO CLIMB" MESH, TYP.
PLANT SCHEDULE

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CONTRA COSTA COLLEGE
C-4001 CAMPUS SAFETY CENTER

LANDSCAPE PLAN

PLANT SCHEDULE

1. NUMERICAL PLANT QUANTITIES ARE FOR INFORMATION ONLY. IN CASE OF DISCREPANCY, VERIFY FROM PLAN.
2. AMENDMENTS.
3. IMPORTED TOPSOIL SHALL BE TESTED BY AN APPROVED SOIL TESTING SERVICE, AND TOPSOIL SHALL BE AMENDED PER THE LANDSCAPE NOTES.
4. CONTACT COMMON GROUND ALLIANCE (C.G.A.) @ 811. CALL AT LEAST 48 HOURS PRIOR TO PERFORMING EXCAVATION. CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UNDERGROUND UTILITIES AND STRUCTURES PRIOR TO ANY EXCAVATION.
5. IMPORTED TOPSOIL SHALL BE TESTED IN THE FIELD AND TOPSOIL SHALL BE AMENDED PER THE LANDSCAPE NOTES.
6. SOIL CONDITIONS CAUSING THE RETENTION OF WATER IN PLANTING PITS FOR MORE THAN 2 HOURS SHALL BE CORRECTED PRIOR TO PLANTING TO PROVIDE POSITIVE DRAINAGE, AT NO ADDITIONAL COST TO THE OWNER.
7. CONTRACTOR SHALL SECURE PLANT MATERIALS AS SPECIFIED IMMEDIATELY UPON BID AWARD. IF PLANT MATERIALS ARE NOT IMPORTED TOPSOIL SHALL BE REMOVE FROM LANDSCAPE PLANTERS AND PROPERLY DISPOSED OFF-SITE. IMPORTED TOPSOIL IS AMENDED PER THE LANDSCAPE NOTES.
8. MILL TREATED SOIL SHALL BE REMOVED FROM LANDSCAPE PLANTERS AND PROPERLY DISPOSED OF OFF-SITE. IMPORTED TOPSOIL IS AMENDED PER THE LANDSCAPE NOTES.
9. TREE LOCATIONS MAY BE ADJUSTED IN THE FIELD BY THE LANDSCAPE ARCHITECT TO SUIT SITE REQUIREMENTS.
10. TREE TO BE EXCAVATED TO A DEPTH OF 24" OR TO THE DEPTH REQUIRED TO REMOVE LIME TREATED SOIL.
11. ALL PLANT MATERIALS SHALL COMPLY WITH SPECIFICATIONS OF ANSI Z60.1 "STANDARD FOR NURSERY STOCK"
12. PLANT SCHEDULE Shall refer to planting details and specifications for more information.

NOT A PART - SCOPE OF WORK UNLESS SOFTWATER PROJECT

LANDSCAPE NOTES

1. REFER TO PLANTING DETAILS AND SPECIFICATIONS FOR MORE INFORMATION.
2. PLANTERS SHALL BE BACKFILLED WITH APPROVED TOPSOIL. REFER TO SPECIFICATION FOR AMENDING OF TOPSOIL.
3. BARK MULCH, TYP. AT 4" THICK, TO BE INSTALLED AT THE BASE OF ALL SHRUBS. REFER TO SPECIFICATION FOR AMENDING OF TOPSOIL.
4. SOIL CONDITIONS CAUSING THE RETENTION OF WATER IN PLANTING PITS FOR MORE THAN 2 HOURS SHALL BE CORRECTED PRIOR TO PLANTING TO PROVIDE POSITIVE DRAINAGE, AT NO ADDITIONAL COST TO THE OWNER.
5. TOP DRESS ALL SHRUB AND GROUNDCOVER AREAS, (NOT LAWN) WITH A 3" LAYER OF GORILLA HAIR TYPE SHREDDED MULCH.
6. PLANTING TO PROVIDE POSITIVE DRAINAGE, AT NO ADDITIONAL COST TO THE OWNER.
7. CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UNDERGROUND UTILITIES AND STRUCTURES PRIOR TO ANY EXCAVATION.
8. CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UNDERGROUND UTILITIES AND STRUCTURES PRIOR TO ANY EXCAVATION.
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12. CONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UNDERGROUND UTILITIES AND STRUCTURES PRIOR TO ANY EXCAVATION.

PROJECT NO: 985-0008
DATE: 11/16/2017

SCALe: 1" = 10'-0"
CONTRA COSTA COLLEGE
C-4001 CAMPUS SAFETY CENTER
2600 MISSION BELL DRIVE
SAN PABLO, CA 94806

LANDSCAPE DETAILS
PROJECT NO. 500-5004
DATE: 11.15.2017

1. SET ROOT CROWN 1" ABOVE GRADE

2. AMENDED PLANTING SOIL

3. GROUND COVER PLANT

4. TREE PLANTING

5. GROUND COVER PLANT SPACING

6. SHRUB PLANTING

1/2" = 1'-0"
The Contractor shall provide adequate irrigation to all minimum size shall be 1 1/2". Additional irrigation equipment to provide required coverage to sustain health plant growth. Additional notes for layout of dripperline.

Pipe shall be minimum of 3/4" pipe size. The only allowed pipe size is Commercial/Municipal Use. Globe Configuration, with NPT Threaded Inlet/Outlet, for Hunter ICV-G 1" system. Pressure Regulation: 40psi. Flow Range: 2 GPM to 20 GPM.

Drip control zone kit. 1" ICV globe valve with 1" HY100 filter. 36" long RZWS with installed .25gpm bubblers, 1/2" swing joint. Provide ethernet connection in 1" conduit from controller to electrical POC shown on sheet E1.1. Provide stub out for future connections. Controller with 2-wire and 200-station capacity. Mounted on controller panel with control panel.

Drip pipe shown as a schematic on plans. Refer to details 11. Stake out each remote control valve and isolation valve shown on the installation details. Install all quick coupler valve number.

AFTER PIPE IS INSTALLED, CONTRACTOR TO FLUSH MAINLINE AND LATERAL IRRIGATION CLEAR OF SUBSURFACE DRIPPERLINE. Management to flush mainline and lateral irrigation clear of shrub or ground cover areas where possible.

SUBSURFACE DRIPPERLINE for shrub areas shall have a minimum 3" size as mainline pipe diameter at valve location. Size range as mainline pipe diameter at valve location. Size Range - 1/2" to 2". Maximum length of run shall not exceed manufacturer's maximum length of run shall not exceed manufacturer's maximum length of run. Maximum length of run shall not exceed manufacturer's maximum length of run. Maximum length of run shall not exceed manufacturer's maximum length of run. Maximum length of run shall not exceed manufacturer's maximum length of run.

Subsurface drip system is designed to meet a minimum flush flow velocity. The only allowed pipe size is size range as mainline pipe diameter at valve location. Size Range - 1/2" to 2". Maximum length of run shall not exceed manufacturer's maximum length of run.

Applies bark mulch over entire planter bed per planting plan. After dripperline is backfilled and coverage test is approved, any field changes deemed necessary by the owner. Any field changes deemed necessary by the owner.

The contractor shall verify the locations of all existing utilities, structures, and services before commencing work. The contractor shall verify the locations of all existing utilities, structures, and services before commencing work. The contractor shall verify the locations of all existing utilities, structures, and services before commencing work.

Consultant, Office of Regulation Services, Div. of the State Architect, File No. 7-C1, Identification Stamp.

The plans are approximate only. Any discrepancies between these plans are approximate only. Any discrepancies between these plans are approximate only. Any discrepancies between these plans are approximate only.
GENERAL NOTES:
1. FIELD VERIFY UG ROUTES PRIOR TO DIGGING. CALL 811 TWO DAYS IN ADVANCE TO DETERMINE UTILITY AND SIGNAL RUNS.
2. HAND DIG AT AREAS WHERE MULTIPLE LINES ARE IN CLOSE PROXIMITY AND OR CROSSING EACH OTHER.
3. SECURE AS BUILT DRAWINGS FROM THE CONTRACTOR FOR REFERENCE.
4. ALL CONCRETE PULL BOXES ARE TRAFFIC RATED, TYPICAL, UNLESS NOTED OTHERWISE. COMPLETE WITH EXTENSION AND COVER AS SHOWN.
5. ELECTRICAL - FOR POWER
6. FIRE ALARM - FOR FIRE ALARM
7. TELECOMMUNICATION - FOR TELEPHONE/DATA RUN
8. USE UTILITY LINES SHOWN AS LIGHT LINES INDICATE EXISTING TO REMAIN UG.

SITE PLAN

CONTRA COSTA COLLEGE
C-4001 CAMPUS SAFETY CENTER
2600 MISSION BELL DRIVE
SAN PABLO, CA 94806

985-0008

CONSULTANT NO.
ISSUE DATE

CONSULTANT'S STAMP
APPROVAL

CONSULTANT

11.15.2017

FIELD VERIFY UG ROUTES PRIOR TO DIGGING. CALL 811 TWO DAYS IN ADVANCE TO DETERMINE UTILITY AND SIGNAL RUNS.

HAND DIG AT AREAS WHERE MULTIPLE LINES ARE IN CLOSE PROXIMITY AND OR CROSSING EACH OTHER.

SECURE AS BUILT DRAWINGS FROM THE CONTRACTOR FOR REFERENCE.

ALL CONCRETE PULL BOXES ARE TRAFFIC RATED, TYPICAL, UNLESS NOTED OTHERWISE. COMPLETE WITH EXTENSION AND COVER AS SHOWN.

ELECTRICAL - FOR POWER

FIRE ALARM - FOR FIRE ALARM

TELECOMMUNICATION - FOR TELEPHONE/DATA RUN

USE UTILITY LINES SHOWN AS LIGHT LINES INDICATE EXISTING TO REMAIN UG.
GENERAL NOTES:

1. Field verify location of Bldg equipment with the modular building installer prior to rough-ins.
2. Interior work related to electrical, other than shown on plans, is considered_connexion, fire alarms and signaling equipment is by others.
3. Drawings are diagrammatic and not necessarily drawn to scale. Do not scale electrical drawings.
4. Provide fire seal for all pipe penetrations.
5. All equipment shown are NEMA 1 rated typical unless noted otherwise.
6. Provide transition fittings for UG feeder run from PVC Schedule 40 conduit to rigid galvanized steel, PVC coated, grounding as required. Provide 2-3 cubic feet of concrete envelope at transition fitting below ground.
7. Provide code required clearances of equipment.
8. Provide fire alarm controls panel "OFF".

CONTRA COSTA COLLEGE
C-4001 CAMPUS SAFETY CENTER
2600 MISSION BELL DRIVE
SAN PABLO, CA 94806

1/4" = 1'-0"
### BLEED LISTS OF EQUIPMENT

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

### BLEED LECTURING NOTES

- Ensure all wires are securely fastened to avoid damage.
- Check all connections for proper polarity.
- Verify that all equipment is operational.
- Confirm that all labels are clearly visible.

### BLEED ADVANCEMENTS

- Implement all safety protocols.
- Monitor system performance regularly.
- Coordinate with the project manager.

### BLEED SYSTEM SPECIFICATION

- This system is designed for high security.
- Regular maintenance is required.
- Compliance with local regulations is mandatory.

### BLEED APPLICATION CODES

- CA: California
- 01: Building Code
- 11: Electrical Code
- 69: Fire Protection

### SYSTEM LOCATION MAP

- Map showing the system's layout.
- Marked with critical points of interest.
- Annotations for ease of navigation.

---

**CONTRA COSTA COLLEGE**

C-4001 CAMPUS SAFETY CENTER
2600 MISSION BELL DRIVE
SAN PABLO, CA 94806

**CONSULTANT NO.**

**ISSUE DATE**

**CONTRA COSTA COLLEGE**

C-4001 CAMPUS SAFETY CENTER
2600 MISSION BELL DRIVE
SAN PABLO, CA 94806

**CONSULTANT NO.**

**ISSUE DATE**

**FA NOTES, SYMBOLS & EQUIP. LIST**

**PRODUCT NO.**

**DATE:** 11/15/2017

**DESCRIPTION:**

- System layout.
- Equipment list.
- Installation notes.
1. Field verify exact routing of new trench line from existing security line.

2. Data network between existing panels are to be done as directed by the campus bid fire alarm contractor. Coordinate as required.

3. Interior work related to fire alarm is to be done by the contractor who shall be responsible for fire alarm as the final electrical contractor.

4. Signage and design work is not necessarily drawn to scale. Do not scale electrical drawings.

5. Provide fire seal for all pipe penetrations.


7. Underground lines shown as light lines indicate existing to remain, typ. loc.

---

FIRE ALARM
SITE PLAN

CONSULTANT: ECONOMIES
CANYON CONSULTING ENGINEERS
3318 Hiltop Way - Ste 18
Richmond, CA 94804

CONSULTANT'S STAMP
APPROVAL

CONSULTANT NO.
ISSUE
DATE

FILE NO.
PROJECT NO.
DATE

985-0008
C-4001 CAMPUS SAFETY CENTER
2600 MISSION BELL DRIVE
SAN PABLO, CA 94806

11/15/2017
11.15.2017

N. = 1/16" = 1'-0"

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### TECHNOLOGY SYSTEMS PATHWAY SERVICES ROUGH-IN SCHEDULE

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>ATTACHMENT</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>4</td>
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</table>

### TELECOMMUNICATIONS CABLE SCHEDUING

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>ATTRIBUTE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
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<tr>
<td>C</td>
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</table>

### CABLE SERVICE TYPES AND TERMINATIONS

<table>
<thead>
<tr>
<th>DESCRIPTOR</th>
<th>CABLE TYPE</th>
<th>CONDUCTORS</th>
<th>NEC</th>
<th>TERMINATION TYPE AT EQUIPMENT ROOM</th>
<th>TERMINATION TYPE AT USER SPACE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
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<td>B</td>
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</tbody>
</table>

### CONNECTING MEDIA TYPES

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>DATA CABLE</th>
<th>VOICE CABLE</th>
<th>VIDEO CABLE</th>
<th>LENGTH (FY)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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### NOTES

- Not for construction.
- All cables must be securely fastened to the building structure using approved hardware.
- Telecommunication equipment must be installed in accordance with local codes and regulations.
- All cabling must be labeled and documented for easy access and maintenance.
- Regular maintenance checks should be conducted to ensure the integrity of the cabling system.
TOILET PARTITION

GENERAL NOTES

ACCESSORY SCHEDULE

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TOILET PAPER DISPENSER: SCOTT GREE BACK JUMBO ROLL TISSUE DISPENSER</td>
</tr>
<tr>
<td>2</td>
<td>COMBINATION TOILET/SINK: ACORN #1449</td>
</tr>
<tr>
<td>3</td>
<td>GLASS MIRROR: BOBRICK #165 2460</td>
</tr>
<tr>
<td>4</td>
<td>GRAB BAR: BOBRICK #6806 x 42&quot; OR APPROVED EQUAL, SEE DETAIL 1/A-2.20</td>
</tr>
<tr>
<td>5</td>
<td>GRAB BAR: BOBRICK #6806 x 48&quot; OR APPROVED EQUAL, SEE DETAIL 1/A-2.20</td>
</tr>
<tr>
<td>6</td>
<td>SURFACE MOUNTED SOAP DISPENSER: KIMBERLY CLARK PROFESSIONAL</td>
</tr>
<tr>
<td>7</td>
<td>SURFACE MOUNTED SOAP DISPENSER: PROVIDED BY OWNER</td>
</tr>
</tbody>
</table>

SYMBOL LEGEND:
- Symbol 1: Toilet Paper Dispenser
- Symbol 2: Combination Toilet/Sink
- Symbol 3: Glass Mirror
- Symbol 4: Grab Bar
- Symbol 5: Grab Bar
- Symbol 6: Surface Mounted Soap Dispenser
- Symbol 7: Surface Mounted Soap Dispenser
### PLUMBING ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOP</td>
<td>Back of Pan</td>
</tr>
<tr>
<td>BVP</td>
<td>Bell Valve Post</td>
</tr>
<tr>
<td>CAA</td>
<td>Connection Above</td>
</tr>
</tbody>
</table>
NOTE:
ALL PLUMBING FIXTURES SHALL MEET 2016 CALGREEN MANDATORY MEASURES. MAXIMUM FLOW RATE AT 20% REDUCTION PER TABLE 5.303.2.3.