



PROJECT MANUAL
INCLUDING SPECIFICATIONS

FOR

**Adelante Academy Temporary Portable
Classroom**

2999 Ridgemont Dr, San Jose, CA 95127

Client Project Number: TBD

ARCHITECT

SVA ARCHITECTS

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SVA Project Number: 2023-40122

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SECTION 00 00 01

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ARCHITECTURAL



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ELECTRICAL

SECTION 00 01 10

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**PROJECT MANUAL
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SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Project consists of construction of the **Adelante Academy Temporary Portable Classroom** project located at 2999 Ridgmont Dr, San Jose, CA 95127, as indicated in Contract Documents.
 - 1. Owner reserves right to remove and retain possession of existing items prior to start of Contract.
 - 2. Removal of hazardous material shall be per separately provided hazardous material abatement report prepared by others. Architect shall not be involved in determination, removal or disposal of hazardous materials.

1.2 REQUIREMENTS INCLUDED

- A. This section includes administrative provisions:
 - 1. Work sequence.
 - 2. Contractors use of premises.
 - 3. Field engineering.
 - 4. Regulatory requirements and reference standards.
 - 5. Owner furnished Contractor installed products (OFCI).
 - 6. Owner pre-ordered products.

1.3 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Owner and Architect.
- B. Perform construction in phases as indicated.

1.4 CONTRACTORS USE OF PREMISES

- A. Limit use of premises for Work and construction operations and to allow for work by other contractors.
- B. Coordinate use of premises and access to site under direction of Owner and Architect.

1.5 FIELD ENGINEERING

- A. Provide field engineering services; establish lines and levels by use of recognized engineering survey practices.
- B. Locate and protect control and reference points.

1.6 REGULATORY REQUIREMENTS AND REFERENCE STANDARDS

A. Regulatory Requirements:

1. Architect has contacted governing authorities and reviewed design requirements of local, state and federal agencies for applicability to Project.
2. Contractor shall be responsible for contacting governing authorities directly for necessary information and decisions bearing upon performance of Work.

B. Reference Standards:

1. For Products specified by association or trade standards, comply with requirements of referenced standard, except when more rigid requirements are specified or are required by applicable codes.
2. Applicable date of each standard is that in effect as of date on proposal or date on Contract where no proposal is available, except when a specific date is specified.

1.7 OWNER FURNISHED CONTRACTOR INSTALLED PRODUCTS (OFICI

A. Select products are to be furnished and paid for by Owner and installed by Contractor:

1. Refer to Drawings and Specifications.

B. Owner's Responsibilities:

1. Arrange for and deliver shop drawings, product data, and samples to Contractor.
2. Arrange and pay for product delivery to site.
3. Inspect products jointly with Contractor on delivery.
4. Submit claims for transportation damage.
5. Arrange for replacement of damaged, defective, or missing items.
6. Arrange for manufacturer's warranties, inspections, and service.

C. Contractor's Responsibilities:

1. Review shop drawings, product data, and samples.
2. Receive and unload products at site.
3. Inspect jointly with Owner for completeness and damage.
4. Handle, store, and install products.
5. Finish products as required after installation.
6. Repair or replace items damaged by Work of this Contract.

1.8 OWNER PRE-ORDERED PRODUCTS

A. Select products have been pre-ordered by Owner:

1. Refer to Drawings.

- B. Owner has negotiated purchase orders for these products for incorporation into Project.
 - 1. Purchase orders are assigned to Contractor; costs shall be included into base bid.
 - 2. Contractor's responsibilities are same as if Contractor negotiated purchase orders.

END OF SECTION

SECTION 01 20 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Special administrative and procedural requirements necessary to prepare and process Application for Payment.

1.2 SCHEDULE OF VALUE

- A. Coordination: Coordinate preparation of Schedule of Values with preparation of Contractor's Construction Schedule.
1. Correlate line items in Schedule of Values with other required administrative forms and schedules, including application for Payment forms with Continuation Sheets, Submittals Schedule, and Contractor's Construction Schedule.
 2. Submit Schedule of Values to Architect at earliest possible date but no later than seven days before date scheduled for submittal of initial Application for Payment.
- B. Format and Content: Use Project Manual table of contents as guide to establish line items for Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: Include following Project identification on Schedule of Values.
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's Project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Submit draft of AIA Document G703 Continuation Sheets.
 3. Provide breakdown of Contract Sum in enough detail to facilitate continued evaluation of Application for Payment and progress reports. Coordinate with Project Manual table of contents.
 - a. Provide several line items for principal subcontract amounts where appropriate.
 4. Round amounts to nearest whole dollar; total shall equal Contract Sum.
 5. Provide separate line item in Schedule of Values for each part of Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

6. Provide separate line items in Schedule of Value for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of Work.
7. Each item in Schedule of Values and Application for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in Schedule of Values or distributed as general overhead expense at Contractor's option.
8. Schedule Updating: Update and resubmit Schedule of Values before next application for Payment when Change Orders or Construction Change Directives result in a change in Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment: Application for Payment at time of Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Date for each progress payment is indicated in Agreement between Owner and Contractor. Period of construction Work covered by each Application for Payment is period indicated in Agreement.
- C. Payment Application Forms: AIA Document G702 and AIA Document G703 Continuation Sheets as form for Application for Payment.

USE FOLLOWING FOR LEED CERTIFIED PROJECTS.

1. LEED Progress Reports: With each application for payment, submit LEED action plans as specified in Section 01 35 10.
- D. Application Preparation: Complete every entry on form. Execute by person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal:
 1. Contractor shall provide ten copies of Application for Payment one week prior to Payment Request ("Draw") Meeting, for review of team members.

2. Contractor shall provide ten wet signed copies of Application for Payment at Payment Request ("Draw") Meeting.
 - a. Provide each copy with transmittal form listing attachments and recording appropriate information about application.
 - b. Copies shall include waivers of lien and similar attachments if required.
- F. Waivers of Mechanic's Lien: With each Application for Payment submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of Contract and related to Work covered by payment.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves right to designate which entities involved in Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms executed in manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following.
 1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittals Schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.

- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted including but not necessarily limited to following.
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement accounting for final changes to Contract Sum.
 4. AIA Document G706, Contractor's Affidavit of Payment of Debts and Claims.
 5. AIA Document G706A, Contractor's Affidavit of Release of Liens.
 6. AIA Document G707, Consent of Surety to Final Payment.
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Completion.
 9. Final liquidated damages settlement statement.

USE FOLLOWING FOR LEED CERTIFIED PROJECTS.

10. LEED Final Reports: Submit complete set of LEED Reports as required for submittal to USGBC and as specified in Section 01 35 10.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. General: Procedures are described for requesting substitution of unlisted materials in lieu of materials named in Specifications or approved for use in addenda.
 - 1. Provide products listed in Contract Documents, products by manufacturers listed in Contract Documents, and products meeting specified requirements.
 - a. Contract Amount: Base on materials and products included in Contract Documents.
 - b. Where materials and products are listed in Contract Documents, materials and products by manufacturers not listed shall not be used without Owner's and Architect's approval of Contractor's written request for substitution.
 - 2. Purpose: After bidding, substitutions will only be considered where Owner will receive benefit or because specified materials are no longer available due to no fault of Contractor.
 - 3. Purpose: Substitutions will only be considered where Owner will receive benefit or because specified materials are no longer available due to conditions beyond Contractor control.
 - a. Owner benefits either from a Contractor proposed reduction of the Contract amount or from a reduction in Contract time based on acceptance of proposed substitution.
 - b. List proposed cost or time reductions on request for substitution.
 - c. Requests not including a proposed cost or time reduction will not be considered unless Contractor submits supporting information indicating specified materials are not available.
- B. Related Sections:
 - 1. Section 01 60 00: Product requirements.

1.2 SUBSTITUTIONS

- A. Within a period of 35 days after award of Contract, Owner and Architect will consider formal requests for substitutions only from Contractor as specified in 1.1 Summary.
 - 1. Owner and Architect will consider only one request for substitution for each material; where requests are denied Contractor shall be required to provide specified materials.

2. After initial 35-day period, requests will be considered only when a product becomes unavailable through no fault of Contractor; more than one request for substitution will be considered if necessary.
- B. Prior to submittal of second Request for Payment Owner and Architect will consider formal requests for substitutions from Contractor as specified in 1.1 Summary.
1. Owner and Architect will consider only one request for substitution for each material; where requests are denied Contractor shall be required to provide specified materials.
 2. After payments begin, requests will be considered only when a product becomes unavailable through no fault of Contractor; more than one request for substitution will be considered if necessary.
- C. Submit each request with sequentially numbered "Substitution Request Transmittal" acceptable to Owner and Architect; submit separate request for each product and support each request with:
1. Product identification with manufacturer's literature and samples where applicable.
 2. Name and address of similar projects on which product has been used, and date of installation.
- D. Submit itemized comparison of proposed substitution with product specified and list significant variations.
- E. Submit data relating to changes in construction schedule.
- F. Note effect of substitution on other work, products, or separate contracts.
1. Note if acceptance of substitution could require revision of Contract Documents, Drawings, details or Specifications.
- G. Include accurate cost data comparing proposed substitution with product and amount of net change in Contract price.
1. Include costs to other contractors and costs for revisions to Drawings, details or Specifications.
- H. Substitutions will not be considered for acceptance when:
1. They are indicated or implied on submittals without a formal request from Contractor.
 2. They are requested directly by a subcontractor or supplier.
 3. Acceptance will require substantial revision of Contract Documents.
- I. Substitute products shall not be ordered without written acceptance of Owner and Architect.

- J. Owner and Architect will determine acceptability of proposed substitutions and reserves right to reject proposals due to insufficient information.

1.3 CONTRACTOR'S REPRESENTATION

- A. Requests constitute a representation that Contractor:
 - 1. Has investigated proposed product and determined it meets or exceeds, in all respects, specified product.
 - 2. Will provide same warranty or longer warranty for substitution as for specified product.
 - 3. Will coordinate installation and make other changes that may be required for Work to be complete in all respects.
 - 4. Waives claims for additional costs that subsequently become apparent.
 - 5. Will pay costs of changes to Contract Documents, Drawings, details and Specifications required by accepted substitutions.

1.4 ARCHITECT'S DUTIES

- A. Review Contractor's requests for substitutions with reasonable promptness.
 - 1. Architect will recommend that Owner accept or reject substitution request.
 - 2. Upon request, Architect will provide cost for changes to Contract Documents, Drawings, details and Specifications required for substitutions.
- B. Notify Contractor in writing of decision to accept or reject requested substitution.

CONTRACTOR'S SUBSTITUTION REQUEST

(Use separate form for each request)

Date: _____ Request No.: _____

TO: **Architect** _____
Phone: _____ Fax: _____

PROJECT: _____ Project No.: _____
CONTRACTOR _____

SPECIFIED ITEM: _____
Section: _____ Page: _____ Paragraph: _____ Description: _____
Drawing Number(s): _____ Detail Number(s): _____

The undersigned request consideration of the following:

PROPOSED SUBSTITUTION: _____

REASON FOR NOT GIVING PRIORITY TO SPECIFIED ITEMS: _____

SAVINGS or CREDIT to OWNER for ACCEPTING SUBSTITUTE: \$ _____
PROJECT COMPLETION CHANGE for ACCEPTING SUBSTITUTE Days _____

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

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

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

1. Proposed substitution has been fully checked and coordinated with the Contract Documents.
2. The proposed substitution does not affect dimensions shown on Drawings.
3. The proposed substitution does not require revisions to mechanical or electrical work.
4. The undersigned will pay for changes to the building design, including architectural and engineering design, detailing, and construction costs caused by the requested substitution.
5. The proposed substitution will have no adverse effect on other trades, construction schedule, or warranty.
6. Maintenance and service parts will be locally available for the proposed substitution.
7. The proposed substitution will have no adverse effect on LEED credits (applies to LEED Projects ONLY)
8. The proposed substitution will have no adverse effect on Green Building Requirements where applicable.

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

Attachments: The attached data is furnished herewith for evaluation of the proposed substitution.

Catalog Drawings Samples Reports Tests Other: _____

Submitted by: _____

(Firm) (Authorized Legal Signature)

(Address) (Telephone)

For use by the Architect: Accepted Accepted as Noted Rejected: Submit Specified Item

BY: _____
(Authorized Signature)

Date: _____ Remarks: _____

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: This section specifies administrative and procedural requirements governing Contract modification procedures.
 - 1. Requests for Information (RFI).
 - 2. Change Order.
 - 3. Allowances.
 - 4. Construction Change Directive.
- B. Related Requirements:
 - 1. Section 01 25 00: Substitution procedures.
 - 2. Section 01 30 00: Administrative requirements.

1.2 MINOR CHANGES IN WORK

- A. Architect will issue supplemental instructions authorizing minor changes in Work, not involving adjustment to Contract Sum or Contract Time, on AIA Form G710, Architect's Supplemental Instructions or similar form.

1.3 REQUESTS FOR INFORMATION

- A. Contractor may submit a written Request for Information (RFI) in format approved by Architect relating to perceived inconsistencies and omissions in Contract Documents.
 - 1. A record of RFI's is to be maintained by Contractor along with information regarding origin of request, date of request, and date request was received from Architect. Number RFI's sequentially based on date of request.
- B. Requests for Information shall be used only as a means of obtaining clarification of information not included in Contract Documents and shall not be used to assist Contractor in preparation of shop drawings or other information required by Contract.
 - 1. Contract Documents are intended to contain enough information to show aesthetic and design intent and to provide information such that construction procedures (means and methods) may be reasonably inferred.
 - 2. Contract Documents are not intended to provide specific information related to means and methods of construction nor are they intended to be exhaustive in content.
- C. Contractor shall carefully review requests for information by subcontractors and suppliers to ascertain if information is in Contract Documents prior to submitting a Request for Information to Architect based on requests by others.
 - 1. Contractor may suggest possible solutions to fit Project conditions where appropriate.

D. Architect reserves right to return RFI's that do not reasonably relate to necessary clarification of intent of Contract Documents and to charge Contractor for time and materials involved in answering RFI's where information is in Contract Documents.

1. RFI's shall not be used as a request for substitutions; refer to Section 01 25 00 – Substitution Procedures.

1.4 CHANGE ORDERS

A. Owner-Initiated Proposal Requests: Architect will issue detailed description of proposed changes in Work that require adjustment to Contract Sum or Contract Time. If necessary, description will include supplemental or revised Drawings and Specifications.

1. Proposal requests issued by Architect are for information only. Do not consider change order proposal requests as instruction either to stop work in progress or to execute proposed change.
2. Within 10 days of receipt of a proposal request, submit estimate of cost necessary to execute change to Architect for Owner's review.
 - a. Include list of quantities of products required and unit costs, with total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental and amounts of trade discounts.
 - c. Include a statement indicating effect of proposed change in Work will have on Contract Time.

B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to Contract, Contractor may propose changes by submitting a request for a change to Architect and Owner.

1. Include statement of reasons for change and effect of change on Work. Provide a complete description of proposed change. Indicate effect of proposed change on Contract Sum and Contract Time.
2. Include a list of quantities of products required and unit costs with total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental and amounts of trade discounts.
4. Comply with requirements in Section 01 25 00 - Substitution Procedures if proposed change requires substitution of unspecified product or system for specified product or system.

C. Proposal Request Form: Use AIA Document G709 for Change Order Proposal Requests; other substitute formats shall be submitted to Owner and Architect for approval prior to use.

- D. Change Order Procedures: Contractor shall be directed to proceed with Work upon Owner's approval of Proposal.
 - 1. Architect will issue Change Order for signatures of Owner and Contractor on AIA Form G701 or similar form, including approved Change Order proposals for that time period.
 - 2. Amounts of each Change Order shall be indicated in each Request for Payment including payment status for each individual Change Order.

1.5 ALLOWANCES

- A. Allowance Adjustment: For Contract items bid based on allowance, submit Change Order Proposal on difference between actual purchase amount and allowance, based on work-in-place.
 - 1. Include installation cost in purchase amount only where indicated as part of allowance.
 - 2. When requested, prepare explanations and documentation to substantiate amounts claimed for work done based on allowances.
 - 3. Submit substantiation of a change in Scope of work claimed in Change Orders related to allowances.
 - 4. Owner reserves right to establish actual quantity of work-in-place by independent quantity survey, measure or count.
- B. Submit claims for increase costs because of a change in scope or nature of allowance described in Contract Documents, whether for purchase order amount or Contractor's handling, labor, installation, overhead and profit.
 - 1. Submit claims within 21 days of receipt of Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than 21 days.
 - 2. Do not include Contractor's or subcontractor's indirect expense in Change Order cost amount unless it is clearly shown that nature or extent of work has changed from what could have been foreseen from information in Contract Documents.
 - 3. No change to Contractor's indirect expense is permitted for selection of higher or lower-priced materials or systems of same scope and nature as originally indicated.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When Owner and Contractor disagree on terms of Proposal Request, Architect may issue a Construction Change Directive per AIA Form G714 or similar form.
 - 1. Construction Change Directive instructs Contractor to proceed with change in Work, for subsequent inclusion in Change Order.
 - 2. Construction Change Directive contains a complete description of change in Work. It also designates method to be followed to determine change in Contract Sum or Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of Work required by Construction Change Directive. Coordinate scheduling with Construction Manager to allow monitoring by Owner if desired.
 - 1. After completion of change, submit itemized account and supporting data necessary to substantiate cost and time adjustments to Contract.

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section describes general procedural requirements for ongoing submittals.

1. Schedule of values.
2. Product data and manufacturer's literature.
3. Shop drawings.
4. Samples.
5. Manufacturers' certificates.
6. Excess materials and attic stock.
7. Design build (delegated design) procedures.
8. Deferred approval requirements.

B. Related Requirements:

1. Section 01 31 00: Project management and coordination.
2. Section 01 32 00: Construction Schedule – Network Analysis.
3. Section 01 32 10: Construction Schedule – Bar Chart.
4. Section 01 40 00: Test reports, manufacturer's field reports, and mock-ups.
5. Section 01 70 00: Manufacturers' instructions.
6. Section 01 77 00: Closeout requirements including Project Record Documents.
7. Section 01 78 00: Warranties.

1.2 GENERAL SUBMITTAL PROCEDURES

A. Submittals: Transmit each item using form approved by Architect; submit sample to Architect for approval prior to use.

1. Identify Project, Contractor, subcontractor, major supplier.
 - a. Attach sequential identification number for each new submittal.
 - b. Identify each resubmittal using original submittal number and sequential identification clearly indicating item is resubmitted.
2. Identify pertinent Drawing sheet and detail number, and Specification section number as appropriate.
3. Identify deviations from Contract Documents.
4. Provide space for Contractor and Architect review stamps.

5. Contractor: Review and stamp submittals from subcontractors prior to submitting to Architect.
 - a. Review submittals and indicate where conflicts occur with Contract Documents and with work of other subcontractors.
 - b. Return submittals that vary significantly from Contract Documents for correction and resubmittal prior to submitting to Architect.
 - c. Submittals that vary significantly from Contract Documents and that fail to indicate thorough Contractor review prior to submission to Architect will be returned without review.
 - d. Cursory review and stamping of subcontractor submittal by Contractor shall not be acceptable.
- B. Initial Schedules: Submit initial progress schedule and schedule of value in duplicate within 15 working days after award of Contract.
 1. After review by Owner and Architect revise and resubmit where required.
- C. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.
- D. After Architect review of submittal, revise and resubmit as required, identify changes made since previous submittal.
- E. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply.

1.3 TYPES OF SUBMITTALS

- A. General: Project requires various types of submittals to maintain communications, minimize misunderstandings, avoid unnecessary conflicts, and to ensure complete documentation for Project Record Documents.
 1. Maintain complete set of submittals including required revisions.
- B. Construction Schedules: Submit construction progress schedules for Design Team and Owner review and to maintain entire team up-to-date on construction activities.
- C. Schedule of Values: Submit Schedule of Values indicating division of Work, subcontractors to perform work, products being used, and values attributed to each to inform Design Team and Owner.
- D. Action Submittals: Submittals relating to product data and manufacturer's literature, shop drawings, and samples for Design Team review and comment; do not begin fabrication, delivery, or installation until Design Team review is complete.
- E. Information Submittals: Submittals relating to certifications, qualifications, reports, including test reports, and instructions are for information; Design Team may choose to comment but action is not generally anticipated.

1. Manufacturer installation instructions and recommendations shall be considered information submittals.
- F. Design/Build Submittals: Where portion of Work requires design by specialized professionals submit information necessary to ensure work complies with Contract Documents along with certifications signed by qualified professional.
 1. Calculations: Do not submit calculations unless specifically required by Contract Documents; submit calculations required by applicable authorities directly to applicable authorities;
 - a. Submit certification by qualified professional indicating required calculations have been prepared and work conforms to Contract Documents and applicable codes and regulations.
- G. Maintenance Materials Submittals: Compile maintenance information and materials during Work to ensure complete set of documents, maintenance manuals, and operation instructions.
- H. Closeout Submittals: Compile closeout submittals, organize, and submit to Owner prior to or at time of Substantial Completion. Project will not be considered Substantially Complete until closeout submittals have been received by Owner.
- I. Material Safety Data Sheets (MSDS): MSDS will only be reviewed by Architect when submitted to show compliance with LEED certification requirements.
 1. Non-LEED submittals that include material safety data sheets will be returned for resubmittal.

1.4 SCHEDULE OF VALUES

- A. Submit typed schedule on AIA Form G703 or another Owner and Architect pre-approved 8-1/2" by 11" paper format; Contractor's standard media-driven printout will be considered on request. Submit within 15 days after award of Contract.
- B. Format: Table of Contents of this Project Manual, with modifications as pre-approved by Owner and Architect; identify each line item with number and title of major Specification sections.
- C. Include in each line item a directly proportional amount of Contractor overhead and profit.
- D. Revise schedule to list change orders for each Application for Payment.
 1. Submit subschedule for each phase of Work.

1.5 PRODUCT DATA/MANUFACTURERS' LITERATURE

- A. Action Submittals: Mark each copy to identify applicable Products, models, options, and other data; supplement manufacturers' standard data to provide information unique to the Work.

- B. Information Submittals: Include manufacturers' installation instructions only when required by Specifications or specifically requested by Architect.
 - 1. Maintain copy of manufacturer installation instructions and recommendations in Contractor's field office for review.
- C. Product data shall be submitted as electronic PDF files unless otherwise noted or approved by Architect in advance.
 - 1. Where paper copies are permitted submit number of copies Contractor requires, plus one copy to be retained by Architect.
- D. Submit number of copies Contractor requires, plus one copy to be retained by Architect.

1.6 SHOP DRAWINGS

- A. Shop drawings shall be submitted as electronic PDF files unless otherwise noted or approved by Architect in advance.
 - 1. Where prints are permitted submit one reproducible print; minimum sheet size 8-1/2" by 11".
- B. Shop drawings shall be submitted in reproducible format acceptable to Architect and Owner; computerized PDF files will be acceptable unless otherwise directed.
 - 1. Prints: Submit one reproducible print; minimum sheet size 8-1/2" by 11".
 - 2. Prints: Submit three reproducible prints; minimum sheet size 8-1/2" by 11".
- C. Distribution: After review, reproduce and distribute.

1.7 SAMPLES

- A. Submit full range of manufacturers' standard colors, textures, and patterns for Architect's selection.
- B. Submit samples to illustrate functional characteristics of Product, with integral parts and attachment devices.
- C. Coordinate submittal of different categories for interfacing work.
- D. Include identification on each sample, giving full information.
- E. Submit number of samples required by Contractor plus one to be retained by Architect.
 - 1. Maintain one set of approved samples at Project Field Office.

- F. Sizes: Provide following sizes unless otherwise specified.
 - 1. Flat or Sheet Products: Minimum 6" square, maximum 12" by 12".
 - 2. Linear Products: Minimum 6", maximum 12" long.
 - 3. Bulk Products: Minimum one pint, maximum one gallon.
- G. Full size samples may be used in the Work upon approval.

1.8 MANUFACTURERS' CERTIFICATES

- A. Submit certificates, in duplicate in accordance with requirements of each Specification section.

1.9 EXCESS MATERIALS AND ATTIC STOCK

- A. Excess Materials: Excess materials shall be considered property of Owner; inform Owner of extent of excess materials and methods required for handling and storage; remove from site excess materials not required by Owner for maintenance stock.
- B. Attic Stock: Owner may choose to obtain additional attic stock for maintenance purposes where excess materials are not considered adequate.
 - 1. Owner may require as much as 5% extra materials for maintenance purposes. Exact amount of each material shall be determined by Owner based on following meeting and additional costs determined by Contractor.
 - a. Contractor shall be prepared to order up to 5% extra materials on items that may not be readily available in future such as custom colors, off-shore manufacture, anticipated life span under 5 years, and potential for damage.
 - 1) Do not order extra attic stock until extent is determined and agreed to by Owner including which materials require extra stock and exactly how much those materials will cost including shipping and handling.
 - b. Excess Materials: Furnish excess materials only for materials that have a shelf-life of more than three years.
 - 2. Meeting: Conduct meeting prior to beginning Work to discuss extent of materials Owner would like to receive at Project Closeout for attic stock for maintenance materials; where available include personnel from Owner's maintenance crew.
 - a. Estimate amount of excess materials to be anticipated to be ordered in addition to materials for handling and storage and how those materials will be invoiced and identified regarding material and location in Project.
 - b. Determine area necessary for adequate storage, handling, and identifying excess materials and attic stock and discuss with Owner.
 - c. Submit information regarding equipment necessary for handling of excess materials and attic stock due to weight, size, and storage requirements.

- d. Assist Owner in determining where on-site or off-site additional attic stock for maintenance purposes will be delivered and stored.
3. Additional Costs: After meeting submit to Owner detailed listing of additional costs for each material Owner may like to receive for attic stock and assist Owner in modifying listing to determine acceptable final costs.
 - a. Include unit prices for desired attic stock where excess materials are not adequate for Owner maintenance stock.
4. Substantial Completion: Submit Construction Bulletin at Substantial Completion indicating changes to Contract Amount for attic stock including unit price totals for materials where excess materials are not adequate.
5. Final Completion: Ensure attic stock has been received, identified, cataloged, and stored at locations agreed upon with Owner based on Change Order indicating amounts finally agreed to by Owner.

1.10 DESIGN/BUILD PROCEDURES

- A. Design as Part of Means and Methods of Construction: Select Project components require construction team design as part of means and methods of construction as described in various sections.
 1. Terms commonly used such as Design/Build, Delegated Design, and Design/Assist are applicable to these procedures as determined by law but shall be generally referred to in these documents as Design/Build.
 - a. In general Design/Build includes design by licensed professionals with expertise beyond that allowed under standard architectural licensure, and outside of scope of work of other design professionals on the design team.
 2. Contractor may be required to provide design services as part of construction for specific work defined as design or design-build where special expertise is required that is not available in the Project design team.
 3. Subcontractors, fabricators, and manufacturers may be required to provide design services as part of their work due to special expertise in design services for their specific components, refer to technical sections for Design/Build.
 4. Contractor, subcontractors, fabricators, manufacturers, and suppliers shall be responsible for attachments, anchors, fasteners, adhesives, and connectors suitable to applications unless specific items are listed in Contract Documents.
 - a. Where specific items are listed in Contract Documents Contractor, subcontractors, fabricators, manufacturers, and suppliers shall review and submit comments where items listed are not acceptable.
 - b. Where no comments are received, listed items shall be considered acceptable.

- B. Contractor acknowledges and accepts responsibility for specialty design as part of means and methods of construction, as well as coordination of parties involved to achieve architectural design intent indicated in Contract Documents.
 - 1. Design-build work includes sizing, sequencing, and detailing for construction by professional licensed or registered engineer or design professional with special expertise applicable to portion of Work involved.
 - 2. Design-build work shall be constructed in compliance with building codes and regulations in effect and shall be fit and proper for intended use.
 - 3. Design-build work shall include drawings, specifications, and calculations prepared, stamped, and signed by qualified professional licensed or registered engineer licensed in the Project location as appropriate to design-build work.
 - a. Plans, specifications, and calculations shall be acceptable to Owner, Owner's Representative, and applicable authorities.
- C. Where required by Owner Contractor shall submit copies of current insurance policies covering errors and omissions of persons designing design-build work with deductibles and limits per occurrence as mutually agreed by Owner and Contractor.
 - 1. Provide endorsement to insurance providing for 30-day notice to Owner prior to cancellation or material reduction in coverage.
 - 2. Insurance shall be maintained for not less than applicable statute of limitations for claims of latent defects, if such insurance is not written on an occurrence basis during time design-build work is designed and constructed.
- D. Review proposed layouts with Design Team and with various trades prior to commencing work related to design-build work.

1.11 DEFERRED APPROVAL REQUIREMENTS

- A. Installation of deferred approval items shall not be started until detailed plans, specifications, and engineering calculations have been accepted and signed by Architect or Engineer of Record responsible for Project design.
- B. Deferred Approval Items shall be signed by California registered architect or professional engineer delegated responsibility covering specific work shown requiring approval by Division of the State Architect.
 - 1. Deferred approval items for this Project include but may not be limited to following:
 - a. Translucent Walls and Roofs – Section 08 45 00.
 - b. Telescopic Bleachers – Section 12 66 01.
 - c. Grandstands – Section 13 34 16.
 - d. Hydraulic Elevators – Section 14 24 00.

2. Deferred approval drawings and specifications become part of the approved submittal documents for the Project when they are submitted to and approved by Division of the State Architect.
3. Submit four prints of each drawing. Drawings shall include empty 7" by 9" space on first sheet reserved for Architect to add "General Conformance Block" required for DSA.
4. Submit four copies of calculations, product data and test reports.
5. Identify and specify supports, fasteners, spacing, penetrations, etc., for each deferred approval items, including calculations for each fastener.
6. Submit documents to Architect of Record for review.
7. Deferred submittal documents shall bear stamp and signature of architect or engineer licensed in State of California and responsible for work shown on deferred submittal documents.
8. Architect of Record will forward submittal to appropriate Project Engineer.
9. Review of Project Architect or Engineer of Record is for conformance with design concept shown on Contract Documents. Neither Architect or Engineer of Project shall be responsible for review for correctness of deferred approval items.
10. After review by Architect/Engineer of Record, Architect of Record will forward two copies of submittal to Division of the State Architect for approval.
11. Respond to review comments made by Division of the State Architect and revise and resubmit submittal for final approval.
12. Architect of Record will forward two copies of final revised submittal to the Division of the State Architect for approval.
13. The Division of the State Architect will return one copy of final submittal to the Architect of Record.
14. Architect of Record will forward one copy of evidence of submittal approval by Division of the State Architect for final distribution by General Contractor.

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Description of Project management and coordination including but not necessarily limited to the following:
 - 1. General Project coordination procedures.
 - 2. Coordination drawings.
 - 3. Staff names.
 - 4. Administrative and supervisory personnel.
 - 5. Project meetings.

- B. Related Sections:
 - 1. Section 01 30 00: Administrative requirements.
 - 2. Section 01 79 00: Demonstration and training.

1.2 COORDINATION

- A. Coordination: Coordinate construction operations included in various Specifications sections to ensure efficient and orderly installation of each part of Work.
 - 1. Coordinate construction operations that depend on each other for proper installation, connection, and operation.
 - 2. Coordinate work to assure efficient and orderly sequence of installation of construction elements.
 - 3. Make provisions for accommodating items installed by Owner or under separate contracts.

- B. Prepare memoranda for distribution to each party involved as needed, outlining special procedures required for coordination.
 - 1. Include required notices, reports, and list of attendees at meetings; include Architect and Owner in distribution.

- C. Verify characteristics of interrelated operating equipment are compatible; coordinate work having interdependent responsibilities for installing, connection to, and placing such equipment in service.

- D. Coordinate space requirements and installation of mechanical and electrical work indicated diagrammatically on Drawings.
 - 1. Follow routing shown for pipes, ducts, and conduits as closely as possible; make runs parallel with lines of building.
 - 2. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated; coordinate locations of fixtures and outlets with finish elements.
- F. Administrative Procedures: Coordinate scheduling and timing of administrative procedures with other construction activities and activities of other contractors to avoid conflicts and ensure orderly progress of Work.

1.3 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings for areas where space availability is limited and necessitates maximum utilization of space for components and where separate entities, products, and materials require coordination.
 - 1. Require each subcontractor with items located in ceiling space to furnish coordination drawings of their items to assist in preparation of Contractor's Coordination Drawings.
 - 2. Indicate relationship of components shown on separate Shop Drawings.
 - 3. Indicate required installation sequences.
 - 4. Ceiling Spaces: Take special care to coordinate structure, ceiling systems, equipment located in ceiling spaces, fire protection systems, mechanical systems, and electrical systems.
- B. Staff Names: Immediately after receipt of notice to proceed or immediately after signing of Contract by Owner and Contractor, submit list of principal staff assignments, including superintendent and other personnel in attendance at Project site.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.4 SUPERVISORY AND ADMINISTRATIVE PERSONNEL

- A. Provide supervisory personnel, in addition to Project Superintendent, as required for proper and timely performance of Work and coordination of subcontracts.
- B. Provide administrative staff as required to allow Project Superintendent and supervisory personnel to allocate maximum time to Project supervision and coordination.

1.5 PROJECT MEETINGS

- A. Schedule and administer Project meetings throughout progress of Work:

1. Pre-construction meeting.
 2. Progress meetings at weekly intervals.
 3. Pre-installation conferences.
 4. Coordination meetings.
 5. Special meetings.
- B. Make physical arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes and distribute copies within two days to Architect, Owner, participants, and those affected.
- C. Attendance: Job superintendent, major subcontractors and suppliers as appropriate to agenda; Architect, Owner, and Owner and Architect's consultants as appropriate to agenda topics for each meeting.
- D. Suggested Agenda: Review of Work progress, status of progress schedule and adjustments, delivery schedules, submittals, requests for information, maintenance of quality standards, pending changes and substitutions, and issues needing resolution.

END OF SECTION

SECTION 01329

CONSTRUCTION SCHEDULE - BAR CHART

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. References.
- B. Performance requirements.
- C. Qualifications.
- D. Quality Assurance.
- E. Project record documents.
- F. Submittals.
- G. Review and evaluation.
- H. Format.
- I. Cost and schedule reports.
- J. Early work schedule.
- K. Construction schedule.
- L. Short interval schedule.
- M. Requested time adjustment schedule.
- N. Recovery schedule.
- O. Updating schedules.
- P. Distribution.

1.2 REFERENCES

- A. Construction Planning and Scheduling Manual - A Manual for General Contractors and the Construction Industry, The Associated General Contractors of America (AGC).
- B. National Weather Service - Local Climatological Data.

1.3 PERFORMANCE REQUIREMENTS

- A. Ensure adequate scheduling during construction activities so work may be prosecuted in an orderly and expeditious manner within stipulated Contract Time.

- B. Ensure coordination of Contractor and subcontractors at all levels.
- C. Ensure coordination of submittals, fabrication, delivery, erection, installation, and testing of materials and equipment.
- D. Ensure on-time delivery of Owner furnished materials and equipment.
- E. Ensure coordination of jurisdictional reviews.
- F. Assist in preparation and evaluation of applications for payment.
- G. Assist in monitoring progress of work.
- H. Assist in evaluation of proposed changes to Contract Time.
- I. Assist in evaluation of proposed changes to Construction Schedule.
- J. Assist in detection of schedule delays and identification of corrective actions.

1.4 QUALIFICATIONS

- A. Scheduler: Personnel with 3 years minimum experience in scheduling construction work of a complexity and size comparable to this Project.
- B. Administrative Personnel: 3 years minimum experience in using and monitoring schedules on comparable projects.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with Construction Planning and Scheduling Manual published by the AGC.
- B. In the event of discrepancy between the AGC publication and this section, provisions of this section shall govern.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Section 01 77 00.
- B. Submit one reproducible and two copies of final Record Construction Schedule which reflects actual construction of this Project.
- C. Record schedule shall be certified for compliance with actual way project was constructed.
- D. Receipt of Record Construction Schedule shall be a condition precedent to any retainage release or final payment.

1.7 SUBMITTALS

- A. Within 7 days from the Notice of Award submit proposed Early Work Schedule and preliminary Cost Report defining activities for first 60 days of Work.

- B. Within 45 days from the Notice of Award submit proposed Construction Schedule and final Cost Report.
- C. Submit updated Construction Schedule at least 10 days prior to each Application for Payment.
- D. Submit Short Interval Schedule at each Construction Progress Meeting.
- E. Submit Time Adjustment Schedule within 10 days of commencement of a claimed delay.
- F. Submit Recovery Schedules as required by completion of work.
- G. Submit one reproducible and two copies of each schedule and cost report.

1.8 REVIEW AND EVALUATION

- A. Early Work Schedule shall be reviewed during Preconstruction Conference with Owner and Architect.
- B. Within 5 days of receipt of Owner and Architect's comments provide satisfactory revision to Early Work Schedule or adequate justification for activities in question.
- C. Acceptance by Owner of corrected Early Work Schedule shall be a condition precedent to making any progress payments for first 60 days of Contract.
- D. Cost loaded values of Early Work Schedule shall be a basis for determining progress payments during first 60 days of Contract.
- E. Participate in joint review of Construction Schedule and Reports with Owner and Architect.
- F. Within 7 days of receipt of Owner and Architect's comments provide satisfactory revision to Construction Schedule or adequate justification for activities in question.
- G. In the event that an activity or element of work is not detected by Owner or Architect review, such omission or error shall be corrected by next scheduled update and shall not affect Contract Time.
- H. Acceptance by Owner of corrected Construction Schedule shall be a condition precedent to making any progress payments after first 60 days of Contract.
- I. Cost-loaded values of Construction Schedule shall be basis for determining progress payments.
- J. Review and acceptance by Owner and Architect of Early Work Schedule or Construction Schedule does not constitute responsibility whatsoever for accuracy or feasibility of schedules nor does such acceptance expressly or impliedly warrant, acknowledge or admit reasonableness of activities, logic, duration, or cost loading stated or implied on schedules.

1.9 FORMAT

- A. Shall be fully developed horizontal bar-chart-type schedule prepared under concepts and methods outlined in AGC Construction Planning and Scheduling Manual.
- B. Provide separate bar for each activity or operation.
- C. Activity shall not have a duration longer than 14 days or a value over \$20,000.00 except non-construction activities for procurement and delivery.
- D. Prepare schedule on sheet of sufficient width to clearly show data.
- E. Provide continuous heavy vertical line identifying first day of week.
- F. Provide continuous subordinate vertical line identifying each day of week.
- G. Identify activities by number, description, and cost.
- H. Show each activity in proper sequence.
- I. Indicate graphically sequences necessary for related activities.
- J. Provide legend of symbols and abbreviations used.

1.10 COST AND SCHEDULE REPORTS

- A. Activity Analysis: Tabulate each activity and identify for each activity:
 - 1. Description.
 - 2. Interface with outside contractors or agencies.
 - 3. Duration.
 - 4. Start date.
 - 5. Finish date.
 - 6. Actual start date.
 - 7. Actual finish date.
 - 8. Monetary value keyed to Schedule of Values.
 - 9. Responsibility.
 - 10. Percentage complete.
 - 11. Variance positive or negative.
- B. Cost Report: Tabulate each activity and identify for each activity:

1. Description.
2. Total cost.
3. Percentage complete.
4. Value prior to current period.
5. Value this period.
6. Value to date.

1.11 EARLY WORK SCHEDULE

- A. Shall establish scope of work to be performed during the first 60 days of Contract.
- B. Shall contain the following phases and activities:
 1. Procurement activities to include mobilization, shop drawings and sample submittals.
 2. Identification of key and long-lead elements and realistic delivery dates.
 3. Construction activities in units of whole days limited to 14 days for each activity except non-construction activities for procurement and delivery.
 4. Approximate cost and duration of each activity.
- C. Shall contain seasonal weather considerations. Seasonal rainfall shall be 10 year average for the month as evidenced by Local Climatological Data obtained from U.S. National Weather Service.
- D. Activities shall be incorporated into Construction Schedule.
- E. No application for payment will be evaluated or processed until Early Work Schedule has been submitted and reviewed.
- F. Shall be updated on a monthly basis while Construction Schedule is being developed.
- G. Failure to submit an adequate or accurate Early Work Schedule or failure to submit on established dates will be considered a substantial breach of Contract.

1.12 CONSTRUCTION SCHEDULE

- A. Shall include Early Work Schedule as first 60 days of Construction Schedule.
- B. Shall be a fully developed horizontal bar-chart-type schedule.
- C. Shall indicate a completion date for project that is no later than required completion date.
- D. Conform to mandatory dates specified in the contract documents.

- E. Should schedule indicate a completion date earlier than any required completion date, Owner or Architect shall not be liable for any costs should project be unable to be completed by such date.
- F. Seasonal weather shall be considered in planning and scheduling of all work. Seasonal rainfall shall be 10 year average for the month as evidenced by Local Climatological Data obtained from U.S. National Weather Service.
- G. Provide sub-schedules to define critical portions of entire schedule.
- H. Indicate procurement activities, delivery and installation of Owner furnished material and equipment.
- I. Level of detail shall correspond to complexity of work involved.
- J. As developed shall show sequence of activities required for complete performance of Work.
- K. Shall be logical and show a coordinated plan of Work.
- L. Show order of activities. Include specific dates of completion.
- M. Duration of activities shall be coordinated with subcontractors and suppliers and shall be best estimate of time required.
- N. Failure to include any activity shall not be an excuse for completing all work by required completion date.
- O. An activity shall meet the following criteria:
 - 1. Any portion or element of work, action, or reaction that is precisely described, readily identifiable, and is a function of a logical sequential process.
 - 2. Descriptions shall be clear and concise. Beginning and end shall be readily verifiable. Starts and finishes shall be scheduled by logical restraints.
 - 3. Responsibility shall be identified with a single performing entity.
 - 4. Additional codes shall identify building, floor, bid item and CSI classification.
 - 5. Assigned dollar value (cost-loading) of each activity shall cumulatively equal total contract amount. Mobilization, bond and insurance costs shall be separate. General requirement costs, overhead, profit, shall be prorated throughout all activities. Activity costs shall correlate with Schedule of Values.
- P. For major equipment and materials show a sequence of activities including:
 - 1. Preparation of shop drawings and sample submissions.
 - 2. Review of shop drawings and samples.
 - 3. Finish and color selection.

4. Fabrication and delivery.
 5. Erection or installation.
 6. Testing.
- Q. Include a minimum of 15 days prior to completion date for punch lists and clean up. No other activities shall be scheduled during this period.

1.13 SHORT INTERVAL SCHEDULE

- A. Shall be fully developed horizontal bar-chart-type schedule directly derived from Construction Schedule.
- B. Prepare schedule on sheet of sufficient width to clearly show data.
- C. Identify activities by same description as Construction Schedule.
- D. Show each activity in proper sequence.
- E. Indicate graphically sequences necessary for related activities.
- F. Indicate activities completed or in progress for previous 2 week period.
- G. Indicate activities scheduled for succeeding 2 week period.
- H. Further detail may be added if necessary to monitor schedule.

1.14 REQUESTED TIME ADJUSTMENT SCHEDULE

- A. Updated Construction Schedule shall not show a completion date later than the Contract Time, subject to any time extensions processed as part of a Change Order.
- B. If an extension of time is requested a separate schedule entitled "Requested Time Adjustment Schedule" shall be submitted to Owner and Architect.
- C. Indicate requested adjustments in Contract Time which are due to changes or delays in completion of work.
- D. Extension request shall include forecast of project completion date and actual achievement of any dates listed in Agreement.
- E. To the extent that any requests are pending at time of any Construction Schedule update, Time Adjustment Schedule shall also be updated.
- F. Schedule shall be a fully developed horizontal bar-chart-type schedule.
- G. Accompany schedule with formal written time extension request and detailed impact analysis justifying extension.
- H. Time impact analysis shall demonstrate time impact based upon date of delay, and status of construction at that time.

- I. Activity delays shall not automatically constitute an extension of Contract Time.
- J. Failure of subcontractors shall not be justification for an extension of time.
- K. Extensions will be granted only to extent that time adjustments extend Contract completion date.
- L. Owner shall not have an obligation to consider any time extension request unless requirements of Contract Documents, and specifically, but not limited to these requirements are complied with.
- M. Owner shall not be responsible or liable for any construction acceleration due to failure of Owner to grant time extensions under Contract Documents should requested adjustments in Contract Time not substantially comply with submission and justification requirements of Contract for time extension requests.
- N. In the event a Requested Time Adjustment Schedule and Time Impact Analysis are not submitted within 10 days after commencement of a delay it is mutually agreed that delay does not require a Contract time extension.

1.15 RECOVERY SCHEDULE

- A. When activities are behind Construction Schedule a supplementary Recovery Schedule shall be submitted.
- B. Form and detail shall be sufficient to explain and display how activities will be rescheduled to regain compliance with Construction Schedule.
- C. Maximum duration shall be one month and shall coincide with payment period.
- D. Ten days prior to expiration of Recovery Schedule verification to determine if activities have regained compliance with Construction Schedule will be made. Based upon this verification the following will occur:
 - 1. Supplemental Recovery Schedule will be submitted to address subsequent payment period.
 - 2. Construction Schedule will be resumed.

1.16 UPDATING SCHEDULES

- A. Review and update schedule at least 10 days prior to submitting an Application for Payment.
- B. Approved change orders which affect schedule shall be identified as separate new activities.
- C. Change orders of less than \$20,000.00 value or less than 3 days duration need not be shown unless completion date is affected.
- D. Maintain schedule to record actual prosecution and progress.

- E. No other revisions shall be made to schedule unless authorized by Owner.
- F. Provide narrative Progress Report at time of schedule update which details the following:
 - 1. Activities or portions of activities completed during previous reporting period.
 - 2. Actual start dates for activities currently in progress.
 - 3. List of major construction equipment used during reporting period and any equipment idle.
 - 4. Number of personnel by craft engaged on Work during reporting period.
 - 5. Progress analysis describing problem areas.
 - 6. Current and anticipated delay factors and their impact.
 - 7. Proposed corrective actions for Recovery Schedule.
 - 8. Proposed modifications, additions, deletions and changes in Construction Schedule.
- G. Schedule update will form basis upon which progress payments will be made.
- H. Owner will not be obligated to review or process Application for Payment until schedule and Progress Report have been submitted.

1.17 DISTRIBUTION

- A. Following joint review and acceptance of updated schedules distribute copies to Owner, Architect, and all other concerned parties.
- B. Instruct recipients to promptly report in writing any problem anticipated by projections shown in schedule.

END OF SECTION

SECTION 01 35 15

CALGREEN ENVIRONMENTAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Comply with CALGreen environmental requirements related to energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality.
 - 1. Comply with specific CALGreen requirements as adopted by authorities having jurisdiction and applicable to Project.

1.2 ENVIRONMENTAL REQUIREMENTS

- A. Mandatory Measures: Comply with CALGreen Mandatory Measures applicable to Project.
 - 1. Design team and construction team are each required to participate to maximum degree possible to achieve CALGreen environmental requirements.
 - 2. Contract Documents are not intended to limit alternative means of achieving environmental requirements.
 - a. Suggestions from Contractor, subcontractors, suppliers, and manufacturers for achieving environmental requirements are encouraged; team approach is also encouraged.
 - 3. Voluntary Tiers: Verify extent of Voluntary Tiers applicability to Project.
 - a. Construction team is encouraged to work with Owner and Design Team to incorporate additional measures as defined in CALGreen Appendixes.
 - b. Contact Owner and Architect regarding extent of intent of Project to reach Voluntary Tiers, additional work necessary to achieve enhanced Voluntary Tiers, and potential costs involved in achieving each Voluntary Tier.
 - c. Construction team is required to achieve Mandatory Measures and Voluntary Tiers as applicable, and to achieve as much as possible without unacceptable cost impact or schedule impact as determined by Owner.
- B. Requirements: Construction team is required to review CALGreen requirements relative to Project related to following.
 - 1. Energy Efficiency: Comply with California Energy Commission requirements.
 - 2. Water Efficiency and Conservation: Comply with requirements for both indoor and outdoor water use.
 - 3. Material Conservation and Resource Efficiency:

- a. Nonresidential Projects: Provide weather-resistant exterior wall and foundation envelope including prevention of landscape irrigation spray on structures (if any) and prevent water intrusion at exterior entries.
 - b. Residential Projects: Seal openings and penetrations in building envelope
Construction Waste:
 - c. Provide construction waste management plan as defined by CALGreen with demolition and construction waste diverted from landfill by recycling or salvage for reuse.
 - d. Nonresidential Projects Building Maintenance and Operation: Provide for commissioning requirements as required by CALGreen including but not limited to testing, documentation and training, testing and adjusting.
 - e. Residential Projects Building Maintenance and Operation: Provide operation and maintenance data as required by CALGreen.
4. Nonresidential Projects Environmental Quality: Comply with following as adopted by authorities having jurisdiction and as applicable to Project.
- a. Fireplaces: Comply with requirement for fireplaces (if any) to be direct-vent sealed-combustion gas type or sealed wood-burning fireplace, woodstove, or pellet stove.
 - b. Mechanical Equipment Pollution Control: Cover duct and related air distribution component openings to prevent dust and debris accumulation.
 - c. Finish Material Pollution Control: Comply with CALGreen requirements for volatile organic compound (VOC) emissions including but not necessarily limited to following (as applicable):
 - 1) Adhesives, sealants and caulks.
 - 2) Paints and coatings.
 - 3) Carpet systems including carpet, carpet cushion, and adhesives.
 - 4) Resilient flooring systems.
 - 5) Composite wood products formaldehyde limitations.
 - d. Filters: Comply with requirements for mechanically ventilated buildings to have air filtration media for outside and return air prior to occupancy.
 - e. Environmental Tobacco Smoke (ETS) Control: Comply with CALGreen requirements for ETS.
 - f. Interior Moisture Control: Comply with California Building Code requirements and CALGreen requirements for vapor retarder at concrete slab foundations and capillary break (aggregate base).
 - g. Building Material Moisture Content: Do not use water damaged building materials, remove and place wet and high moisture content insulation, and do not enclose wall or floor framing when moisture content exceeds 19%.

- h. Indoor Air Quality: Comply with CALGreen requirements for outside air delivery and carbon dioxide monitoring.
 - i. Environmental Comfort: Comply with CALGreen requirements for whole acoustical control and interior sound control.
 - j. Outdoor Air Quality: Comply with CALGreen requirements for reduction of greenhouse gases and ozone depletion.
5. Residential Projects Environmental Quality:
- a. Fireplaces: Comply with requirement that gas fireplaces (if any) shall be direct-vent sealed-combustion type and woodstoves or pellet stoves (if any) comply with U.S. EPA Phase II emissions limits.
 - b. Mechanical Equipment Pollution Control: Cover duct and related air distribution component openings to prevent dust and debris accumulation.
 - c. Finish Material Pollution Control: Comply with CALGreen requirements for volatile organic compound (VOC) emissions including but not necessarily limited to following (as applicable):
 - 1) Adhesives, sealants and caulks.
 - 2) Paints and coatings.
 - 3) Carpet systems including carpet, carpet cushion, and adhesives.
 - 4) Resilient flooring systems.
 - 5) Composite wood products formaldehyde limitations.
 - d. Interior Moisture Control: Comply with CALGreen requirements for vapor retarder at concrete slab foundations and capillary break (aggregate base).
 - e. Building Material Moisture Content: Do not use water damaged building materials, remove and place wet and high moisture content insulation, and do not enclose wall or floor framing when moisture content exceeds 19%.
 - f. Indoor Air Quality: Provide humidistat-controlled bathroom exhaust fans with Energy Star compliance, ducted to terminate outside building.
 - g. Environmental Comfort: Comply with CALGreen requirements for whole house exhaust fan louvers to be insulated or have covers which close when fan is off, and with heating and air-conditioning system design requirements.
- C. Planning and Design: Construction team shall coordinate with Design Team regarding Project Planning and Design methods related to CALGreen requirements related to Project design and shall comply with requirements related to construction.

1.3 QUALITY ASSURANCE

- A. Project Management and Coordination: Contractor to identify one person on Contractor's staff to be responsible for CALGreen issues compliance and coordination.

1. Experience: Environmental project manager to have experience relating to CALGreen building construction.
 2. Responsibilities: Carefully review Contract Documents for CALGreen issues, coordinate work of trades, subcontractors, and suppliers; instruct workers relating to environmental issues; and oversee Project Environmental Goals.
 - a. Submittals: Collect, compile, verify, and maintain sufficient information for submittals indicating compliance with applicable CALGreen requirements.
 3. Meetings: Discuss CALGreen Goals at following meetings.
 - a. Pre-construction meeting.
 - b. Pre-installation meetings.
 - c. Regularly scheduled job-site meetings.
- B. CALGreen Issues Criteria: Comply with requirements listed in CALGreen and various Specification sections.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General Issues: Do not use materials with moisture stains or with signs of mold or mildew.
1. Moisture Stains: Materials that have evidence of moisture damage, including stains, are not acceptable, including both stored and installed materials; immediately remove from site.
 2. Mold and Mildew: Materials that have evidence of growth of molds or of mildew are not acceptable, including both stored and installed materials; immediately remove from site.

2.2 SUBSTITUTIONS

- A. Substitutions Environmental Issues: Requests for substitutions shall comply with requirements specified in Section 01 25 00 – Substitution Procedures, with following additional information required where environmental issues are involved.
1. Indicate each proposed substitution complies with CALGreen requirements.
 2. Owner and Architect reserve right to reject proposed substitutions where CALGreen information is not provided and where substitution may impact mandatory requirements or Project voluntary tier requirements.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Environmental Issues: Protect interior materials from water damage; where interior products not intended for wet applications are exposed to moisture, immediately remove from site.
 - 1. Protect installed products using methods that do not support growth of molds and mildews. Immediately remove from site materials with mold and materials with mildew.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes general quality control requirements.
 - 1. General quality control.
 - 2. Manufacturers' field services.
 - 3. Mock-ups.
 - 4. Independent testing laboratory services and inspections.
- B. Related Requirements:
 - 1. Refer to applicable codes and Specifications sections for test requirements.

1.2 QUALITY CONTROL, GENERAL

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.3 MANUFACTURER'S FIELD SERVICES

- A. When specified in respective Specification sections, require manufacturer or supplier to have qualified personnel provide on-site observations and recommendations.
 - 1. Observe field conditions, including conditions of surfaces and installation.
 - 2. Observe quality of workmanship.
 - 3. Provide recommendations to assure acceptable installation and workmanship.
 - 4. Where required, start, test, and adjust equipment as applicable.
- B. Representative shall submit written report to Architect or Owner listing observations and recommendations.

1.4 MOCK-UPS

- A. Erect field samples and field mock-ups at locations on site as approved in advance and in accordance with requirements where included in Specifications section.
 - 1. Test mock-ups requiring special equipment may be erected at location having access to necessary equipment; coordinate with Architect.
- B. Field samples and mock-ups not approved and not capable of being acceptably revised shall be removed from site.
- C. Approved field samples and mock-ups may be used as part of Project.

1.5 TESTING LABORATORY SERVICES AND INSPECTIONS

- A. Testing laboratory services and inspections specified and required by applicable codes and regulations will be performed by firms independent of firms related to construction operations and shall be acceptable to applicable authorities.
 - 1. Notify Owner immediately where potential conflict of interest may be involved with testing laboratories or inspection services for Project.
 - 2. Owner or Architect may also require independent testing of items where doubts exist that product or system does not conform to Contract Documents.
 - 3. Owner will employ and pay for testing laboratory and special inspectors to provide Project specific testing and inspections under applicable codes and Specification sections except where indicated otherwise.
 - a. Owner employment of testing laboratory and inspectors shall not relieve Contractor of obligation to perform Work in accordance with requirements of applicable codes and Contract Documents.
 - 1) Laboratory and inspectors may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - b. Retesting required because of non-conformance to specified requirements shall be performed by Owner's testing laboratory.
 - 1) Payment for retesting shall be charged to Contractor by deducting inspection and testing charges from Contract amount.
 - c. Owner provided testing shall be limited to Project specific testing and shall not include general tests or approvals of materials, equipment or systems.
 - d. Owner provided inspections shall be limited to Project design team inspections and special inspectors required by applicable authorities.
- B. Services shall be performed in accordance with requirements of governing authorities and with specified standards.
- C. DSA Projects: Testing and inspections shall be performed in accordance with DSA 103 Form.
- D. Reports will be submitted to Architect in duplicate giving observations and results of tests and inspections, indicating compliance or non-compliance with specified standards and with Contract Documents.
 - 1. Where required, testing laboratory and inspectors will submit copy of tests and inspections directly to enforcing agency.

- E. Contractor shall cooperate with testing laboratory and inspection personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.
 - 1. Notify Owner, Architect, inspectors, and testing laboratory sufficiently in advance of expected time for operations requiring inspection and testing services.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes temporary construction facilities and temporary controls.
 - 1. Electricity and lighting.
 - 2. Heat and ventilation.
 - 3. Water and sanitary facilities.
 - 4. Construction aids.
 - 5. Temporary enclosures.
 - 6. Barriers.
 - 7. Cleaning during construction.
 - 8. Project identification.
 - 9. Field offices.
 - 10. Cellular telephone service.
 - 11. Storage.
- B. Related Requirements:
 - 1. Section 01 70 00: Progress cleaning and final cleaning.
- C. Provide temporary construction facilities and temporary controls as required to conform to applicable authorities and as required to complete Project in accordance with Contract Documents.
 - 1. Authorities: Contact governing authorities to establish extent of temporary facilities and temporary controls required by authorities.

1.2 ELECTRICITY AND LIGHTING

- A. Provide electrical service required for construction operations, with branch wiring and distribution boxes located to allow service and lighting by means of construction-type power cords.
 - 1. Connection to existing electrical service is permitted.
- B. Provide lighting for construction operations.
 - 1. Permanent lighting may be used during construction; maintain lighting and make routine repairs.
- C. Owner will pay costs of energy used from existing on-site services.

1.3 HEAT AND VENTILATION

- A. Provide heat and ventilation as required to maintain specified conditions for construction operation, to protect materials and finishes from damage due to temperature and humidity.
- B. Owner will pay costs of energy used from existing on-site services.

1.4 WATER AND SANITARY FACILITIES

- A. Provide water service required for construction operations; extend branch piping with outlets located so water is available by use of hoses.
 - 1. Connection to existing facilities is permitted.
 - 2. Owner will pay for water used from existing on-site services.
- B. Provide and maintain required sanitary facilities and enclosures.

1.5 CONSTRUCTION AIDS

- A. Noise, Dust and Pollution Control: Provide materials and equipment necessary to comply with local requirements for noise, dust and pollution control.
- B. Fire Protection: Maintain on-site fire protection facilities as required by applicable authorities and insurance requirements.
- C. Security: Protect Site and Work; prevent unauthorized entry, vandalism, and theft.
 - 1. Coordinate with Owner's security program.
- D. Dewatering: Provide and operate drainage and pumping equipment; maintain excavations and site free of standing water.

1.6 ENCLOSURES

- A. Temporary Closures: Provide temporary weather-tight closures for exterior openings for acceptable working conditions, for protection for materials, to protect interior materials from dampness, for temporary heating, and to prevent unauthorized entry.
 - 1. Provide doors with self-closing hardware and locks.
- B. Temporary Partitions: Provide temporary partitions as required to separate work areas from completed areas, to prevent penetration of dust and moisture into completed areas, and to prevent damage to finished areas and installed equipment.
 - 1. Construction: Framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces; Flame Spread Rating of 25 in accordance with ASTM E84.

1.7 BARRIERS

- A. Barriers: Provide barriers as required to prevent public entry to construction areas and to protect adjacent properties from damage from construction operations.
 - 1. Fence: Provide minimum 8-foot high commercial grade chain link or painted solid wood fence around construction site; equip with gates with locks.
 - 2. Covered Walkways: Provide lighted covered painted walkways as required by governing authorities for public rights-of-way and for public access to existing building.
- B. Barricades: Provide barricades as required by governing authorities.
- C. Tree Protection: Provide barriers around trees and plants designated to remain; protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.

1.8 CLEANING DURING CONSTRUCTION

- A. Control accumulation of waste materials and rubbish; recycle or dispose of off-site.
- B. Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

1.9 PROJECT IDENTIFICATION

- A. Project Sign: Provide minimum 32-square foot Project identification sign of wood frame and exterior grade plywood construction, painted, with computer generated graphics by professional sign maker.
 - 1. Design: As furnished by Architect.
 - 2. Submit to Owner and Architect additional names or changes proposed to Project sign for prior written approval.
 - 3. Erect on site at location established by Architect.
- B. Other Signs: Subject to approval of Architect and Owner.

1.10 FIELD OFFICES

- A. Field Office: Provide weather-tight field office, with lighting, electrical outlets, data outlets, heating, and ventilating equipment, and equipped with furniture.
 - 1. Meeting Space: In addition, provide space for Project meetings with table and chairs to accommodate minimum six persons.
 - 2. Telephone Service: Provide telephone service to field office.

3. Multi-Purpose Copier: Provide plain paper multi-purpose color and black-and-white copier with enlargement and reduction capability and with built-in printer, scanner, and facsimile capabilities.

1.11 CELLULAR TELEPHONE SERVICE

- A. Cellular Telephone Service: Furnish on-site Project Managers with cellular telephone. Ensure Owner and Architect ability to contact site during construction operations.
 1. Schedules: Submit schedules of on-site Project Managers with individual cellular telephone numbers to Owner and Architect; maintain schedules and cell phone numbers up to date during Project on-site operations.

1.12 STORAGE

- A. Storage for Tools, Materials, and Equipment: Limit on-site storage to Project area; provide weather-tight storage, with heat and ventilation for products requiring controlled conditions.
 1. Maintain adequate space for organized storage and access.
 2. Provide lighting for inspection of stored materials.

1.13 REMOVAL

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion Inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities.
- C. Restore existing facilities used during construction to specified or original condition.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes basic product requirements governing material and equipment.
 - 1. General product requirements.
 - 2. Product list.
 - 3. Quality assurance.
 - 4. Delivery, storage, and handling.

- B. Related Requirements:
 - 1. Section 01 25 00: Substitution procedures.
 - 2. Section 01 30 00: Submittal of manufacturers' certificates.
 - 3. Section 01 77 00: Operation and maintenance data.

1.2 GENERAL PRODUCTS REQUIREMENTS

- A. Products include material, equipment, and systems.
- B. Comply with Specifications, referenced standards, and applicable codes and regulations as minimum requirements.
- C. Provide new materials except as specifically allowed by Contract Documents.
- D. Materials to be supplied in quantity within a Specification section shall be by one manufacturer, shall be the same, and shall be interchangeable.
- E. Provide equipment and systems composed of materials from a single manufacturer except where otherwise recommended by equipment or systems manufacturer or where otherwise indicated in Contract Documents.
- F. Contractor's Options: Comply with following options; requests for substitutions for named manufacturers and products shall comply with requirements specified in Section 01 25 00 – Substitution Procedures.
 - 1. Products Identified by Reference Standards: Select product meeting referenced standard for products specified only by reference standard.
 - a. Requests for Substitutions to be limited to products not complying with referenced standards.
 - 1) Submit justification for non-compliance with reference standards as part of Request for Substitutions; if product is foreign made submit rationale why foreign standards and basic materials indicates compliance.

2. Named Manufacturers: Where names of manufacturers are specified select any named manufacturer product meeting Specifications for products specified by naming one or more manufacturers.
 - a. Submit Request for Substitution for any manufacturer not named.
 3. Named Manufacturers and Named Products: Select any named manufacturer named product meeting Specifications for products specified by naming one or more manufacturers and products.
 - a. Where only one manufacturer and product is named together with additional manufacturers without specific products, Requests for Substitutions to be limited to products not comparable to that specified.
 - 1) Contractors, subcontractors, suppliers, and manufacturers shall take special care to ensure comparable products are being supplied based on design, performance, quality, and longevity.
 - 2) Substitutions: Submit Request for Substitution for any manufacturer not named and for products not comparable to those specified in design, performance, quality, and longevity.
 4. Basis of Design: Where manufacturer or manufacturer and product both are indicated as Basis of Design, submit Request for Substitution for other manufacturers and products.
 5. "Or Equal" Clauses: Submit request for substitution for manufacturer or product not specifically named in Specifications where terms "or equal", "or approved equal", or similar references are made.
- G. Nameplates: Do not attach or imprint manufacturer or producer nameplates on exposed surfaces in occupied spaces except for required labels and operating data.
1. Equipment Nameplates: Provide permanent nameplate on service connected and power operated equipment located on easily accessible surface inconspicuous in occupied spaces.
 - a. Provide name of product and manufacturer, model and serial number, capacity, speed, rating, and similar information.

1.3 SUBMITTALS

- A. Product List: Within 35 days after award of Contract, submit to Owner and Architect a complete list of major products proposed for installation, with name of manufacturer, trade name, and model.
- B. Product List: Prior to submittal of second Request for Payment, submit to Architect complete list of major products which are proposed for installation, with name of manufacturer, trade name, and model.

1. Tabulate products by Specification number and title.

C. Substitutions: Refer to Section 01 25 00 – Substitution Procedures.

1.4 QUALITY ASSURANCE

A. Comply with industry standards and applicable codes except when more restrictive tolerances or requirements indicate more rigid standards or precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Install products straight, true-to-line, and in correct relationship to adjacent materials, with hairline joints, free of rough, sharp and potentially hazardous edges.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1. Seismic Anchors: Conform to code requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Transport products by methods to avoid product damage, deliver in undamaged condition in manufacturer's unopened containers or packaging.

B. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.

C. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

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

E. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

F. Arrange storage to provide access for inspection; periodically inspect to assure products are undamaged and are maintained under required conditions.

G. Provide equipment and personnel to handle products by methods to prevent soiling and prevent damage.

H. Promptly inspect shipments to assure products comply with requirements, quantities are correct, and products are undamaged.

I. Immediately remove from Project products damaged, wet, stained, and products with mold and products with mildew.

1. Take special care to prevent absorbent products such as gypsum board and acoustical ceiling units from becoming wet.

END OF SECTION

SECTION 01 70 00

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes execution requirements.
 - 1. Installer qualifications.
 - 2. Examination.
 - 3. Manufacturer's instructions.
 - 4. Installation.
 - 5. Cleaning.
 - 6. Protection.

- B. Related Requirements:
 - 1. Section 01 50 00: Cleaning during construction.
 - 2. Section 01 77 00: Closeout procedures.
 - 3. Section 01 79 00: Demonstration and training.

1.2 INSTALLER QUALIFICATIONS

- A. Experienced Installers: Installers to have minimum five-years successful experience installing items like those required for Project, except for individuals in training under direct supervision of experienced installer.

1.3 EXAMINATION

- A. Acceptance of Conditions: Beginning installation of a product signifies installer has examined substrates, areas, and conditions for compliance with manufacturer requirements for tolerances and other conditions affecting performance.

- B. Field Measurements: Take field measurements as required to fit Work properly; recheck measurements prior to installing each product.
 - 1. Where portions of Work are to fit to other construction verify dimensions of other construction by field measurements before fabrication; allow for cutting and patching to avoid delaying Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

1.4 MANUFACTURERS' INSTRUCTIONS

- A. Manufacturer's Recommendations: When work is specified to comply with manufacturers' recommendations or instructions, distribute copies to persons involved and maintain one set in field office.
 - 1. Conform to requirements specified in Section 01 30 00 for submittal of recommendations or instructions to Architect; submit to Architect only where specified or where specifically requested; otherwise keep in Field Office.
- B. Perform work in accordance with details of recommendations and instructions and specified requirements.
 - 1. Should a conflict exist between Specifications and recommendations or instructions consult with Architect.
- C. Where manufacturer's information notes special recommendations in addition to installation instructions, comply with both recommendations and instructions.

1.5 INSTALLATION

- A. Pre-Installation Meetings: Installers and suppliers are to attend pre-installation meetings scheduled by Contractor.
- B. Comply with manufacturers written recommendations and installation instructions unless more restrictive requirements are specified.
- C. Locate Work and components accurately, in correct alignment and elevation.
 - 1. Make vertical work plumb and horizontal work level.
 - 2. Install components to allow space for maintenance and ease of removal for replacement.
- D. Install products at time and under conditions to ensure best possible results; maintain conditions required for product performance until Substantial Completion.
- E. Conduct operations so no part of Work is subject to damaging operations or excessive loads during normal conditions.
- F. Securely anchor permanent construction in place, accurately located and aligned with other portions of Work.
- G. Allow for building movement including thermal expansion and contraction.
- H. Make joints of uniform width; arrange joints as indicated, for best visual effect where not otherwise indicated; fit exposed connections together to form hairline joints except where otherwise indicated.

1.6 CLEANING

- A. Cleaning During Construction: Specified in Section 01 50 00 - Temporary Facilities and Controls.
- B. Progress Cleaning: Keep installed areas clean using cleaning materials specifically recommended by manufacturers of product being cleaned; where not otherwise recommended use nontoxic materials that will not damage surfaces.
 - 1. Remove debris from concealed spaces before enclosing space.
 - 2. Supervise construction operations to assure no part of construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
- C. Final Cleaning: Execute final cleaning at Substantial Completion.
 - 1. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces.
 - a. Vacuuming Equipment: Type with high efficiency particulate arrestor (HEPA) type filters; properly maintained.
 - 2. Clean equipment and fixtures to a sanitary condition, clean filters of mechanical equipment, replace filters where cleaning is impractical.
 - a. Clean ducts.
 - 3. Clean site; sweep paved areas.
 - 4. Remove waste, surplus materials and rubbish from Project and site; recycle to maximum extent feasible.

1.7 PROTECTION

- A. Protect products subject to deterioration with impervious cover. Provide ventilation to avoid condensation and trapping water.
- B. Take care to use protective covering and blocking materials that do not soil, stain, or damage materials being protected.
- C. After installation, provide coverings to protect products from damage from traffic and construction operations, remove when no longer needed.
- D. Protect interior materials from water damage; immediately remove wet materials from site to prevent growth of mold and mildew on site.

END OF SECTION

SECTION 01 73 00

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor is responsible for cutting, fitting and patching to complete Work and to:

1. Make its parts fit together properly.
2. Uncover work to provide for installation of ill-timed work.
3. Remove and replace defective work.
4. Remove and replace work not conforming to Contract Documents.
5. Remove samples of installed work as required for testing.
6. Provide routine penetrations of non-structural surfaces for installation of piping.
7. Provide routine penetrations of non-structural surfaces for installation of conduit.

B. Related Requirements:

1. Section 01 50 00: Temporary facilities and controls.
2. Section 02 41 00: Structure demolition.
3. Section 02 41 20: Selective building demolition for remodeling.

1.2 SUBMITTALS

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

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

B. Request shall include:

1. Identification of Project and description of affected work.
2. Necessity for cutting or alteration.
3. Effect on work of Owner or separate contractor.
4. Effect on structural integrity, or weatherproof integrity of Project.
5. Alternatives to cutting and patching.
6. Cost proposal, when applicable.
7. Written permission of separate contractor whose work will be affected.
8. Description of proposed work including:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Products proposed to be used.
 - c. Extent of refinishing to be included.

C. Should conditions of Work or schedule indicate a change of products from original installation, Contractor shall submit request for substitution as specified in Section 01 25 00 – Substitution Procedures.

- D. Submit written notice to Architect designating date and time work will be uncovered.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with Specifications and standards for each specific product involved.
- B. Where Specifications and standards have not been provided, provide materials and fabrication consistent with quality of Project and intended for commercial construction.
- C. Provide new materials for cutting and patching unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of work.
- C. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with work until Architect has provided further instructions.

3.2 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.
 - 1. Provide services of licensed engineer for designing temporary support where required by applicable authorities for temporary supports and for shoring; submit engineering calculations directly to applicable authorities upon request.
- B. Protect other portions of Project from damage.

3.3 PERFORMANCE

- A. Execute cutting by methods that provide proper surfaces to receive installation of repairs and finishes.
 - 1. Execute excavating and backfilling by methods which will prevent settlement, and which will prevent damage to other work.
- B. Employ same installer or fabricator to perform cutting and patching work as employed for new construction for:
 - 1. Weather-exposed or moisture resistant elements.
 - 2. Sight-exposed finished surfaces.

- C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- D. Restore work that has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
- E. Fit work tight to pipes, sleeves, ducts, conduit and penetrations through surfaces.
- F. Refinish entire surfaces as necessary to provide even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section describes Contract closeout procedures.
 - 1. Substantial Completion.
 - 2. Final Completion.
 - 3. Project record documents.
 - 4. Material and finish data.
 - 5. Operation and maintenance manuals.

- B. Related Requirements:
 - 1. Section 01 30 00: Administrative requirements including attic stock.
 - 2. Section 01 78 00: Warranties.
 - 3. Section 01 79 00: Demonstration and training.

1.2 SUBSTANTIAL COMPLETION

- A. Immediately prior to Substantial Completion, schedule agency reviews as required for “temporary certificate of occupancy” or for “certificate of occupancy”.

- B. When Contractor considers Work, or a designated portion thereof is substantially complete, submit written notice, with list of items to be completed or corrected.
 - 1. List (“Punch List”): Format pre-approved by Owner and Architect; tabular form with each space listed required.

- C. Within a reasonable time, Owner and Architect will inspect status of completion and may add to “Punch List”.
 - 1. Contractor shall pay for Architect's time and direct expenses where more than one Substantial Completion inspection is required.

- D. Should Owner and Architect determine Work is not substantially complete, Contractor will be promptly notified in writing, giving reasons.

- E. Contractor shall remedy deficiencies and send a second written notice of substantial completion; Architect will reinspect Work.
 - 1. Contractor shall pay for Architect's time and direct expenses where more than one Substantial Completion inspection is required.

- F. When Work is determined to be substantially complete by Architect, a Certificate of Substantial Completion will be prepared in accordance with General Conditions.

- G. DSA Projects: Contractor shall complete DSA 6-C Form and upload electronically to DSAbox within three days of completion of Work.

1.3 FINAL COMPLETION

- A. When Work is complete, submit written certification indicating:
 - 1. Work has been inspected for compliance with Contract Documents.
 - 2. Work has been completed in accordance with Contract Documents and deficiencies listed (in 'Punch List") with Certificate of Substantial Completion have been corrected.
 - 3. Equipment and systems have been tested in presence of Owner's representative and are operational.
 - 4. Work is complete and ready for final inspection.
- B. Special Submittals: In addition to submittals required by Contract, submit following.
 - 1. Provide submittals required by governing authorities to governing authorities with copies included in Project Record Documents.
 - 2. Submit final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

1.4 PROJECT RECORD DOCUMENTS

- A. Keep documents current; do not permanently conceal any work until required information has been recorded.
 - 1. Owner will provide Contractor with a separate set of Drawings to maintain for Project Record Documents.
 - 2. Store reproducible Drawings, one set of Project Manual, and one copy of each Change Order separate from documents used for construction, for use as Project Record Documents.
 - 3. Indicate actual work on Drawings; indicate actual products used in Project Manual, including manufacturer, model number and options.
 - 4. Update Project Record Documents daily and allow for Architect inspection at least once a month.
- B. At Contract close-out submit documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.
- C. As-Built Documents: General Contractor shall have electronic "As Built" sets of Contract Documents (Project Drawings and Project Specifications) prepared prior to Final Completion.

1. Contractor shall use one complete electronic set of Contract Documents (Drawings and Specifications) for use for "As-Builts".
 2. As-Built Drawings: Revise Drawings based on Record Documents and field measurements made after installation and indicate actual locations of structural elements, ducts, piping, wiring, and equipment.
 - a. Professional draftspersons experienced in electronic media used for Contract Documents shall revise original Project Drawings based on information recorded on Project Record Documents.
 3. As-Built Specifications: Revise Specifications to indicate manufacturers who provided materials specified along with specifics indicating accessories, options, and finishes used in Project.
 - a. Cross referencing Submittal records is acceptable for accessories only.
 4. Review Submittal: Submit two copies of electronic media of "As-Built" Documents to Architect for review.
 - a. After Architect review, revise where indicated and submit final electronic media to Owner.
- D. Final Completion Submittal: At Project Completion submit both Project Record Documents and As-Built Documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.

1.5 MATERIAL AND FINISH DATA

- A. Provide data for primary materials and finishes.
- B. Submit two sets prior to final inspection, bound in 8-1/2" by 11" three-ring binders with durable plastic covers, clearly identified regarding extent of contents.
 1. Electronic Format: Where available in electronic format, submit USB 3.0 flash drives with information required for material and finish data.
- C. Arrange by Specification division and give names, addresses, and telephone numbers of subcontractors and suppliers. List:
 1. Trade names, model or type numbers.
 2. Cleaning instructions.
 3. Product data.
 4. Maintenance recommendations.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. Provide manuals for:
 1. Electrically operated items.
 2. Electrical equipment and controls.
 3. Maintenance manuals provided as part of Submittals.

- B. Submit two sets prior to final inspection, bound in 8-1/2" by 11" three-ring binders with durable plastic covers, clearly identified regarding extent of contents.
- C. Provide a separate volume for each system, with a table of contents and index tabs for each volume.
- D. Arrange by Specification division and gives names, addresses, and telephone numbers of Subcontractors and suppliers. List:
 - 1. Appropriate design criteria.
 - 2. List of equipment and parts lists.
 - 3. Operating and maintenance instructions.
 - 4. Shop drawings and product data.
- E. Electronic Format: Where available in electronic format, submit two USB 3.0 flash drives with information required for operation and maintenance manuals.

END OF SECTION

SECTION 01 78 00

WARRANTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Warranties: Compile required, and incidental warranties required by Contract Documents.
 - 1. Manufacturer Warranties: Provide manufacturer's standard warranties where specified including inspections and services included or required as part of manufacturer's standard warranty.
 - 2. Special Warranties: Provide special warranties as required by Specifications sections.
 - 3. These warranties shall be in addition to and not a limitation of other rights Owner may have against Contractor under Contract Documents and which may be prescribed by law, regardless of wording of warranty.

- B. Extended Correction Period: Contractor shall correct failure of materials and systems to perform in a manner consistent with their intended use including but not limited to failure of waterproofing and roofing systems to resist penetration from water.
 - 1. Standard Correction Period: One year after Substantial Completion or Beneficial Occupancy by Owner except where otherwise noted in Contract Documents; coordinate with General Conditions and Supplementary Conditions.
 - a. Items used by Contractor during construction operations shall not be considered substantially completed.
 - b. Correction of Work Period begins with Owner occupancy not completion of component.
 - 2. Extended Correction Period: Requirements are same as standard correction period but for an extended period as indicated in Specifications sections.
 - 3. Contractor Responsibilities: Bear cost of correcting failed work and replacing construction damaged by failure of materials and systems to perform in a manner consistent with their intended use during correction period.
 - a. Requirements for correction period shall apply to Subcontractors, suppliers, installers, and those responsible for failed work.
 - b. Owner and Design Team shall not be responsible for determining degree of responsibility of those involved.

4. Owner's Rights under Law: Correction period shall be in addition to and not a limitation of other rights Owner may have against Contractor under Contract Documents and which may be prescribed by law.

1.2 FORM OF SUBMITTAL

- A. Special Warranty and Extended Correction Period Forms: Provide duplicate copies, notarized or on Contractor and Manufacturer's letterhead without conditions or exceptions to requirements specified.
 1. Assemble documents executed by subcontractors, installers, suppliers, and manufacturers.
 2. Provide table of contents and assemble in binder with durable plastic cover, clearly identified regarding extent of contents.
 3. Electronic Format: Submit USB 3.0 flash drives of warranties, in Microsoft Word.
- B. Manufacturer Warranty Forms: Use manufacturer's standard forms unless otherwise directed in Contract Documents; completed form shall not detract from or confuse interpretations of Contract Documents.
 1. Manufacturer's authorized representative shall sign manufacturer warranties.
 2. Subcontractor and installer shall countersign warranty where specified.
 - a. Provide required warranties for waterproofing and roofing systems countersigned by subcontractor and installer.
- C. Submit final warranties prior to final application for payment.
 1. For equipment put into use with Owner's permission during construction, submit within ten days after first operation.
 2. For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.
- D. Provide information for Owner's personnel regarding proper procedure in case of failure and instances that might affect validity of manufacturer warranty.
- E. Size: 8-1/2" by 11" for three-ring binder; fold larger sheets to fit.

1.3 WARRANTIES AND CORRECTION OF WORK DOCUMENTS

- A. Warranties and Correction of Work Documents are intended to protect Owner against failure of work and against deficient, defective and faulty materials and workmanship, regardless of sources.
- B. Limitations: Warranties and correction of work requirements are not intended to cover failures that result from:

1. Unusual or abnormal phenomena of the elements.
 2. Owner's misuse, maltreatment or improper maintenance of work.
 3. Vandalism after substantial completion.
 4. Insurrection or acts of aggression including war.
- C. Related Damages and Losses: Remove and replace work which is damaged as result of failure, or which must be removed and replaced to provide access for correction of work.
- D. Reinstatement: After correction of work reinstate warranty or extended correction period for corrected work to date of original expiration, but not less than half original period.
1. Correction of Work Period: The general correction of work period specified shall not be extended by corrective work except to extent required to correct failure and repair or replace materials damaged by failure.
- E. Replacement Cost: Replace or restore failing items without regard to anticipated useful service lives where part of correction of work period, extended correction of work period, and special warranty period unless otherwise noted.
- F. Rejection of Warranties: Owner reserves right to reject unsolicited and coincidental product warranties that detract from or confuse interpretations of Contract Documents.

END OF SECTION

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Provide equipment and systems demonstration and instruction in accordance with Contract Documents.
 - 1. Video record seminars and system demonstrations.
- B. Related Sections:
 - 1. Section 01 31 00: Project management and coordination.
 - 2. Section 01 77 00: Contract closeout procedures.
 - 3. Refer to Facility Services Subgroups for mechanical and electrical requirements.

1.2 DESCRIPTION

- A. Seminar Agenda and Outline:
 - 1. Prepare a seminar agenda and outline in consultation and cooperation with Owner. Include following:
 - a. Equipment and systems that will be included in seminars.
 - b. Name of companies and representatives presenting at seminars.
 - c. Outline of each seminar's content.
 - d. Time and date allocated to each system and item of equipment.
 - 2. Submit preliminary seminar agenda and outline for review and comment by Owner.
 - a. Revise and resubmit agenda and outline until all seminar requirements have been satisfied and seminar dates and presenters have been finalized.
 - 3. Submit final seminar agenda and outline no later than eight weeks before date of Acceptance of Work.
- B. Seminar Organization:
 - 1. Contractor's presentation leaders shall chair seminars.
 - a. Coordinate qualification of training personnel, seminar contents, and presentations with Owner.
 - 2. Coordinate individual presentations and ensure manufacturer's representatives scheduled to be at training seminars are present.

3. Arrange for presentation leaders familiar with design operation, maintenance and troubleshooting of equipment and systems.
 - a. Where one person is not familiar with all aspects of equipment or system; arrange for specialists familiar with each aspect.
4. Coordinate proposed seminar dates with Owner and select mutually agreeable dates.
5. Video Recording: Arrange for video recording (audio and video) of training seminars and system demonstrations, including seminar and demonstration questions and answers.

C. Seminar Content:

1. Architect's Consultants will explain design philosophy of primary systems.
2. Include following information in presentations dealing with specific systems.
 - a. An overview of how system is intended to operate.
 - b. Describe design parameters, constraints and operational requirements.
 - c. Describe system operation strategies.
 - d. Provide information to help in identifying and troubleshooting problems.
3. Include following information in presentations dealing with equipment.
 - a. Explanation of how equipment operates.
 - b. Recommended preventative and routine maintenance.

D. System Demonstration:

1. Demonstrate operation of equipment and systems when specified in individual technical sections. Include following in demonstration.
 - a. Start-up and shut down.
 - c. Operation.
 - d. Scheduled and preventative maintenance.
 - e. Troubleshooting.
2. Demonstration may be conducted at time of original starting with Owner's prior approval.

E. Seminar and Demonstration Questions:

1. Be prepared to answer questions raised by Owner's personnel at demonstrations and seminars.
2. If unable to satisfactorily answer questions immediately, provide written response within three days.

F. Use manufacturer's operation and maintenance data as basis of instruction.

1.3 SUBMITTALS

- A. Video Recording: Submit three copies of each video recording in DVD format acceptable to Owner; include label on each DVD and on each container identifying Project and Seminar content.

END OF SECTION

SECTION 02 40 00

DEMOLITION

PART 1 - GENERAL

1.01 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.

1.02 RELATED SECTIONS

- A. Section 31 23 00 – Excavation and Fill.
- B. Section 31 23 33 – Trenching and Backfill.

1.03 RELATED DOCUMENTS

- A. California Building Code: Chapter 33 – Site Work, Demolition and Construction.
- B. California Building Code: Section 1809A.14 – Pipes and Trenches.

1.04 DEFINITIONS

- A. ANSI: American National Standards Institute.
- B. CAL-OSHA: California Occupational Safety and Health Administration.

1.05 SUBMITTALS

- A. Follow Submittal procedure outlined in Section 01 33 00 – Submittal Procedures.

1.06 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. Salvable 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

2.01 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

3.01 PREPARATION

- A. Protect and maintain benchmarks and survey control points during construction.
- B. Protect existing site improvements to remain during construction.

3.02 RESTORATION

- A. Restore damaged improvements to their original condition, as acceptable to the Owner.

3.03 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed or abandoned.
- 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.

3.04 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, expansion joint, score mark or edge, remove material to joint, mark or edge.

3.05 BACKFILL

- A. Place and compact material in excavations and depressions remaining after site clearing in conformance with Section 31 23 33 – Trenching and Backfill.

3.06 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 02 43 20

STRUCTURE MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Prepare existing structure indicated for move, move to new location, and set on new foundation as required for completion of moving existing structure as indicated on Drawings.
 - 1. Coordinate Work with work under other sections and under separate contracts, including earthwork, foundation construction, and disconnecting and installation of utilities.
- B. Related Sections:
 - 1. Section 02 41 00: Structure demolition.
 - 2. Division 22: Disconnecting and reconnecting piping systems.
 - 3. Division 26: Disconnecting and reconnecting electrical systems.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Design/Build: Provide special engineering for structure both for moving and for connection to new foundation to ensure compliance with applicable codes and Contract Documents.
- B. Transport: Carefully examine structure and design structural supports, framing, reinforcement, and bracing to transfer loads of structure to transport carrying structure.
- C. Route: Investigate and confirm load bearing capacity of route over which structure will be moved.
- D. Coordination: Arrange with applicable authorities for traffic control, police escorts, relocation of services, and arrangements for legally moving structure.
 - 1. Coordinate exact route with authorities.
 - 2. Verify locations of utility services and establish and obtain approvals for methods of avoiding.
- E. Pre-Moving Conference: Convene pre-moving conference at least one week prior to commencing work for moving structure. Require attendance of parties involved with moving structure.
 - 1. Ascertain method for determining damage to structure and finishes before and after moving.

2. Review intended route for moving and identify existing damage to surfaces on route of move.
3. Identify method and responsibility for repairs after moving.
4. Review coordination with affected utility companies.

1.3 SUBMITTALS

- A. Subcontractor Experience: Submit experience information including details regarding damages from moving existing structures and methods used to be prevent such damages on this Project.
- B. Methods: Submit detailed description of method of moving structure along with designated route for move.
- C. Permits: Submit permits for moving structure.
- D. Design/Build Certificates: Submit certification signed by California licensed structural engineer indicating compliance with Contract Documents and code requirements.

1.4 QUALITY ASSURANCE

- A. Moving Subcontractor Qualifications: Company with minimum five years successful experience moving structures like Project and capable of providing complete information regarding experience.
 1. Submit complete information indicating experience in building moving including list of projects, dates, name of owner, telephone number, and pictures of structure before and after move.

1.5 PROJECT CONDITIONS

- A. Place markers to indicate location of disconnected services.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide equipment, supports, framing, reinforcement, and bracing as required to transfer loads of structure to transport carrying structure and to prevent damage to structure.
- B. Carefully remove, store and protect materials that cannot be secured during move and which can be removed and reinstalled to original condition.
 1. Inventory and record condition of items removed that cannot be secured.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare site, route of transport, and destination site.
- B. Secure operating, moving, and suspended items such as doors, windows, and light fixtures, in manner to prevent damage to items and to structure during move.
 - 1. Items may be removed and reinstalled after structure is moved.

3.2 APPLICATION

- A. Prevent movement of building components to maximum degree possible, provide and place bracing and be responsible for safety and support of structure and components.
 - 1. Assume liability for damage and injury.
- B. Carefully shore and brace structure prior to final disconnection and removal from existing foundation; cut structure free of foundation.
 - 1. Use methods that do not damage materials indicated to remain.
 - 2. Cut concrete and masonry using masonry saws and hand tools; provide sharp clean cuts requiring minimal patching for new construction.
 - 3. Use impact tools only where specifically approved in advance for areas where operations do not damage building.
 - 4. Perform work in accordance with authorities having jurisdiction.
 - 5. Remove demolished materials from site along with contaminated, vermin infested, and dangerous materials encountered; dispose of by safe means so as not to endanger health of workers or public.
- C. Move structure in one piece, unless otherwise approved in writing, maintaining structural and integrity of structure for future restoration.
 - 1. Raise structure clear of foundation in manner to prevent damage.
 - 2. Cease operations if safety of structure appears to be endangered; take precautions to properly support structure.
 - 3. Do not resume operations until safety is restored.
 - 4. Move structure, control speed, and provide anchor and restraining devices; maintain integrity of structure.
- D. Transport structure by methods which minimize transfer of movement to structure and which prevents racking, twisting, and distortion.
 - 1. Protect adjacent structures and property from damage during move.

- E. Carefully position and lower structure onto new foundation and secure in place to resist seismic loads in conformance with California Building Code.
 - 1. Do not remove bracing, shoring, and supports until structure is fully secured to new foundation.
 - 2. Adjust structure on new foundation level and true to lines to permit doors to swing properly, windows to open properly, floor surfaces level, and walls plumb.
 - 3. Acceptable Tolerances:
 - a. Maximum Variation from Level and Plumb: 1/4".
 - b. Maximum Offset from Original Position: 1/4".
- F. Reinstall items temporarily removed prior to moving to prevent damage.
- G. Leave structure secure from unauthorized entry with doors intact and locked and temporary plywood construction covering holes and openings not otherwise enclosed.
- H. Remove tools and equipment upon completion of work; leave both areas in condition acceptable to Owner and Architect.

3.3 REPAIR

- A. Repair damage to building, route, and adjacent construction caused as result of moving structure.
- B. Refinish damaged surfaces to match original condition.
- C. Pay third party claims for incidental damages.

END OF SECTION

SECTION 09 90 00

PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Provide painting and finishing of exposed items and surfaces requiring field painting and finishing including shop primed items.
1. Specified surface preparation, priming and coats of paint are in addition to shop-priming and surface treatment specified under other sections of work.
 2. Painting and finishing include field finishing of exterior and interior items not listed as "Surfaces not to be Painted" unless clearly indicated otherwise.
 3. Painting and finishing include field finishing of select shop finished items such as mechanical grilles and registers and shop primed items such as access panels and louvers in doors, to match adjacent surfaces.
 - a. Match adjacent surfaces in color and sheen unless otherwise indicated.
 4. Field paint exposed bare and covered pipes, ducts, and hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work in occupied spaces.
 5. Wood Doors: Contractor option to factory finish or field finish, coordinate with Section 08 14 00 - Wood Doors.
- B. Surfaces Not to be Painted:
1. Finished items including finished metal surfaces.
 2. Walls and ceilings in concealed areas and generally inaccessible areas.
 3. Moving parts of operating mechanical and electrical units.
 4. Labels: Keep equipment identification and fire rating labels free of paint.
 5. Plastic smoke stops and weather-stripping at doors.
- C. Related Sections: Shop priming of ferrous metal items is included under various Specification sections.
1. Section 06 40 00: Shop finishing of architectural woodwork.
 2. Section 09 64 30: Wood floor finish.
 3. Section 09 64 60: Wood athletic floor finish.
 4. Section 09 67 20: Decorative epoxy coating.
 5. Section 09 96 70: High performance coating for exterior steel.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's technical information, including paint label analysis and application instructions for each material.

- B. Samples: Submit samples for review of color and texture; provide list of material and application for each coat of each finish sample.
 - 1. Brush-Outs: Submit samples of each color and material with texture to simulate actual conditions, on hardboard.
 - a. Submit 8" by 10" samples of wood finishes on actual wood surfaces; label and identify each as to location and application.
 - b. Submit samples of concrete masonry (maximum 4" square) defining filler, prime and finish coats.
 - 2. Field Samples: Duplicate painted finishes of approved samples on actual wall surfaces and components for approval prior to commencing work.
 - a. Size: Minimum 100 sf located where approved.
 - b. Components: One full component as directed.
 - c. Simulate finished lighting conditions for review.
- C. Manufacturer Certificates: Furnish certificates from each manufacturer stating materials are top quality lines and suitable for intended use on this Project.

1.3 QUALITY ASSURANCE

- A. Sustainability Requirements: Comply with CALGreen requirements including those relative to finish material pollution control for paints and coatings.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, with:
 - 1. Name of material, color and sheen.
 - 2. Manufacturer's name, stock number and date of manufacture.
 - 3. Contents by volume, for major pigment and vehicle constituents.
 - 4. Thinning and application instructions.

1.5 SITE CONDITIONS

- A. Apply water-base paints when temperature of surfaces and surrounding air are between 50 and 90-degrees F.
- B. Do not apply paint in rain, fog or mist; or when relative humidity exceeds 85 percent; or to damp or wet surfaces.
- C. Painting may be continued during inclement weather if areas to be painted are enclosed and heated within temperature limits specified.
- D. Provide additional temporary ventilation during interior application of paints to eliminate volatile organic compound (VOC) emissions from interior spaces as quickly as possible.

PART 2 - PRODUCTS

2.1 SYSTEMS MANUFACTURERS

- A. Benjamin Moore & Co.
- B. Sherwin-Williams Co.
- C. Pittsburgh Paints, PPG Pittsburgh Paints, including Glidden Professional.
- D. Dunn-Edwards Corp.
- E. Kelly Moore Paint Co.
- F. Vista Paint Co.
- G. Frazee Paint Co.
- H. Substitutions: Refer to Section 01 25 00.

2.2 MATERIALS

- A. System Description: Provide painting and finishing of exposed items and surfaces requiring field painting and finishing including shop primed items.
 - 1. Definition: "Painting" and "coating" as used herein means systems including primers, emulsions, enamels, stains, sealers and fillers, whether used as prime, intermediate or finish coats.
- B. Regulatory Requirements:
 - 1. Volatile Organic Compound (VOC) Emissions: Furnish materials approved for use by applicable air quality management district for limitations of volatile organic compounds for architectural or special coatings as applicable.

CALIFORNIA REQUIREMENT BELOW, REVISE IF OTHER METHOD USED AT EXIT STAIRS.

- 2. California Stair Stripes: Paint 2" stripes at stair nosing not otherwise marked, full tread and landing width, in accordance with California Code of Regulations, Title 24, Access Compliance requirements.
 - a. Exterior Stairs: Provide at landing and each tread in each stair run.
 - b. Interior Stairs: Provide at landing and last tread at each stair run.
- C. Material Quality: Provide top line quality commercial grade (professional painter) paints; materials not bearing manufacturer's identification as their top line product shall not be acceptable.
 - 1. Primers: Provide premium grade primers recommended by paint manufacturer for substrates indicated and for finish systems specified.

2. Undercoats and Barrier Coats: Provide undercoat paints produced by same manufacturer as finish coats; use only thinners approved by paint manufacturer and use only within recommended limits.
 3. Finish Coats: Provide finish coats capable of being washed with mild detergent without loss of color, sheen, or pigments.
 - a. Color pigments: Pure, non-fading, applicable types to suit substrates and service indicated; no lead content permitted.
 4. Finish Coat Coordination: Provide finish coats which are compatible with prime paints, undercoats, and barrier coats used.
 - a. Review other Specification sections in which prime paints are provided; ensure compatibility of total coatings systems.
 - b. Upon request from other trades furnish information on characteristics of finish materials proposed for use.
 - c. Provide barrier coats over incompatible primers or remove and prime as required.
 - d. Notify Architect in writing of any anticipated problems in use of specified coating systems with substrates primed by others.
- D. Colors and Finishes: Prior to commencement of painting work, Architect will furnish color chips for surfaces to be painted.
1. Use of proprietary names in color selection is not intended to imply exclusion of equivalent products of other manufacturers.
 2. Final acceptance of colors will be from samples applied on site.
 3. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Inspection: Examine areas and conditions under which painting work is to be applied.
1. Start of painting work indicates acceptance of surfaces and conditions of surfaces and conditions within any area.
 2. Where exposed items or surfaces are not specifically mentioned in Schedules, paint same as adjacent similar materials or areas.
 3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to a durable paint film.

- B. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as specified for substrate condition.
 - 1. Existing Painted Finishes:
 - a. Clean existing painted surfaces and remove oil, grease, dust, stains, scale, efflorescence, mildew, mold, algae, blisters, and non-adhering paint.
 - b. Measure adhesion of existing paints using ASTM D3359 tape test; remove existing coatings where poor adhesion is indicated.
 - c. Feather edges of severely deteriorated paint where several coats are removed as part of cleaning, to provide smooth transition for new paint.
 - d. Fill holes, cracks, and defects and fill and sand smooth, ready for new paint finish.
- C. Remove hardware, accessories, and items in place and not to be painted, or provide protection prior to surface preparation and painting; after painting reinstall removed items.
- D. Clean surfaces before applying paint; remove oil and grease prior to mechanical cleaning; program cleaning so contaminants from cleaning process do not fall onto wet, newly painted surfaces.
- E. Cementitious Materials: Prepare by removing efflorescence, chalk, dirt, grease, oils, and by roughening as required to remove glaze.
 - 1. Determine alkalinity and moisture content of surfaces to be painted.
 - 2. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, neutralize before application of paint.
 - 3. Do not paint over surfaces where moisture content exceeds manufacturer's printed directions.
- F. Wood: Clean wood surfaces of dirt, oil, and other foreign substances; sandpaper smooth surfaces exposed to view and dust off.
 - 1. Scrape and clean seasoned knots and apply thin coat of recommended knot sealer, before application of priming coat.
 - 2. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job; prime edges, ends, faces, undersides, and backsides of wood.
 - 3. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler; sandpaper smooth when dry.
- G. Ferrous Metals: Touch up shop-applied prime coats wherever damaged using same type of primer as applied in shop or barrier coat compatible with finish paint.
 - 1. Bare Surfaces: Clean surfaces that are not galvanized or shop-coated, of oil, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

2. Galvanized Surfaces: Clean free of oil and surface contaminants, using non-petroleum-based solvent; primer and touch-up primer to be zinc-rich primer.
- H. Mix painting materials in accordance with manufacturer's directions.
- I. Store materials in tightly covered containers; maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.
- J. Stir materials before application to produce mixture of uniform density and stir as required during application; do not stir surface film into material, if necessary, strain material before using.

3.2 APPLICATION

- A. Apply paint in accordance with manufacturer's directions; use applicators and techniques best suited for substrate and type of material being applied.
1. Apply additional coats when stains or blemishes show through final coat, until paint is a uniform finish, color and appearance.
 2. Provide extra attention during application to assure dry film thickness at corners and crevices is equivalent to that of flat surfaces.
 3. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces; paint surfaces behind permanently fixed equipment and furniture with prime coat only.
 4. Finish doors on tops, bottoms and side edges same as faces.
 5. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 6. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
 7. Sand lightly between coats when recommended by system manufacturer.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated or prepared for painting as soon as practicable after preparation.
1. Allow time between successive coatings to permit proper drying.
 2. Do not recoat until paint feels firm and does not deform or feel sticky under moderate thumb pressure.
- C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended by coating manufacturer.
- D. Prime Coats: Apply to items not previously primed; recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat.

- E. Finish Coats: Provide even texture; leave no laps, irregularity in texture, skid marks, or other surface imperfections.
 - 1. Opaque Finishes: Provide opaque, uniform finish, color and coverage; cloudiness, spotting, holidays, brush marks, runs, sags, ropiness, and other surface imperfections are not acceptable.
 - 2. Transparent and Stained Finishes: Produce glass smooth surface film of even luster; provide with no cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, and other surface imperfections.
- F. Completed Work: Match approved samples for color, texture and coverage; remove, refinish or repaint work not accepted.

3.3 PAINTING SCHEDULE

- A. Exterior Work: Provide following paint systems and sheens unless otherwise indicated.
 - 1. Metal: Semigloss sheen.
 - a. 1st Coat: Touch-up primer, prime if none.
 - b. 2nd and 3rd Coat: Exterior 100% acrylic enamel.
 - 2. Metal: High-performance coating specified in Section 09 96 70.
 - 3. Concrete: Flat sheen.
 - a. 1st and 2nd Coat: Exterior acrylic latex emulsion.
 - 4. Concrete, Elastomeric Coating:
 - a. Refer to Section 09 96 80 – Elastomeric Coating.
 - 5. Plaster: Flat sheen.
 - a. 1st and 2nd Coat: Heavy body vapor permeable waterproof elastomeric acrylic coating.
 - 6. Plaster: Flat sheen.
 - a. Refer to Section 09 96 80 – Elastomeric Coating.
 - 7. Concrete Masonry Units: Flat sheen.
 - a. 1st Coat: Surface filler.
 - b. 2nd and 3rd Coat: Heavy body waterproof acrylic emulsion.
 - c. Apply filler at rate to ensure coverage with pores filled.
 - 8. Concrete Masonry Units: Flat sheen.
 - a. Refer to Section 09 96 80 – Elastomeric Coating.

9. Fiber Cement Siding: Flat sheen.
 - a. 1st Coat: Alkali resistant primer.
 - b. 2nd and 3rd Coat: Exterior 100% acrylic enamel.
 10. Opaque Finished Wood: Semigloss sheen.
 - a. 1st Coat: Primer undercoat.
 - b. 2nd and 3rd Coat: Exterior 100% acrylic enamel.
 11. Stained Wood: Flat sheen.
 - a. 1st Coat: Exterior semi-transparent penetrating stain.
 12. Natural Finish Wood: Flat sheen.
 - a. 1st Coat: Exterior clear penetrating wood sealer and preservative.
 13. Traffic Line Paint: Manufacturer's standard sheen; colors as required by line or symbol; blue for handicapped parking spaces.
 - a. 1st and 2nd Coat: Water based acrylic/epoxy traffic line paint; other systems subject to prior approval by Architect.
- B. Interior Work: Provide following paint systems and sheens unless otherwise indicated.
1. Gypsum Board Systems: Eggshell (satin) sheen at walls, flat sheen at ceilings, semigloss sheen at toilet rooms.
 - a. 1st Coat: Universal primer.
 - b. 2nd and 3rd Coat: Interior latex or acrylic latex emulsion.
 2. Metal: Semigloss sheen.
 - a. 1st Coat: Touch-up primer, prime if none.
 - b. 2nd and 3rd Coat: 100% acrylic enamel.
 3. Opaque Finished Wood: Semigloss sheen.
 - a. 1st Coat: Primer undercoat.
 - b. 2nd and 3rd Coat: 100% acrylic enamel.
 4. Stained Wood: Satin rubbed sheen.
 - a. 1st Coat: Wood stain.
 - b. 2nd Coat: Sanding sealer.
 - c. 3rd and 4th Coat: Acrylic modified urethane.
 - d. Fill open grained wood with filler and wipe before 2nd coat.

5. Transparent Finished Wood: Satin rubbed sheen.
 - a. 1st Coat: Bleached shellac.
 - b. 2nd and 3rd Coat: Acrylic modified urethane rubbing varnish.
 - c. Fill open grained wood with filler and wipe before 1st coat.
 6. Concrete: Flat sheen.
 - a. 1st Coat: Primer sealer.
 - b. 2nd and 3rd Coat: Interior latex emulsion.
 7. Concrete Masonry Units: Flat sheen.
 - a. 1st Coat: Surface filler.
 - b. 2nd and 3rd Coat: Interior latex emulsion.
 - c. Apply filler at rate to ensure coverage with pores filled.
 8. Plaster: Eggshell (satin) sheen at walls, flat sheen at ceilings, semigloss sheen at toilet rooms.
 - a. 1st Coat: Latex primer-sealer.
 - b. 2nd and 3rd Coat: Interior acrylic latex emulsion.
 9. Cotton and Canvas Covering Over Insulation: Flat sheen.
 - a. 1st (Size) Coat: Interior latex emulsion.
 - b. 2nd Coat: Interior latex emulsion.
 - c. Add fungicidal agent to render fabric mildew proof.
 10. Concrete Floors: Gloss sheen; non-slip finish.
 - a. 1st Coat: Concrete conditioner.
 - b. 2nd and 3rd Coat: Polyurethane coating.
 11. Wood Floors: Satin sheen; non-slip finish.
 - a. 1st Coat: Stain and filler as approved by Architect.
 - b. 2nd and 3rd Coat: Clear acrylic modified polyurethane.
- C. Special Whiteboard (Liquid Markers) Interior Wall Paint: Manufacturer's standard sheen and system.
1. Manufacturers:
 - a. Sherwin-Williams/Dry Erase Coating.
 - b. IdeaPaint (800.393.5250)/White Dry Erase Paint.
 - c. Substitutions: Refer to Section 01 25 00.
- D. Sheens: Comply with ASTM D523, reflectance of paint.
1. Flat: 1-10.
 2. Satin: 15-30.

3. Eggshell: 30-45.
4. Semigloss: 45-75.
5. Gloss: 75-100.

3.2 CLEAN-UP, PROTECTION, AND REPAIR

- A. Clean-Up: During progress of work, remove discarded paint materials, rubbish, cans and rags from site at end of each workday.
 1. Clean glass and paint-spattered surfaces immediately by proper methods of washing and scraping, using care not to scratch or damage finished surfaces.
- B. Protection: Protect work of other trades, whether to be painted or not; correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
 1. Provide "Wet Paint" signs to protect newly painted finishes.
 2. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
- C. Repair: At completion of work of other trades, touch-up and restore damaged surfaces or defaced painted surfaces.

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Provide general signage as indicated complete with attachment devices and accessories as required for complete installation.
- B. Related Sections:
 - 1. Section 09 90 00: Traffic line paint.
 - 2. Division 26: Photoluminescent exit signs.

1.2 SUBMITTALS

- A. Product Data: Furnish manufacturer's literature and indicate each sign type, style, color, and method of attachment.
- B. Shop Drawings: Furnish listing of sign types, lettering and locations, along with dimensions of each sign.
 - 1. Computerized Output: Furnish computerized samples of signs and graphics at full scale duplicating final appearance.
 - 2. Dimensional Letter Signs: Furnish complete shop drawings regarding fabrication and method of attachment of dimension letter signs.
 - 3. Photoluminescent Egress Path Signage: Submit complete shop drawings indicating locations of luminous egress path markings and signage.
- C. Samples: Furnish full size samples where requested.
- D. Certification: Furnish manufacturer certification that photoluminescent egress path markings and signage conform to California Building Code requirements.

1.3 QUALITY ASSURANCE

- A. Sustainability Requirements: Comply with CALGreen requirements including those relative to finish material pollution control for adhesives.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Package separately or in like groups of names, labeled as to names enclosed; include installation template, attachment system and installation instructions.

PART 2 - PRODUCTS

2.1 SYSTEMS MANUFACTURERS

- A. ASI Modulex, ASI Sign Systems, Inc.
- B. Mohawk Sign Systems.
- C. Vomar Products, Inc.
- D. Substitutions: Refer to Section 01 25 00.

2.2 MATERIALS

- A. System Description: Provide signage as indicated with attachment devices and accessories.
- B. Regulatory Requirements: Provide signs for assuring access for persons with disabilities in accordance with state and federal regulations.
 - 1. California Regulations: Comply with California Building Code.
 - 2. Federal Regulations: Comply with Americans with Disabilities Act (ADA) Standards.
- C. Dimensional Letter Signage: Provide individual letter signs as indicated.
 - 1. Aluminum: Manufacturer's standard for individual letter signs.
 - a. Finish: Clear anodized finish, AA-M12C22A41, Class I, AAMA 607.1.
 - 2. Stainless Steel: ASTM A666, Type 304 nonmagnetic corrosion resistant stainless steel with No. 4 satin directional polish finish.
 - 3. Fabrication: Fabricate dimensional letters as indicated, of minimum 0.25" plate or casting with edges and corners smooth and finished to match adjacent metal finishes.
 - 4. Attachment: Secure letters using connections concealed after installation; method subject to Architect approval.
 - a. Take care back welding does not damage exposed sign surfaces.
- D. Toilet Room Door Signs: Provide door signs conforming to California requirements for signs for toilet rooms; concealed mounting system.
 - 1. Material, Plastic: Manufacturer's standard colored plastic/photopolymer signs.
 - a. Texture: Smooth.
 - b. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.

2. Material:
 - a. Aluminum: Manufacturer's standard for individual letter signs.
 - 1) Finish: Clear anodized finish, AA-M12C22A41, Class I, AAMA 607.1.
 - b. Stainless Steel: ASTM A666, Type 304 nonmagnetic corrosion resistant stainless steel with No. 4 satin directional polish finish.
3. Total Thickness: 0.25".
4. Provide signs required by California Code of Regulations Title 24.
 - a. Men's Room: 12" equilateral triangle, vertex pointing up.
 - b. Ladies' Room: 12" diameter circle.
 - c. Unisex Toilet: 12" diameter circle with equilateral triangle, vertex pointing up, superimposed on the circle; circle and triangle each 0.25" thick.
 - 1) Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.
5. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.
6. Symbols: As selected from manufacturer's standard symbols.
7. Adhesive: Type as recommended by sign manufacturer for type of substrate involved.
- E. Toilet Room Wall Signs: Provide signs conforming to California Building Code and ADA Standards for signs for permanent rooms, with inset symbols and with raised and Braille characters; concealed mounting system.
 1. Material, Plastic: Manufacturer's standard colored plastic/photopolymer signs.
 - a. Texture: Smooth.
 2. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.
 3. Material:
 - a. Aluminum: Manufacturer's standard for individual letter signs.
 - 1) Finish: Clear anodized finish, AA-M12C22A41, Class I, AAMA 607.1.
 - b. Stainless Steel: ASTM A666, Type 304 nonmagnetic corrosion resistant stainless steel with No. 4 satin directional polish finish.
 4. Comply with California Building Code and ADA Standards for raised and Braille characters, pictorial symbols, finish, and contrasts requirements.

- F. Entry Decals: Provide minimum 6" square decals with international handicapped symbol white on blue background with white border, applied to glass at accessible entry doors of existing buildings where all entry doors are not accessible.
- G. Porcelain Signs at Parking: Provide porcelain enamel on steel sign with beaded text and symbols meeting requirements of California Building Standards Code and with ADA Standards.
 - 1. At entry to parking provide state required sign indicating unauthorized vehicles parking in accessible parking spaces may be towed at owner's expense using exact wording required by CBC.
 - 2. Verify location and telephone number of location vehicle is to be towed with Owner; place this information as permanent part of sign wording.
 - 3. At parking spaces provide California required reflectorized sign, minimum 70 sq. inches, with symbol indicating accessibility.
 - 4. At van accessible parking spaces provide required "VAN PARKING" signs.
- H. Tactile Exit Door Signs: Provide colored plastic/photopolymer signs, conforming to California Building Code Section 1011.3 and ADA Standards for signs for permanent rooms, with tactile raised and Braille characters; concealed mounting system.
 - 1. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.
 - 2. Size and Style: As indicated on Drawings.
- I. Room Identification and Direction Signs: Provide signs conforming to California and ADA Standards for permanent signs, total thickness 0.125"; provide raised and Braille characters conforming to California and ADA Standards; concealed mounting.
 - 1. Material, Plastic: Manufacturer's standard colored plastic/photopolymer signs.
 - a. Texture: Smooth.
 - 2. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.
 - 3. Material:
 - a. Aluminum: Manufacturer's standard for individual letter signs.
 - 1) Finish: Clear anodized finish, AA-M12C22A41, Class I, AAMA 607.1.
 - b. Stainless Steel: ASTM A666, Type 304 nonmagnetic corrosion resistant stainless steel with No. 4 satin directional polish finish.
 - 4. Sizes and Styles: As indicated on Drawings, as directed by Architect where not otherwise indicated.

- J. Applied Copy Signs and Graphics: Letters and graphics as indicated on Drawings; Contractor option of silk-screen or vinyl applied.
 - 1. Silk-screen Signs and Graphics: Computer design screens for signs and graphics to designs and criteria established by Architect.
 - a. Silk-screen Lacquer: Match Advanced Screen Products/Industrial Gloss Lacquer Silk-screen Ink; colors as selected by Architect.
 - 2. Vinyl Signs and Graphics: Computer design vinyl signs and graphics to designs and criteria established by Architect.
 - a. Vinyl: Opaque non-reflective vinyl film, minimum 0.0035" thick, with pressure sensitive adhesive backing suitable for applications indicated; match 3M/Scotchcal Vinyl Film.
 - 3. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.

- K. Tactile Emergency Evacuation Signs: Silk-screened polycarbonate with screening on back and with tactile and Braille information conforming to California requirements and ADA Standards.
 - 1. Information: Provide sign system with information as required by applicable authorities for emergency egress.
 - 2. Silk-Screen Colors:
 - a. Colors: Where color is not indicated on Drawings or Finish Schedule, provide custom color as directed by Architect.
 - b. Silk-screen Lacquer: Match Advanced Screen Products/Industrial Gloss Lacquer Silk-screen Ink; colors as selected by Architect.
 - 3. Size and Style: As indicated on Drawings and acceptable to applicable authorities.
 - 4. Attachment: Method subject to Architect approval.

- L. Photoluminescent Egress Path Markings and Signage: Provide exit path marking and signage required by applicable codes including but not limited to exit path markings, stair nosing, handrails, demarcation and obstruction markings, doors, and hardware.
 - 1. Acceptable Manufacturers:
 - a. Balco Inc./IllumiTread Exit Path Markings.
 - b. ZERO International/Exit Marking Systems.
 - c. American Permalight Inc./Egress Path Markings.
 - d. Active Safety/Egress Path Markings.
 - e. Substitutions: Refer to Section 01 25 00.
 - 2. Refer to CBC Title 24, Part 2, Section 1025.

3. System: UL 1994 listed.
4. Photoluminescent exit signs are in Division 26.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs in accordance with manufacturer recommendations and installation instructions, free from distortions and defects.
- B. Dimensional Letter Signage: Locate dimensional letters with spacing based on full-size computer-generated installation drawings secured to structure as required to resist anticipated loads.
 1. Final Location: As approved in field by Architect based on full size drawings.
- C. Toilet Room Door Signs: Install signs on doors after doors are painted and finished.
 1. Location: Mount signs with centerline of sign between 58" and 60" height as required by applicable code.
 2. Install centered and level, in line, in accordance with the manufacturer's recommendations.
 3. Clean and polish, remove excess adhesive.
- D. Toilet Room Wall Signs: Install signs on walls after surfaces on which they are to be mounted are painted and finished.
 1. Location: Mount signs at 48" to 60" height as required by applicable codes on strike side of door.
 2. Location: Mount signs with tactile characters 48" minimum (baseline of lowest Braille cells) and 60" maximum (baseline of highest line of raised characters) above finished floor and with on strike side of door for room identification signs as required by applicable codes, at heights indicated on details.
 3. Install level, in line, in accordance with California Building Code and ADA Standards to allow a person to approach within 3" of signs without being within a door swing and without encountering protruding objects.
 4. Clean and polish, remove excess adhesive.
- E. Entry Signs: Install in locations as approved by Architect.
- F. Stair Signs: Install signs inside stairwell after walls are finished, at locations immediately adjacent to door on strike side as required by referenced code, readily visible when door is open.
 1. Location: Mount signs at 48" to 60" height as required by applicable codes.

- G. Parking Signs: Provide mounting hardware, including painted posts, as needed; mount signs at heights required by state code.
 - 1. Install parking entry sign at location as directed by Architect.
- H. Tactile Exit Door Signs: Install at doors with lighted "EXIT" signs; apply after walls are finished.
 - 1. Location: Mount signs at 48" to 60" height as required by applicable codes on strike side of door.
 - 2. Install level, in line, in accordance with the manufacturer's recommendations and ADA Standards to allow a person to approach within 3" of signs without being within a door swing and without encountering protruding objects.
 - 3. Clean and polish, remove excess adhesive.
- I. Room Identification and Direction Signs: Install signs after walls are finished.
 - 1. Location: Mount signs at 48" to 60" height as required by applicable codes on strike side of door for room identification signs, where indicated for direction signs.
 - 2. Room Identification Signs Location: Mount signs with tactile characters 48" minimum (baseline of lowest Braille cells) and 60" maximum (baseline of highest line of raised characters) above finished floor and with on strike side of door for room identification signs and where indicated for directional signs.
 - 3. Install signs level, in line, in accordance with the manufacturer's recommendations, California Building Code and ADA Standards.
 - 4. Install room identification signs at doors to allow a person to approach within 3" of signs without being within a door swing and without encountering protruding objects.
 - 5. Clean and polish, remove excess adhesive.
- J. Applied Copy Signs and Graphics: Examine surfaces and construction for conditions adversely affecting installation, performance and quality of work.
 - 1. Apply signage and graphics centered and level, in line, in accordance with manufacturer's recommendations.
- K. Emergency Evacuation Signs: Install signs after walls are finished.
 - 1. Location: Mount signs at locations indicated, as directed by Architect and applicable authorities if not otherwise indicated.
 - 2. Install signs level and in accordance with the manufacturer's recommendations and requirements of applicable authorities.
 - 3. Clean and polish.

- L. Photoluminescent Egress Path Markings and Signage: Install exit path marking and signage as required by applicable codes.

END OF SECTION

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SECTION 26 00 00 - GENERAL ELECTRICAL SPECIFICATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This specification shall apply to all phases of Work hereinafter specified, shown on Drawings, or as required to provide a complete installation of electrical systems for this Project. Work required under this specification is not limited to just the Electrical Drawings - refer to Architectural, Structural, Landscape, and Mechanical/Plumbing Drawings, as well as all other drawings applicable to this project, which designate the scope of work to be accomplished. The intent of the Drawings and Specifications is to provide a complete and operable electrical system that includes all documents that are a part of the Contract.
1. Work Included: Furnish labor, material, services and skilled supervision necessary for the construction, erection, installation, connections, testing, and adjustment of all circuits and electrical equipment specified herein, or shown or noted on Drawings, and its delivery to the Owner complete in all respects ready for use.
 2. The electrical Work includes installation or connection of certain materials and equipment furnished by others. Verify installation details, installation and rough-in locations from the actual equipment or from the equipment shop drawings.
- B. Electrical Drawings: Electrical Drawings are diagrammatic, and are intended to convey the scope of work, indicating intended general arrangement of equipment, conduit and outlets. Follow Drawings in laying out Work and verify spaces for installation of materials and equipment based on actual dimensions of equipment furnished.

1.02 QUALITY ASSURANCE

- A. Design, manufacture, testing and method of installation of all apparatus and materials furnished under requirements of these specifications shall conform to latest publications or standard rules of the following:
1. Institute of Electrical and Electronic Engineers - IEEE
 2. National Electrical Manufacturers' Association - NEMA
 3. Underwriters' Laboratories, Inc. - UL
 4. National Fire Protection Association - NFPA
 5. Federal Specifications - Fed. Spec.
 6. American Society for Testing and Materials - ASTM
 7. American National Standards Institute - ANSI
 8. National Electrical Code - NEC
 9. National Electrical Safety Code - NESC
 10. Insulated Cable Engineers Association - ICEA
 11. American Institute of Steel Construction - AISC
 12. State and Municipal Codes In Force In The Specific Project Area

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13. Occupational Safety and Health Administration (OSHA)
14. Electronics Industries Association/Telecommunications Industry Association (EIA/TIA)
15. California Electrical Code (where adopted)
16. Local Authority Having Jurisdiction (AHJ) Published Electrical Standards and Codes

- B. Perform Work in accordance with the National Electrical Code, applicable building ordinances, and other applicable codes, hereinafter referred to as the "Code." The Contractor shall comply with the Code including local amendments and interpretations without added cost to the Owner. Where Contract Documents exceed minimum requirements, the Contract Documents take precedence. Where code conflicts occur, the most stringent shall apply unless variance is approved.
1. Comply with all requirements for permits, licenses, fees and codes. The Contractor, at Contractor's expense, shall obtain all permits, licenses, fees, special service costs, inspections and arrangements required for Work under this contract, unless otherwise specified.
 2. Comply with requirements of the applicable utility companies serving this Project. Make all arrangements with utility companies for proper coordination of Work.

1.03 GENERAL REQUIREMENTS

- A. Guarantee: Furnish a written guarantee for a period of (1) one-year from date of acceptance.
- B. Wherever a discrepancy in quantity or size of conduit, wire, equipment, devices, circuit breakers, etc., (all materials), arises on the Drawing and/or Specifications, the Contractor shall be responsible for providing and installing all material and services required by the strictest condition noted on Drawings and/or in Specifications to ensure complete and operable systems as required by the Owner and Engineer.
- C. All Core Cutting, Drilling, and Patching:
1. For the installation of work under this Section, the aforementioned shall be performed under this Section of the Specifications and the Concrete section of the Specifications.
 2. No holes will be allowed in any structural members without the written approval of the Project's Structural Engineer.
 3. For penetrations of concrete slabs or concrete footings, the work shall be as directed in the Concrete Section of Specifications.
 4. The Contractor shall be responsible for patching and repairing surfaces where he is required to penetrate for work under this contract.
 5. Penetrations shall be sealed to meet the rated integrity of the surface required to be patched and repaired. The patched surface shall be painted or finished to match the existing surface.
- D. Verifying Drawings and Job Conditions:

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1. The Contractor shall examine all Drawings and Specifications in a manner to be fully cognizant of all work required under this Section.
2. The Contractor shall visit the site and verify existing conditions. Where existing conditions differ from Drawings, adjustment(s) shall be made and allowances included for all necessary equipment to complete all parts of the Drawings and Specifications.

1.04 WORK IN COOPERATION WITH OTHER TRADES

- A. Examine the Drawings and Specifications and determine the work to be performed by the electrical, mechanical and other trades. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, disconnects, relays, and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment.
- B. Provide a conduit-only system for low voltage wiring required for control of mechanical and plumbing equipment described in this or other parts of the Contract Documents. Install all control housings, conduits, and backboxes required for installing conductors to the controls.
- C. Install separate conduits between each heating, ventilating and air conditioning sensing device and its control panel and/or control motor. Before installing any conduit for heating, ventilating and air conditioning control wiring, verify the exact requirements from the control diagrams provided with the equipment manufacturer's shop drawings.

1.05 TESTING AND ADJUSTMENT

- A. Upon completion of all electrical work, the Contractor shall test all circuits, switches, light fixtures, lighting control and dimming systems including distributed systems, UPSs, generators, SPDs, lighting inverters, transfer switches, motors, circuit breakers, motor starters and their auxiliary circuits and any other electrical items to ensure perfect operation of all electrical equipment.
- B. Equipment and parts in need of correction and discovered during such testing, shall be immediately repaired or replaced with all new equipment and that part of the system shall then be retested. All such replacement or repair shall be done at no additional cost to the Owner.
- C. All circuit(s) shall be tested for continuity and circuit integrity. Adjustments shall be made for circuits not complying with testing criteria.
- D. All test reports, including copies of any required Energy Code Acceptance Forms (e.g. CA Title 24 Acceptance for Code Compliance Forms) should be submitted to the Engineer at completion of project.

1.06 IDENTIFICATION

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- A. Nameplates shall be provided for unit substations, switchgear, switchboards, distribution boards, distribution panels, panel boards, motor control centers, transformers, transfer switches, contactors, starters, disconnect switches, enclosed circuit breakers/switches, inverters, UPSs, PDUs, RDCs, SPDs, lighting control panels, dimming panels, door releasing system panels, fire alarm/central monitoring terminal cabinets/power supplies/control panels, and all low voltage system terminal and control cabinets.
1. Nameplate inscriptions shall be identical to the equipment designations indicated in plans and specifications. Nameplates shall be engraved with the device designation/identification on the top line, source identification for the device on the 2nd line per NEC, or CEC where adopted, Art 408.4 and load designation for the device on the bottom line. Where load designation consists of a branch circuit, omit bottom line. Where device designation is not indicated on plans/specifications, Contractor shall submit a written clarification request to the Engineer.

Example: Transformer 1TA
Source Disconnecting Location: Switchboard MSA located in Rm 110
Load: Panels 1LA and 1 LB
 2. All circuit breakers/fuses in switchgear, switchboards, distribution boards, distribution panels, UPS output circuit breakers, PDU sub-feed circuit breakers and motor control centers shall have individual nameplates located immediately adjacent to the respective device. Nameplate inscription shall identify the downstream equipment or device served by the circuit breaker or fuse.
- B. Identification nameplates, UON, shall be laminated/extruded modified acrylic that is 3/32" thick, UV-stabilized, matte finish, suitable for use in 180 deg. F ambient, with beveled edges and engraved white letters 3/8" high, minimum, on 1-1/2" high black background (utility/normal and optional standby power systems) for single line of text. Where two lines of text are required, provide minimum 2" high nameplate. Where three lines of text are required, provide minimum 2.5" high nameplate. Provide white letters on red background for all NEC, or CEC where adopted, Article 517 essential power systems, Article 700 Emergency Systems, Article 701 Legally required standby systems and Article 708 COPS.
- C. Identification nameplates for new switchgear, switchboards, distribution boards, distribution panels, panel boards and motor control centers shall be attached with switchgear manufacturer-provided screws via switchgear manufacturer factory pre-drilled holes. A factory option to rivet identification nameplates to the equipment is only acceptable if screw-fastened nameplates are not an available option from the switchgear manufacturer. Field drilling or other mechanical attachment methods that change/void the NEMA or NTRL rating of the enclosure are strictly forbidden.
- D. Identification nameplates for transformers, transfer switches, disconnect switches, enclosed circuit breakers/switches, inverters, UPSs, PDUs, RDCs, SPDs, lighting control panels, dimming panels, door releasing system panels, terminal cabinets and all circuit breakers/fuses in switchgear, switchboards, distribution boards, distribution

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panels, UPS output circuit breakers, PDUs, PDU sub-feed circuit breakers, and motor control centers shall be attached to the equipment by self-adhesive backing integral to the nameplates. When equipment is located outdoors, provide nameplates without self-adhesive backing and attach to equipment using weather-rated, UV-resistant epoxy. In all cases, clean surfaces before applying identification nameplates parallel to equipment lines.

- E. Warning Placards, as required by General Single Line Diagram Notes for multiple power sources, or instruction placards, as required for all kirk-key interlock schemes, all UPS bypass procedures or as required elsewhere in the plans/specifications shall be engraved 1/2" high white lettering on a red background using the same material specified for identification nameplates with a self-adhesive backing. Warning/instruction placards shall be attached to the face of the equipment directly related to the placards. Provide a formal placard submittal for review by the Engineer prior to ordering any warning/instruction placards. In all cases, clean surfaces before applying warning/instruction placards parallel to equipment lines.
 - F. Receptacles that are part of a UL-listed under floor computer room whip assembly, ceiling and/or cable/ladder tray-mounted receptacles used in lab, manufacturing, commercial kitchen environments or that are serving telecom/data/AV racks and cabinets shall have identification nameplates located on the wiring device plate cover. Nameplates shall be self-adhesive, 3/32" thick Micarta with beveled edges, engraved 1/4" high white lettering on black background with serving power source, circuit identification and NEMA/IEC receptacle type. Use of two (2) separate nameplates per device plate cover is acceptable. Affix nameplates to be visible when plugs are occupying receptacles.
 - G. See wiring device section of this specification for wiring device plate cover labeling requirements.
 - H. See drawings for panel board schedule directory installation requirements.
 - I. See conduit installation section of this specification for conduit labeling requirements.
- 1.07 FINAL INSPECTION AND ACCEPTANCE
- A. After all requirements of the Specifications and/or the Drawings have been fully completed; representatives of the Owner will inspect the work. Contractor shall provide competent personnel to demonstrate the operation of any item or system to the full satisfaction of each representative.
 - B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.
- 1.08 RECORD DRAWINGS

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- A. Drawings of Record: The Contractor shall provide and keep up-to-date, a complete record set of drawings. These shall be corrected daily and show every change from the original Drawings. This set of prints shall be kept on the job site and shall be used only as a record set. This shall not be construed as authorization for the Contractor to make changes in the layout without definite instruction in each case. Upon completion of the work, a set of reproducible Contract Drawings shall be obtained from the General Contractor and all changes as noted on the record set of prints shall be incorporated thereon with black ink in a neat, legible, understandable and professional manner. Refer to the Supplementary General Conditions for complete requirements.

1.09 APPROVALS, EQUALS, SUBSTITUTIONS, ALTERNATIVES, NO KNOW EQUAL

- A. Approvals: Where the words (or similar terms) “approved”, “approval”, “acceptable”, and “acceptance” are used, it shall be understood that acceptance by the Owner, Architect and Engineer are required.
- B. Equal: Where the words (or similar terms) “equal”, “approved equal”, “equal to”, “or equal by”, “or equal” and “equivalent” are used, it shall be understood that these words are followed by the expression “in the opinion of the Owner, Architect, and Engineer.” For the purposes of specifying products, the above words shall indicate the same size, made of the same construction materials, manufactured with equivalent life expectancy, having the same aesthetic appearance/style (includes craftsmanship, physical attributes, color and finish), and the same performance.
- C. Substitution: For the purposes of specifying products, “substitution” shall refer to the submittal of a product not explicitly approved by the construction documents/ specifications.
1. Substitutions of specified equipment shall be submitted and received by the Engineer ten (10) days prior to the bid date for review and written approval. Regulatory Agency approval for all substitutions will be the sole responsibility of the Contractor. To receive consideration, requests for substitutions must be accompanied by documentary proof of its equality with the specified material. Documentary proof shall be in letterform and identify the specified values/materials alongside proposed equal values/materials. In addition, catalog brochures and samples, if requested, must be included in the submittal. **ONLY PRE-BID APPROVED PRODUCTS, ISSUED VIA A FORMAL BID ADDENDUM TO ALL BIDDERS, WILL BE ALLOWED ON THE PROJECT. REGARDLESS OF THE APPROVAL ON ANY SUBSTITUTION, ALL BIDS SHALL BE BASED ON THE PRODUCTS EXACTLY AS SPECIFIED. PRICING FOR EACH APPROVED SUBSTITUTION SHALL BE INCLUDED IN THE BID SUBMITTAL AS A SEPARATE LINE ITEM.**
 2. In the event that written authorization is given for a substitution, after award of contract, the Contractor shall submit to the Engineer quotations from suppliers/distributors of both the specified and proposed equal material for price comparison, as well as a verification of delivery dates that conform to the project schedule.

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3. In the event of cost reduction, the Owner will be credited with 100 percent of the reduction, arranged by Change Order.
 4. The Contractor warrants those substitutions proposed for specified items will fully perform the functions required.
- D. Alternates/Alternatives: For the purposes of specifying products, “alternatives/alternates” may be established to enable the Owner/Architect/Engineer to compare costs where alternative materials or methods might be used. An alternate price shall be submitted in addition to the base bid for consideration. If the alternate is deemed acceptable, written authorization will be issued.
- E. No Known Equal: For the purposes of specifying products, “No Known Equal” shall mean that the Owner/Architect/Engineer is not aware of an equivalent product. The Contractor will need to submit a “Substitution” item, per the requirements listed above, if a different product is proposed to be utilized.
- 1.10 SHOP DRAWINGS/SUBMITTALS
- A. Shop Drawings/Submittals, unless required otherwise by general project specifications or instructions to bidders, shall be submitted in electronic format (PDF) to include a Letter of Transmittal (PDF), which shall give a list of the drawings submitted with dates and/or system(s) components contained within the submittal. Drawings and material cut sheets shall be complete in every respect and edited/marked to indicate specific items being provided. Printed/Hard copies are not acceptable.
- B. The Shop Drawings/Submittals shall be marked with the name of the project, numbered consecutively, and bear the approval of the Contractor as evidence that the Contractor has checked the Drawings. Any Drawings submitted without this approval will be returned to the Contractor for resubmission.
- C. If the shop drawings show variations from the requirements of the Contract because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in the Contractor’s letter of transmittal. If the substitution is accepted, the Contractor shall be responsible for proper adjustment that may be caused by the substitution. Samples shall be submitted when requested.
- D. Only products listed as “Equal” within the contract documents, along with formally approved “Substitutions” will be reviewed. Products not conforming to these items will not be reviewed and will be returned to the Contractor for re-submittal.
- E. Review comments used in response to shop drawings/submittals are:
1. “No Exception Taken” - Product approved as submitted.
 2. “Furnish as Corrected” - Re-submittal not required, although the Contractor shall provide the submitted product with corrections as noted.
 3. “Revise and Resubmit” - Re-submittal required with corrections as noted.
 4. “Rejected” - Re-submittal required based upon the originally specified product.

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- F. Shop drawings shall be submitted on the following but not limited to:
1. Lighting Fixtures, Lamps, and Ballasts.
 2. Switchgear, Switchboards, Distribution Boards, Motor Control Centers, Panel boards, and Bus Ducts; complete with overcurrent device information.
 3. Transformers.
 4. Fire Alarm System/Central Monitoring System.
 5. Wiring Devices.
 6. Lighting Control System/Dimming System Products.
 7. Pullboxes and Underground Vaults.
 8. Terminal Cabinets
 9. Lighting Inverters, UPSs, RDCs, PDUs, Generators, Transfer Switches, SPD Systems.
 10. Cable Tray, Flexible Cable Tray and Cable Runway.
 11. Power Poles and Floor Boxes.
 12. Arc Flash, Short-Circuit and Coordination studies.
 13. All other products called out on drawings that call for shop drawing submittal.

1.11 MAINTENANCE, SERVICING, INSTRUCTION MANUALS AND WIRING DIAGRAMS

- A. Prior to final acceptance of the job, the Electrical Contractor shall furnish to the Owner at least four (4) copies of operating, maintenance, and servicing instructions, as well as four (4) complete wiring diagrams for the following, but not limited too, items or equipment:
1. Lighting Control System/Dimming Systems.
 2. Fire Alarm System.
 3. Transformers.
 4. Switchgear, Switchboards, Distribution Boards, Motor Control Centers, Panel boards, and Bus Ducts; complete with overcurrent device information
 5. Lighting Inverters, UPS's, PDUs, Generators, Transfer Switches, SPD Systems
- B. All wiring diagrams shall specifically cover the system supplied. Typical drawings will not be accepted. Four (4) copies shall be presented to the Owner.

1.12 INTERRUPTION OF SERVICE/SERVICE SHUTDOWN

- A. Any interruption of electrical services, electrical circuits, electrical feeders, signal systems, communication systems, fire alarm systems, etc. required to perform work, shall meet the specific prior-approval requirements of the Owner. Such work shall be scheduled with the Owner to be performed at the Owner's convenience.
- B. Interruptions/outages of any of the Owner's systems and services mentioned above shall be scheduled to occur during other than the Owner's normal business hours. Any overtime costs shall be borne by the Contractor.
- C. See drawings for any additional requirements regarding outages, interruption and any temporary services required.

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PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials and Equipment: All electrical materials and equipment, including custom-made equipment, shall be new and shall be listed by Underwriter's Laboratories (UL) and bear their label or be listed and certified by a Nationally Recognized Testing Lab (NRTL) that is also recognized by the local Authority-Having-Jurisdiction (AHJ)
- B. Switchgear/Switchboards/Distribution Boards/Motor Control Centers:
1. See general single line notes on single line drawing for more information.
- C. Panel boards – Branch Circuit:
1. See drawings for panel board schedules and specifications.
- D. Transformers:
1. See drawings for transformer schedules and specifications.
- E. Lighting Fixtures:
1. See drawings for lighting fixture and lamp schedules and additional specifications. Furnish, install and connect a lighting fixture at each outlet where a lighting fixture type symbol (designated on plans) is shown as being installed. Each fixture shall be complete with all required accessories including sockets, glassware, boxes, and spacers, mounting devices, fire rating enclosure and lamps.
2. Ballasts: See lighting fixture schedule notes. All noisy ballasts shall be replaced at no cost to the Owner.
3. Lamps: See lamp/fixture schedule and lamp/lighting fixture schedule notes.
- F. Wiring Devices:
1. Provide wiring devices indicated per plan. Devices shall be specification grade. Acceptable manufacturers are Leviton, Pass and Seymour and Hubbell. Provide all similar devices of same manufacturer, unless indicated otherwise. All device colors shall be from the full range of manufacturer standard color options as selected by the Architect. This selection will be made during the shop drawing review process
a. Wiring Devices (Decora)
1) Convenience Receptacle #16252
2) Dedicated Receptacle #16352
3) Convenience I.G. Receptacle #16262-IG
4) Dedicated I.G. Receptacle #16362-IG
5) Convenience G.F.C.I. Receptacle #N7599 or GFT1
6) Dedicated G.F.C.I. Receptacle #N7899 or GFNT2
7) Convenience Hospital Grade Receptacle #16252-HG
8) Dedicated Hospital Grade Receptacle #16352-HG
9) Convenience G.F.C.I. Hospital Grade #N7599-HGX or GFNT1-HG

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- | | | |
|-----|---|-----------------------|
| 10) | Dedicated G.F.C.I. Hospital Grade
GFNT2-HG | #N7899-HGX or |
| 11) | Tamper Resistant Convenience Receptacle | #TDR15 |
| 12) | Tamper Resistant Dedicated Receptacle | #TDR20 |
| 13) | Tamper Resistant GFCI Receptacle
GFTR2 | #T7899or |
| 14) | Tamper Resistant. Convenience. G.F.C.I. Hospital Grade Receptacle
#X7599-HGX or GFTR1-HG | |
| 15) | Tamper Resistant. Dedicated. G.F.C.I. Hospital Grade Receptacle
#X7899-HGX or GFTR2-HG | |
| 16) | Weather/Tamper Resistant GFCI Receptacle | #WT899 |
| 17) | Convenience Simplex Receptacle | #16251 |
| 18) | Dedicated Simplex Receptacle | #16351 |
| 19) | Recessed Clock Receptacle | #5361-CH (Non-Decora) |
| 20) | Single Pole Switch | #5621 |
| 21) | Double Pole Switch | #5622-2 |
| 22) | Three Way Switch | #5623-2 |
| 23) | Four Way Switch | #5624-2 |
| 24) | Pilot Light Switch "On" | #5628-2 |
| 25) | Pilot Light Switch "Off" | #5631-2 |
| 26) | Projection Screen Switch | #5657-2 |
| 27) | Low Voltage Momentary Switch | #5657-2 |
| 28) | Keyed Switch | #1221-2L (Non-Decora) |
| 29) | Door Jam Switch | #1865 |

- b. Use of dedicated receptacles is required where plans depict a branch circuit supplying only a single simplex or duplex receptacle. Use of controlled receptacles is required where depicted on plans - see controlled receptacle specifications for additional information.
2. I.G. (isolated ground) receptacle bodies shall be of a basic color specified above with an orange triangle to symbolize isolated ground.
 3. H.G. (hospital grade) receptacle bodies shall be of a basic color specified above with a green circle to symbolize hospital grade.
 4. When shown circuited with an I.G. conductor, receptacles shall be of an I.G. type. As an example, a NEMA L6-30R denoted on the plans and shown circuited with an I.G. conductor shall be an I.G. version of that receptacle.
 5. Wiring devices located in wood finished areas shall generally be black unless otherwise indicated by the Architect.
 6. Wiring devices located in mirrors shall generally be white with stainless steel cover plates unless otherwise indicated by the Architect.
 7. In addition to other device requirements listed elsewhere in this specification, 125V (Volt), 15A (Amp) and 20A Tamper-Resistant wiring devices shall be provided as follows:
 - a. In dwelling units per NEC, or CEC where adopted, Article 210.52.
 - b. In pediatric care areas per NEC, or CEC where adopted, Article 517.18(C).
 - c. In child care or day care facilities.
 - d. In wet and/or exterior locations.

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8. Wiring devices shall be listed "hospital grade", and so identified, in the following locations:
 - a. Patient bed locations within general care areas per NEC, or CEC where adopted, Article 517.18(B).
 - b. Patient bed locations within critical care areas per NEC, or CEC where adopted, Article 517.19(B).
 - c. In "other-than-hazardous" anesthetizing locations per NEC, or CEC where adopted, Article 517.61(C) (2).
9. Wiring device cover plates located on recessed boxes shall be commercial grade nylon. Plate color shall match wiring device color UON on plans. Cover plates utilized on surface mounted boxes shall be metal. Plastic cover plates are unacceptable.
10. Except as otherwise noted, all wiring device plates on the project shall be labeled with panel and circuit number(s) utilizing a Brother P-Touch labeling system with 1/2" tape (yellow on black) or equal by Herman-Tellerman or Panduit. Locate label on the concealed side of the wiring device plate. Handwritten labels are unacceptable.
11. The Contractor shall provide duplex receptacle outlets in the appropriate configurations necessary to comply with applicable energy code requirements for controlled receptacles and as shown on plans. All wiring devices indicated to be controlled receptacles shall be NEMA-approved, electrical code-compliant with factory markings on the face of the receptacle(s) with the word "Controlled" or utilize further markings and symbols to indicate which receptacles on each outlet is/are controlled. Stickers, field-applied markings or other non-permanent markings are not acceptable. Where a GFCI receptacle outlet is required to be controlled, provide an adjacent controlled duplex receptacle outlet connected on the load side of the GFCI outlet. Generally, one receptacle in a duplex receptacle outlet is required to be controlled. It may be the lower receptacle or upper receptacle based on manufacturer offering. However, the controlled receptacle location within a controlled receptacle outlet shall remain consistent throughout the project. Where an existing duplex receptacle outlet is required to be controlled, provide a new wiring device with the appropriate control configuration necessary to comply with plans. All controlled receptacles shall be connected to a branch circuit controlled by an occupancy sensor-based or relay panel lighting control system. Acceptable manufacturers are Leviton, Pass and Seymour and Hubbell.
12. The following wiring device plates shall have custom engraving:
 - a. Key operated switches, switches with pilot lights, and switches for the control of motors, heaters and ventilators. Engraving shall be black and occur on the exposed side of the plate indicating the motor, heater, or ventilator controlled.
 - b. Receptacles on optional standby generator and/or UPS power shall have custom engraved plates with the words "Generator" or "UPS" in black letters. In addition, where located in telecommunications closets, IDFs, server rooms, data centers, labs (wet, dry or electronic) indicate panel board and circuit number.

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- c. For Health Care Facilities, provide custom engraved device cover plates, for all devices, indicating panel board and circuit number. Devices served by normal/utility power circuits shall have black lettering. Devices served by essential electrical system power circuits shall have red lettering.
 - d. All stainless steel and nylon device plates shall be engraved using a rotary engraving process except for black lettering on stainless steel device plates which may be accomplished via laser etching process. All lettering shall be 3/16" high. Provide a dimensioned submittal drawing detailing a typical device faceplate with engraving.
- G. Weatherproof Outlet Covers/Assemblies: All Receptacles identified as weatherproof on the drawings shall be weather-resistant, tamper-resistant, GFCI type and equipped as follows:
- 1. Type WP-A: Recessed wall box with a hinged, lockable, cast aluminum, self-closing, gasket-equipped door that is wet location-listed rain tight while "in use". Unit shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). UON on drawings, provide a minimum of 2 separate compartments suitable for installation of power receptacles, AV or communications outlets. Additionally, unless otherwise noted on drawings, provide the following:
 - a. A 20A weather-resistant, tamper-resistant, GFCI duplex receptacle in the first compartment. Provide branch circuiting per plans.
 - b. A blank metal plate suitable for field installation of power, AV or communications devices in the second compartment.
 - c. Where indicated on plans as requiring data, AV, or other low voltage service outlet, provide minimum 3/4" C.O. with pull string routed from the second compartment to nearest low voltage pull box. Where shown mounted in a building wall, any blank/unused compartment shall be equipped min. 3/4" C.O. with pull string routed to the nearest accessible ceiling space.
 - d. See wiring device section of this specification for additional wiring device plate cover labeling requirements.
 - e. 1 key minimum per device (minimum of 2 per project) to the Owner's project manager upon completion of project.
 - f. Custom color powder coat finish as selected by Architect - Include all costs in base bid for same.
 - g. In locations with sufficient wall depth, provide 6" wide x 6" tall x 5-1/2" deep recessed wall box (C.W. Cole #TL310-WCS-K1-CUSTOM COLOR).
 - h. In locations utilizing shallow stud walls construction or other walls of insufficient depth, provide 10-3/4" wide x 7-3/8" tall x 3-7/8" deep recessed wall box (C.W. Cole #TL310-WCS-SH-K1 -CUSTOM COLOR).
 - i. See drawings for additional details.
 - 2. Type/Subscript WP-B: Wet location-listed raintight while "in use" cast copper-free aluminum lockable cover with baked aluminum lacquer finish and one gang, weather-resistant, tamper-resistant GFCI receptacle. Hubbell WP26E series. Polycarbonate covers are unacceptable. Unit shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). Contractor shall powder coat cover

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assembly to a custom color where receptacle locations are deemed by the Architect to be in aesthetically sensitive or public spaces. Custom color as selected by Architect.

3. Type WP-C: (C.W. Cole #TL310-WCS-PED-ADA-K1-CUSTOM COLOR or #TL310-WCS-PED-K1-CUSTOM COLOR) pedestal device box with a hinged, lockable, cast aluminum, self-closing, gasket-equipped door that is wet location-listed raintight while "in use". Unit shall comply with NEC, or CEC where adopted, Article 406.8(A) and (B). UON on drawings, provide a minimum of 2 separate compartments suitable for installation power receptacles, AV or communications outlets. Additionally, unless otherwise noted on drawings, provide the following:
 - a. A 20A weather-resistant, tamper-resistant, GFCI duplex receptacle in the first compartment. Provide branch circuiting per plans.
 - b. A blank metal plate suitable for field installation of power, AV or communications devices in the second compartment.
 - c. Where indicated on plans as requiring data, AV, or other low voltage service outlet, provide minimum 3/4" C.O. with pull string routed from the second compartment to nearest low voltage pull box.
 - d. See wiring device section of this specification for additional wiring device plate cover labeling requirements.
 - e. 1 key minimum per device (minimum of 2 per project) to the Owner's project manager upon completion of project.
 - f. Include all costs in base bid for ADA version (22.5" tall) of pedestal box. Prior to ordering material, contractor shall coordinate with Architect and/or AHJ to determine which pedestal box locations do not require ADA compliance and may be changed to the standard (11.5" tall) version of the pedestal box.
 - g. Custom color powder coat finish as selected by Architect. Include all costs in base bid for same.
 - h. See drawings for additional details.
4. Type/Subscript WP-D: Damp location-listed (not-Raintite-in-use) cast copper-free, pad lockable, die-cast aluminum cover with baked aluminum lacquer finish and one gang GFCI receptacle. Hubbell/Rayco 502?/503? Series. Polycarbonate covers are unacceptable. Unit shall comply with NEC, or CEC where adopted, article 406.8(a) and (b). Custom color powder coat finish as selected by Architect. Include all costs in base bid for same.

H. Motor Controllers/Starters: See drawings for motorized equipment schedules and specifications.

I. Circuit Breakers:

1. Service entrance circuit breakers smaller than 400A (Amp) frame shall be thermal-magnetic trip with inverse time current characteristics unless otherwise indicated below. Service entrance main circuit breakers and main circuit breakers. 400A frame and larger shall be 100% rated, solid-state type as outlined in this specification. All other service entrance circuit breakers, 400A

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- frame and larger, shall be 100% rated, solid-state type as outlined in this specification.
2. All non-service entrance circuit breakers 225A and larger shall be thermal magnetic type and have continuously adjustable instantaneous pick-ups of approximately 5 to 10 times trip rating. Breakers shall have either tamper-resistant rating dials or easily changed trip rating plugs with trip ratings as indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Additionally, all non-service entrance circuit breakers, 600A frame and larger, located in 480V, 3-phase, 3-wire or 277/480V, 3-phase, 4-wire switchgear, distribution boards, panel boards or busway plugs shall be solid state, 100% rated. Breaker shall have built-in test points for testing long delay, short delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120V operated test kit. Contractor shall utilize a test kit capable of testing all breakers 400A and above - at the Engineer's request.
 3. All non-service entrance circuit breakers less than 225A shall be molded plastic case, air circuit breakers conforming to UL 489. Provide breakers with thermal magnetic trip units, and a common trip bar for two- or three-pole breakers, connected internally to each pole so tripping of one pole will automatically trip all poles of each breaker. Provide breakers of trip-free and trip-indicating bolt-on type, with quick-make, quick-break contacts. Provide single two- or three-pole breaker interchangeability. Provide padlocking device for circuit breakers as shown on the Drawings.
 4. Where a Current Limiting Circuit Breaker (CLCB) is indicated on drawings or as required elsewhere in this specification, provide a UL listed current limiting thermal magnetic circuit breaker(s) UON. An independently operating limiter section within a molded case is not allowed. Coordinate CLCB ratings as required to protect electrical system components on the load side of the CLCB to include, but not limited to, protecting automatic transfer switches, panel boards and lighting control panels.
 5. Where a solid-state circuit breaker is indicated on drawings or as required elsewhere in this specification, provide a solid-state circuit breaker with minimum five function complete with built-in current transformers. The five functions shall be independently adjustable and consist of Overload/Long Time Amp Rating, Long Time Delay, Short Time Delay, Short Circuit/Instantaneous Pickup, but may also include Shunt Trip and/or Ground Fault if so indicated on the Drawings. Rating plugs shall be interlocked so they are not interchangeable between frames. Breaker shall have built-in test points for testing long delay and instantaneous, and ground fault (where shown) functions of the breaker by means of a 120V operated test kit. Contractor shall utilize a test kit capable of testing all breakers 400A and above, at the Engineer's request.
 6. Ground Fault Interrupting Breakers: Provide with molded plastic case, air circuit breakers, similar to above with ground fault circuit interrupt capability, conforming to UL Class A, Group 1.
 7. Arc Fault Interrupting Breakers: Provide with molded plastic case, air circuit breakers, similar to above with arc fault circuit interrupt capability, conforming to

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UL 1699 and UL Class A, Group 1. Provide on all dwelling-unit circuits supplying bedrooms, sleeping quarters etc. as required to comply with NEC, or CEC where adopted, Article 210.12(B).

8. Tandem or half-sized circuit breakers are not permitted.
 9. Series-Rated Breakers: UL listed series-rated combinations of breakers can be used to obtain panelboard-interrupting ratings shown on Drawings. If series-rated breakers are used, switchboards, distribution boards, and panel boards shall be appropriately labeled to indicate the use of series-rated breakers. Shop drawing submittal shall include chart of UL listed devices, which coordinate to provide series rating.
 10. Circuit breakers shall be standard interrupting construction. Panelboard shall accept standard circuit breakers up to 225A.
 11. Circuit breaker handle accessories shall provide provisions for locking handle in the on or off position.
 12. Shunt-trip equipped circuit breakers shall be provided on all elevator feeders.
 13. Temperature compensating circuit breaker(s) shall be provided when located in outdoor enclosure(s) or when located in an enclosure subject to high ambient heat due to due nearby industrial processes, etc.
 14. Provide 75 degree Celsius-rated conductor lugs/lug kits as required on all circuit breakers to accept conductor quantities and sizes shown on drawings.
 15. All circuit breaker terminations shall be suitable for use with 75 degree Celsius ampacity conductors.
 16. Circuit breakers serving Fire Alarm or Central Monitoring panels and power supplies shall be red in color and lockable in the "ON" position.
- J. Disconnect Switches:
1. Non-fusible or fusible, heavy-duty, externally-operated horsepower-rated, 600V A.C: Provide NEMA 3R, lockable enclosures for all switches located on rooftops, in wet or damp areas and in any area exposed to the elements.
 2. Fusible switches shall be Class "R" when 600A or less or Class "L" when greater than 600A.
 3. Amperage, Horsepower, Voltage and number of poles per drawings: All shall be clearly marked on the switch nameplate.
 4. Provide the Owner's project manager with one (1) spare set of fuses and two (2) sets of fuse clips/fuses for every set of fuses on the project.
- K. Fuses:
1. Provide fuses at all locations shown on the Drawings and as required for supplemental protection:
 - a. Fuses shall be manufactured by Bussman, Shawmut, or equal.
 - b. All fuses shall be the product of a single manufacturer.
 2. Main and Feeder Protection:
 - a. Protective devices rated greater than 600A: Provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.

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- b. Protective devices rated 600A or less: Provide Bussman Class R fuses, Class RK series current limiting fuses, having an interrupting rating of 200,000A RMS.
- 3. Motor Protection:
 - a. Where rating of protective device is greater than 600A, provide Bussman Hi-Cap fuses, Class L, current limiting, having an interrupting rating of 200,000A RMS.
 - b. Where rating of protective device is 600A or less, provide Bussman Class RK series current limiting fuses, having an interrupting rating of 200,000A RMS.
 - c. Where fuses feeding motors are indicated, but not sized, it shall be the responsibility of the Contractor to coordinate the fuse size with the motor to provide proper motor running protection.
 - d. When rejection type fuses are specified (Class RK series) the fuse holder of all switches (specified in other Sections) shall be suitable for the fuses provided.
- L. Cable Tray, Flexible Cable Tray and/or Cable Runway:
 - 1. See drawings for Cable Tray, Flexible Cable Tray and/or Cable Runway specifications.
- M. Uninterruptible Power Systems (UPS):
 - 1. See drawings for UPS schedules and specifications.
- N. Power Distribution Units (PDU):
 - 1. See drawings for PDU schedules and specifications.
- O. Generator Systems:
 - 1. See drawings for Generator schedules and specifications.
- P. Transfer Switches:
 - 1. See drawings for Transfer Switch schedules and specifications.
- Q. Lighting Control/Dimming Systems:
 - 1. See drawings for Lighting Control and/or Dimming Systems schedules and specifications.
 - 2. Wall box dimmers shall be rocker-type as manufactured by Lutron (no known equal except as noted below). Dimmers and dimmer faceplates shall match the color of adjacent switches and faceplates. Dimmers and dimmer faceplates in wood finished areas shall generally be black unless otherwise indicated by the Architect. The Contractor shall obtain written approval of the Architect regarding final dimmer and dimmer faceplate color selection prior to ordering material. Multiple dimmers/switches shall be ganged together with a common cover plate. Provide dimmers as follows:
 - a. Incandescent: Lutron DIVA DV-10P or DV-103P (3-way) (1000 Watt max.).
 - b. Electronic Low Voltage: Lutron DIVA DVELV-300P or DVELV-303P- (3-way) (300 Watt).

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- c. Magnetic Low Voltage: Lutron DIVA DVLV-10P or DVLV103p (3-way) (800 Watt max.).
 - d. Fluorescent (3-Wire): Lutron DIVA DVF-103P (single/3way, 8A @ 120V) or DVF-103P-277 (single/3way, 6A @ 277V).
 - e. Fluorescent (0-10V): Lutron DIVA DDTV with PP-H Power Pack.
 - f. Fluorescent (Lutron Tu-Wire): Lutron DIVA DVFTU-5A3P with Lutron H.P. module where required.
 - g. LED (0 - 10V): Lutron DIVA DDTV with PP-H Power Pack.
 - h. Screw Base CFL/LED: Lutron DIVA DVCL-153P.
 - i. Fan Control: Lutron DIVA DVFSQ-F (1.5A @ 120V max, 3 speed, single pole, and 3-way).
3. Contractor shall verify if dimmer(s) requires derating when ganged. Contractor shall provide, and provide connections to, additional Lutron Power Modules, Lutron Power Packs, and / or Lutron Interface Modules where required to accommodate loads higher than dimmers standard or derated load-carrying capacity. Note - contractor may to provide a Lutron recommended dimmer type (typically a #DVF-103P unit) to control the necessary power modules or interface devices.
- R. Fire Alarm System/Central Monitoring System:
- 1. See drawings for Fire Alarm System or Central Monitoring System specifications.
- S. Surge Protective Device (SPD):
- 1. See drawings for SPD specifications.
- T. Conduit:
- 1. Galvanized Rigid Conduit (GRC) shall be full weight threaded type steel. Steel conduit shall be protected by overall zinc coating to inside and outside surfaces, applied by the hot dip, metalizing, or sherardizing process.
 - 2. Intermediate Metal Conduit (IMC), shall be hot-dipped galvanized in accordance with UL 1242, and meet Federal Specification WWC-581 (latest revision).
 - 3. Electrical Metallic Tubing (EMT) shall be zinc-coated steel with baked enamel or plastic finish on inside surfaces. EMT shall be dipped in a chromic acid bath to chemically form a corrosion-resistant protective coating of zinc chromate over galvanized surface.
 - 4. Flexible metal conduit shall be constructed of aluminum or hot-dipped galvanized steel strips wound spirally with interlocking edges to provide greatest flexibility with maximum strength. Interior surfaces shall be smooth and offer minimum drag to pulling in conductors. Use only as directed in writing by the Engineer with the exception of 400 Hz feeders and 400 Hz branch circuits which shall be run in flexible aluminum conduit.
 - 5. Liquid-tight conduit (Seal-Tite) shall be galvanized steel flexible conduit as above except with moisture and oil-proof jacket, pre-cut lengths and factory-installed fittings. For outdoor installations and motor connections only unless otherwise noted on drawings.
 - 6. Factory assembled, or off-site assembled wiring systems (such as Metal Clad (MC) Cable, Type AC Cable, Type NM Cable, Type BX Cable, etc.) shall not be

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used unless otherwise indicated in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing.

7. When approved for use in the Allowed Specification Deviations Section, generally located on the symbols list drawing, MC cables shall be allowed for lighting branch circuits (homeruns shall be EMT), receptacle branch circuits (homeruns shall be EMT) and poke-thru fed systems furniture homeruns. MC shall not be used where exposed, except for a maximum 6' length for final connections to light fixtures, or terminate in electrical panelboards or distribution boards. Equipment ground conductor shall be green. Isolated ground conductor shall be green with yellow stripe. Provide 600V rated aluminum or lightweight steel interlocking armor Metal Clad (MC) cable with copper conductors, THHN (90 degree C) insulation, and integral equipment grounding conductor and isolated grounding conductor as required. Type AC cable listed for use in patient care areas for non-essential electrical system branch circuits per NEC or CEC where adopted, Article 517.13 shall be required in such areas in lieu of MC cable. Type AC and MC cable shall not be used for essential electrical system branch circuits. MC cable shall be manufactured to Underwriter Laboratory Standard 1569. See PART 3 - EXECUTION section of this specification for additional installation requirements.
 8. Nonmetallic Flexible Tubing (ENT) shall not be used unless otherwise indicated in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing. Use of ENT, if allowed, is strictly limited to use in CMU walls and parking structures decks or as directed in writing by the Engineer. See PART 3 - EXECUTION section in this specification for additional installation requirements.
 9. Non-Metallic Conduit:
 - a. Polyvinyl chloride (PVC) rigid conduit, Schedule 40, Type II for underground installation only with solvent welded joints, conforming to Underwriters Laboratories, Inc. (UL) requirements, listed for exposed and direct burial application.
 - b. Conduit and fittings shall be produced by the same manufacturer.
 10. Fire-rated MC Cable:
 - a. 2-hour fire-rated, polymer insulated 600V MC cable listed and conforming to Underwriters Laboratories, Inc. (UL) 2196 and UL 1569 requirements for installation as an Electrical Circuit Protective System for use in complying with NEC, or CEC where adopted, Articles 695 and 700. Where adopted, cable sheath shall be suitable for use as a NEC or CEC equipment grounding conductor, and shall be listed for use in wet locations to 90 degrees C (Raychem or equal).
 - b. Cable connectors shall be brass MC connectors.
- U. Fittings:
1. Condulet type fittings shall be smooth inside and out, taper threaded with integral insulating bushing and of the shapes, sizes and types required to facilitate installation or removal of wires and cables from the conduit and tubing system.

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These fittings shall be of metal, smooth inside and out, thoroughly galvanized, and sherardized cadmium plated.

2. Metallic conduit covers shall have the same finish as the fitting and shall be provided for the opening of each fitting where conductors do not pass through the cover.
 3. Connector, coupling, locknut, bushings and caps used with rigid conduit shall be steel, threaded and thoroughly galvanized. Bushings shall be insulated.
 4. UON all EMT fittings, connectors and couplings installed in concealed locations, areas not considered to be wet or damp locations by the AHJ, or areas not subject to physical damage, shall be steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. Where suitable for use, steel set screw fittings are allowed for trade's sizes of 2" and smaller. Insulated throat is not required for fittings, connectors and couplings 1" and smaller.
 5. All interior and exterior EMT fittings, connectors and couplings, 2" and smaller, installed in exposed or concealed locations that are considered by the AHJ to be wet or damp locations, shall be Raintite-listed, steel, zinc or cadmium plated, threadless, compression, steel locking ring type with insulated throat. If Raintite-listed, EMT fittings, connectors and couplings are unavailable for a given trade size or if conduit is installed in an area subject to damage – provide rigid metallic or intermediate metallic conduits, fittings, connectors and couplings as required.
 6. Flexible steel conduit connectors shall be a malleable iron clamp or squeeze type or steel twist-in type with insulated throat. The finish shall be zinc or cadmium plating.
 7. Conduit unions shall be "Erickson" couplings, or approved equal. The use of running threads will not be permitted.
- V. 600 Volt Conductors - Wire and Cable:
1. All conductors shall be copper. Provide stranded conductor for #10 AWG and larger or when making flexible connections to vibrating machinery. Use compression "fork" type connectors or transition to solid conductors when connecting to switches, receptacles, etc.
 2. Type THHN/THWN-2 thermoplastic, 600 volt, UL approved, dry and wet locations rated at 90 degrees Celsius, for conductors of all sizes from #12 AWG up to and including 1000 kcmil. RHH/RHW insulation is allowed only to provide an Electrical Circuit Protective System to comply with NEC, or CEC where adopted, Articles 695 and 700.
 3. Wire and cable shall be new, manufactured not more than six (6) months prior to installation, shall have size, type of insulation, voltage rating and manufacturer's name permanently marked on outer covering at regular intervals.
 4. Wire and cable shall be factory color-coded by integral pigmentation with a separate color for each phase and neutral. Each system shall be color-coded and it shall be maintained throughout.
 5. Systems Conductor Color Coding:
 - a. Power 208/120V, 3PH, 4W:
 - 1) Phase A = Black

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- 2) Phase B = Red
- 3) Phase C = Blue
- 4) Neutral = White or White with Phase Color Tracer
- 5) Switch legs = Purple (Switch legs shall also be identified separately by numerical tags).
- 6) Travelers = Purple with Black stripe or Pink.
- b. Power 480/277V, 3PH, 4W:
 - 1) Phase A = Orange
 - 2) Phase C = Yellow
 - 3) Neutral = Grey or Grey with Phase Color Tracer
 - 4) Switch legs = Purple (Switch legs shall also be identified separately by numerical tags).
 - 5) Travelers = Purple with black stripe or Pink.
- c. Ground Conductors: Green
- d. Isolated Ground Conductors: Green with continuous yellow stripe.
- e. Fire Alarm System: As recommended by the manufacturer.
6. All color-coding for #12 through #6 AWG conductor shall be as identified above. Conductors #4 AWG and larger shall be identified with utilizing phase tape at each termination.
7. No conductors carrying 120V or more shall be smaller than #12 AWG.
8. Aluminum conductors shall not be used.
9. Wire-pulling compounds used as lubricants in installing conductors in raceways shall only be "Polywater J". No oil, grease, graphite, or similar substances may be used. Pulling of #1/0 or larger conductors shall be done with an approved cable pull machine. Other methods; e.g. using vehicles and block and tackle to install conductors are not acceptable.
- W. Medium Voltage Conductors (greater than 600V):
 1. See drawings for Medium Voltage Cable Schedule and Specifications.
- X. Junction and Pullboxes:
 1. For interior dry locations, boxes shall be NEMA 1 galvanized one-piece drawn steel, knockout type, with removable, machine screw secured covers.
 2. For outside, damp or surface locations, boxes shall be NEMA 3R heavy cast aluminum or cast iron with removable, gasketed, non-ferrous machine screw secured covers.
 3. For in-grade applications, junction and pull boxes shall be pre-cast concrete or molded fiberglass manufactured by Christy, Brooks-Jensen, or Utility Vault Co. Fiberglass boxes shall:
 - a. Be used only in landscape planter areas that are not subject to damage from lawnmowers, tractors and other machinery.
 - b. Not be used in lawn or turf areas.
 - c. Not exceed 11" W x 17" L in size unless required to be larger to meet code requirements.
 4. All boxes shall be sized for the number and sizes of conductors and conduits entering the box and equipped with plaster rings where required.

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5. All boxes located in traffic areas shall be traffic rated.
- Y. Outlet Boxes:
1. For fixtures, boxes shall be galvanized, one-piece drawn steel, knockout type equipped with 3/8" fixture studs and plaster rings where required.
 2. For convenience outlets, wall switches, or other devices, outlet boxes shall be galvanized one-piece drawn steel, knockout type 4" x 4"x 2-1/8" minimum size with plaster rings as required.
 3. For locations where standard boxes are not suitable due to number and size of conduit to be terminated, special boxes shall be designed to fit space or meet other requirements, and submitted for approval.
 4. For exposure to weather, damp locations, or surface mounting, outlet boxes shall be heavy cast aluminum or cast iron with threaded hubs; covers shall be watertight with gaskets and non-ferrous screws.
 5. Outlet boxes used for support of ceiling fans shall be galvanized, one-piece drawn steel, knockout type equipped with bracing bars and plaster rings where required and listed for ceiling fan support use. Such boxes shall be labeled and capable of supporting ceiling fan weights up to 70 pounds.
 6. See drawings for floor box installation notes and specifications.
- Z. Plywood Backboards: Where indicated for telephone or communications system terminals or other equipment assemblies, provide backboards of size indicated. Use 3/4" thick x 8' all (length per plans), Douglas Fir, void-free, kiln-dried, fire-rated plywood finished on one side and prime coat painted on all surfaces with finish coat of enamel paint, color by Architect. Leave one (1) fire-rating stamp/sheet exposed for inspection.
- AA. Terminal Cabinets:
1. Terminal cabinets shall be fabricated of hot dipped galvanized code gauge sheet metal for flush or surface mounting, complete with barriered sections, a door for each vertically barriered section and sizes as indicated on plan. Doors shall be hinged and lockable. Locks shall be keyed to match the branch circuit panelboards. Terminal cabinet trims shall match the branch circuit panels.
 2. Provide each terminal cabinet with a full size mounting backplate.
 3. Terminal cabinets shall be installed complete with full-length skirts of the same construction and finish as the terminal cabinet.
 4. Where mounted outdoors, terminal cabinets shall be NEMA 3R, weatherproof complete with gaskets and required sealant to prevent moisture from entering the terminal cabinet.
 5. All terminal cabinets and terminal cabinet barriered sections shall be labeled by the cabinet or cabinet section use (i.e. CATV, Security, etc.). Labels shall be Micarta type as specified elsewhere in these specifications. Unless otherwise noted, all termination blocks and cables shall be labeled per ANSI/EIA 606 standard.
- BB. Painting: Terminal cabinets, panels, junction boxes, pull boxes, etc., and conduit installed in public view shall be painted with colors selected by the Architect to match

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the subject surfaces. Refer to painting section of the specifications for additional requirements.

CC. Seismic Design, Certification and Anchoring of Electrical Equipment:

1. Contractor shall include all costs in the base bid for labor, materials, all special inspections and structural engineering design necessary to meet the Seismic Design Requirements for Non-structural Components (Chapter 13, ACE SEI 7-05 Minimum Design loads for Buildings and Other Structures) as required by IBC, or CBC where adopted, Section 1708 and as related to the installation all electrical equipment furnished under this contract. See Specific Project Site Seismic Criteria on architectural and/or structural plans which include Building Occupancy Category, Seismic Design Category, Design Spectral Response Acceleration (SDS), Height factor ratio (z/h) and Site Class. Non-structural Component Importance Factor (IP) for a particular component shall be determined based on the following criteria:
 - a. IP = 1.0: Non-life safety, Non-structural Components in an Occupancy Category IV Facility not required for continued operations of the facility or in any other Occupancy Category Facility where component failure will not impair continued operation of the facility.
 - b. IP=1.5: Designated Seismic Systems are those non-structural components in any Occupancy Category IV facility (except as noted above) or that are a part of any code-defined Critical, Life Safety, Emergency and Legally Required Standby Electrical System. Additionally, those non-structural components containing hazardous materials shall be classified as Designated Seismic Systems. While Designated Seismic Systems are generally identified on the plans, they may include items such as generators, automatic transfer switches, UPS units and all associated electrical distribution equipment and components necessary for the designated seismic system to form a complete and operable system. The Contractor shall ultimately be responsible for identifying Designated Seismic Systems. For any electrical component either identified on the plans or determined by the contractor to be a Designated Seismic System, all line and load side electrical distribution systems supporting that Designated Seismic System (including, but not limited to, feeders, panel boards switchboards, transformers, all related component supports and attachments etc.) shall be considered a part of the designated seismic system for the purposes of code-compliance and seismic certification.
 - c. z/h - Height factor ratio: See plans for respective equipment locations.
2. Provide a delegated-design submittal for each of the following seismic-restraint systems to be used as required:
 - a. Restraint Channel Bracings consisting of MFMA-4, shop-or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

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- b. Restraint Cables consisting of ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service, with a minimum of two clamping bolts for cable engagement.
 - c. Seismic-Restraint Accessories consisting of hanger rod/hanger rod stiffener assemblies, multifunctional steel connectors for attaching hangers to rigid channel bracings and/or restraint cables, bushings for floor and wall-mounted equipment anchor bolts and resilient isolation washers and bushings.
 - d. Mechanical Anchor Bolts consisting of drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
 - e. Adhesive Anchor Bolts consisting of drilled-in and capsule anchor system containing resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide specific LEED-compatible environmentally-friendly resins and adhesives on all LEED projects. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
3. Submittal shall include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the contractor's structural engineer responsible for their preparation. Calculations shall include, but not be limited to, static and dynamic loading caused by equipment weight, operation, and seismic and, if applicable, wind forces required to select seismic and, if applicable, wind restraints and for designing vibration isolation bases. Provide seismic and wind-restraint detailing to support system selection, arrangement of restraints, attachment locations, methods, and spacing's with all components identified to include their strengths, directions and values of forces transmitted to the structure during seismic events and association with vibration isolation devices. Sizes of components shall be selected so strength will be adequate to carry present static and seismic loads to accommodate 25% spare future capacity within specified loading limits.
4. Any pre-approval and evaluation documentation shall have a California Office of Statewide Health Planning and Development (OSHPD) Special Seismic Certification Preapproval (OSP) demonstrating horizontal and vertical load testing and analysis showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

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5. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified elsewhere in the project specifications.
6. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment. Flexible connection limitations of the NEC, or CEC where adopted, shall apply.
7. Install seismic-restraint devices using methods approved by OSHPD or an agency acceptable to authorities having jurisdiction providing required submittals for component.
8. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by OSHPD or an agency acceptable to authorities having jurisdiction.
9. The contractor shall engage a qualified testing agency to perform tests and inspections as listed in other Project Specifications, but as a minimum shall include at least four of each type and size of installed anchors and fasteners selected by Architect. Schedule tests with Owner, through Architect, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members as required. Test to 90 percent of rated proof load of device. Prepare and submit test and inspections reports.

DD. Trenching and Backfilling: Contractor shall be responsible for trenching and backfilling. Refer to Trenching and Backfilling section of the specifications for complete requirements.

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION

- A. Installation of Conduit and Outlet Boxes:
1. All conduit installed in the dry walls or ceilings of a building shall be steel tube (EMT), aluminum tube (EMT), or Intermediate Metal Conduit (IMC). Flexible conduit shall not be used in lieu of EMT, IMC or rigid conduit except as noted herein.
 2. Galvanized rigid conduit (GRC) or intermediate metal conduit (IMC) shall be used as follows:
 - a. When noted on the drawings.
 - b. When considered exposed to damage by the local AHJ.
 - c. When installed in wet or damp locations and of a trade size where listed-Raintite fittings, connectors, couplings etc. are unavailable.
 - d. When required by NEC or CEC Article 517.13.

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- e. When installed in concrete and masonry. The use of ENT in CMU walls and parking structures may be allowed only as directed in writing by the Engineer. Request for ENT substitution must be made prior to bid and in accordance with pre-bid substitution requests requirements of these specifications.
3. Intermediate metal conduit (IMC), is approved for use in all locations as approved for GRC or steel-tube EMT and in accordance with NEC, or CEC where adopted, Article 342.
4. Flexible steel conduit shall only be permitted to be used at light fixture outlets and connections to vibrating electrical equipment. Except when concealed in walls or other structural elements, all flexible steel conduit runs shall be less than 6'-0". All outdoor installation shall be made using liquid-tight flex with approved fittings. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of flexible conduit shall be allowed only as approved in writing by the Engineer.
5. Flexible liquidtight conduit shall be installed in lieu of the flexible steel; where required by the NEC, or CEC where adopted, in damp and wet location, where exposed to weather, in refrigerated area (65°F or less), and/or between seismic joints. All rotating electrical equipment shall be supplied with flexible, liquid-tight conduit with appropriate slack and shall not exceed thirty-six (36) inches. Include a separate insulated green ground conductor sized per NEC in each conduit. Other uses of liquidtight flexible conduit shall be allowed as approved in writing by the Engineer on a case by case basis.
6. Rigid metallic conduit installed underground or embedded in concrete shall be 1" trade size minimum and shall be wrapped with 20 mil. Polyvinylchloride plastic tape, PVC conduit installed underground or embedded in concrete shall be 3/4" minimum trade size.
7. Where required for providing an electrical circuit protective system to comply with NEC, or CEC where adopted, Articles 695 and 700 utilize UL Listed 2-hour fire-rated, MC cable or UL Listed 2-hour fire-rated RHH/RHW conductors in conduit.
8. Conduit shall be run so as not to interfere with other piping fixtures or equipment.
9. The ends of all conduit shall be cut square, carefully reamed out to full size and shall be shouldered in fitting.
10. No running threads will be permitted in locations exposed to the weather, in concrete or underground. Special union fittings shall be used in these locations.
11. Where conduit is underground, under slabs or grade, exposed to the weather, or in wet locations, make joints liquid tight and gas tight.
12. All metal conduit in masonry and concrete and where concealed under floor slabs shall have joints painted with thread compound prior to makeup.
13. PVC conduit shall not be run in walls except where approved by the Engineer prior to bid in limited instances that may include concrete or CMU walls used in site retaining, parking structures, or exterior equipment yard or enclosure walls, etc.
14. Where conductors enter a raceway or a raceway in a cabinet, pull box, junction box, or auxiliary gutter, the conductors shall be protected by a plastic bushing type fitting providing a smoothly rounded insulating surface.

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15. Where conduit extends through roof to equipment on roof area, the Contractor shall provide flashing material compatible with the roofing system as required by the roofing specifications or as required by the Owner's roof warranty. This flashing shall be delivered to the roofing Contractor for installation. The actual location of all such roof penetrations and outlets shall be verified by the Architect/Owner. Contractor to verify type of flashing prior to bid and include all costs.
16. All conduit shall be supported at intervals not less than 6'-0" and within 12" from any outlet and at each side of bends and elbows. Conduit supports shall be galvanized, heavy stamped, two-hole conduit clamp properly secured.
17. Where conduit racks are used the rack shall consist of two piece conduit clamps attached to galvanized steel slotted channels, properly secured via threaded rods attached directly to the building structure.
18. Nail-in conduit supports, one-piece set screw type conduit clamps or perforated iron for supporting conduit shall not be used.
19. Seismic Conduit Support:
 - a. All conduit shall be supported in such a manner that it is securely attached to the structure of the building. Attachment is to be capable of supporting the tributary weight of conduit and contents in any direction. Maximum spacing of support and braces are to be as follows:

<u>CONDUIT SIZE</u>	<u>MAXIMUM SPACING</u>
1/2" to 3"	6'-0"
3-1/2" to 4"	8'-0"
20. All conduit runs shall be installed parallel or perpendicular to walls, structural members, or intersection of vertical planes and ceilings. Field made bends and offset shall be avoided where possible. Crushed or deformed raceway shall not be installed.
21. Open knockouts in outlet boxes only where required for inserting conduit.
22. Locate wall outlet of the same type at same level in all rooms, except where otherwise noted.
23. Outlet boxes on metal studs shall be attached to metal hangers, tack welded or screwed to studs; on wood studs attachment shall be with wood screws, nails are not acceptable.
24. Recessed boxes shall not be mounted back-to-back in any wall; minimum offset shall be 24 inches.
25. Junction Boxes that do not contain any device(s) shall be located in storage rooms, electrical closets, or above accessible ceilings, not in hard lid ceilings or other forms of inaccessible ceilings. Place boxes which must be exposed to public view in a location approved by the Owner's Project Manager. Provide covers or plates to match adjacent surfaces as approved by the Owner's Project manager.
26. Surface mounted pull boxes, terminal cabinets, junction boxes, panel boards etc., shall be attached to walls using appropriate screws, fasteners, backing plates, stud blocking etc., as detailed on architectural and/or structural drawings. If architectural and/or structural drawings are not provided on the project, Contractor shall provide all necessary mounting hardware and backing support to

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- comply with local building code requirements and any additional requirements imposed by the local Authority-Having-Jurisdiction.
27. Sleeves shall be installed where conduit passes through masonry or concrete walls and shall be 24 gauge galvanized steel no more that 1/2" greater in diameter than the outside diameter of the conduit. When located in non-rated structures, caulk conduit sleeve with stone wool and waterproof below grade. When located in fire rated structures, provide UL listed fire stopping system. See fire stopping section of this specification for additional requirements.
 28. All boxes shall be covered with outlet box protector, Appleton SB-CK, or similar device/method to keep dirt/debris from entering box, conduit or panels. If dirt/debris does get in, it shall be removed prior to pulling wires.
 29. All boxes installed outdoors shall be suitable for outdoor installations, gasketed, screw cover, and painted as directed by the Architect with weatherproof paint to match building.
 30. All conduit entries to outdoor mounted panels, cabinets, boxes, etc., shall be made using Myers "SCRU-TITE" hubs Series ST.
 31. Provide nylon or a 1/8-inch O.D. polyethylene rope, rated at 250 pounds tensile strength, in all conduits more than 5 feet in length left empty for future use. Not less than 5 feet of rope shall be left at each end of the conduit. Tag all lines with a plastic tag at each end indicating the termination/stub location of the opposite end of the conduit.
 32. All multiple conduit runs within suspended ceilings shall be suspended from building structure by means of unistrut hangers/racks, Conduit shall not be allowed to lay on ceiling or be supported from ceiling suspension wires or other suspension system. Support conduit to structure above suspended ceilings 8" minimum above ceiling to allow removal of ceiling tile. Maintain two-inch clearance above recessed light fixtures
 33. All exposed conduits and support hardware shall be painted to match the finish of the wall or ceiling to which it is supported.
 34. Where conduits or wireways cross seismic joints, provide approved flexible conduit connection or approved expansion/deflection fitting to allow for displacement of conduit in all three axes. Connection shall allow for movement in accordance with design of seismic joint. Non-flexible raceways crossing expansion joints or other areas of possible structural movement shall make provision for 3-way movement at such points by means of expansion/deflection fittings. Fittings shall be installed in the center of their axes of movement and shall not be deflected to make part of a conduit bend, or compressed or extended to compensate for incorrect conduit expansion/deflection fittings(s) complete with ground jumpers. Where necessary, provide approved expansion joints to allow for thermal expansion and contraction of conduit(s). Install expansion joints complete with ground jumpers.
 35. Seal all conduits where termination is subject to moisture or where conduit penetrates exterior wall, floor or roof, in refrigerated areas, classified (hazardous areas) and as indicated on the drawings.
 36. Except as otherwise indicated on the Drawings or elsewhere in these specifications, bends in feeder and branch circuit conduit 2 inches or larger shall

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- have a radius or curvature of the inner edge, equal to not less than ten (10) times the internal diameter of the conduit. Except where sweeping vertically into a building, and where sweep radius equals ten (10) times conduit diameter, underground communications and building interconnect conduits 3 inches or larger shall have a minimum 12'-6" radius or curvature of the inner edge. For the serving utilities, radius bends shall be made per their respective specifications.
37. Tag all empty conduits at each accessible end with a permanent tag identifying the purpose of the conduit, footage end-to-end, and the location of the other end. In wet, corrosive outdoor or underground locations, use brass, bronze, or copper 16 gauge tags secured to conduit ends with #16 or larger galvanized wire. Inscribe on the tags, with steel punch dies, clear and complete identifying information.
38. The following additional requirements shall apply to underground conduits:
- a. Underground conduit shall be Schedule 40 PVC (polyvinyl chloride) unless otherwise indicated elsewhere in these specifications or as required per NEC, or CEC where adopted Article 517.13.
 - b. For all communications conduits 2" and larger and feeders 100A or greater, provide with a minimum 3" inch, (2,000 LB) concrete envelope, 2" inch minimum separation between conduits, installed at depth of not less than 24" below grade. (Provide concrete encasement and/or greater minimum conduit depth as required by the Utility Companies.) Conduit separation within a duct bank shall be maintained using plastic spacers located at 5'-0" intervals. Where power and communication conduits are run in a common trench, a 12" inch minimum separation shall be maintained between power and communication conduits or as required by Utility Companies. Where concrete encasement is not required by serving utilities for a utility-only duct bank, provide free draining sand bedding suitable to achieve 95% relative compaction based on ASTM D1557 using 6" lifts or directed by Utility Company Standards.
 - c. In all cases, where any conduit(s) pass under a building slab or footing, the electrical Contractor will provide a Bentonite clay or concrete barrier that conforms to the height and width of the trench excavation extending a minimum of 24" on either side of the foundation. In all cases, where conduit(s) pass through a sleeve in a footing or other foundation element, the electrical Contractor will provide a Bentonite clay or concrete barrier between the sleeve and the conduit(s) surrounding the conduit(s) for the entire depth of the sleeve. The barrier is required to prevent passage of moisture under or through the slab or footing via the trench or sleeve.
 - d. Where underground conduit passes under a building slab, concrete encasement may not be required, except as required above, contact the Engineer for written direction prior to omitting any encasement.
 - e. Underground conduits, which terminate inside building(s) below grade, such as in a basement level, or which slope so that water might flow into interior building spaces, shall be sealed at the point of penetration with a modular conduit seal (Link-Seal or equal by Rox Systems). Conduit/conduit sealing system penetrations of waterproofing membranes/systems on

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existing structures shall be completely restored as required to maintain membrane/system manufacturer and installer warranty for the installation. All conduits shall be provided with a 4% slope away from buildings. All conduits shall be installed such that the water cannot accumulate in the conduit and such that water drains into the nearest manhole, pull box or vault – not into the facility. In instances where grade changes or elevation differences prevent sloping of conduit away from a building into the nearest manhole, pull box or vault or where accumulation of water in a manhole, pull box or vault may result in water traveling into the facility, conduits shall be sealed internally at each end of each conduit using conduit sealing bushing, sized as required for the conductors contained within the conduit (O-Z Gedney #CSBG 100psig withstand or equal). In all cases, install plugs or caps in spare (empty) conduits at both ends of each conduit (Jackmoon or equal) preventing both water and gas from entering the facility via the conduits.

- f. Include a separate insulated green ground conductor sized per NEC, or CEC where adopted, in each underground electrical feeder/branch circuit.
 - g. All underground conduits with circuits rated at 40As or greater and all underground communications conduits shall be provided with a metallic marker tape located 12 inches below the finished grade.
 - h. Where underground conduits sweep into/through slabs, utilize PVC 90 degree sweeps that transition, via female PVC adapter to GRC coupling mounted flush in slab. GRC couplings shall be 1/2 lap taped with 20-mil tape. If the distance of the conduit run between a sweep and the next connecting sweep, pullbox, vault or manhole exceeds 150 ft then the sweep shall be concrete encased. Exceptions:
 - 1) Communications conduits shown terminating at a finished floor shall have an additional 4" high GRC nipple equipped with a bushing, removable conduit plug, labeling tag and pull rope. Tie off pull rope to conduit plug.
 - 2) Utility conduit sweeps shall be installed per the requirements of the respective utility company.
 - i. All PVC conduit shall be glued for a water and gas tight installation. The Contractor shall use appropriate solvent on all joints prior to gluing conduit and fittings together.
 - j. All underground conduit work shall conform to the Federal, State and Local Safety Orders or Rules regarding excavations, trenches and related earthwork. For projects in California, refer to the California Code of Regulations, Title 8, Construction Code Sections 1540 and 1541 for additional requirements.
39. Installation of Metal Clad (MC) Cable (when use is permitted in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section, generally located on the symbols list drawing).
- a. Provide J-box above accessible ceiling prior to running MC cable within partitions or walls. J-box shall be permanently labeled with panel identification and circuit numbers contained within.

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- b. Overhead MC cable runs shall generally follow building lines to provide a neat and workmanlike installation.
- c. Provide code-sized J-boxes to accommodate MC cable splicing in general. For systems furniture poke-through feeds utilizing MC cable, transition from MC cables to conduit and wire near the panelboard in the TI accessible ceiling space on the floor below the panel board via code-sized gutter(s). Utilize UL listed, insulated barrier strips with recessed screw heads (Ideal #89-6?? Series or equal) fastened within the gutter(s), terminate MC conductors on one side of the strips(s) and individual conductors in conduit from the panelboard(s) on the other side of the strip(s). Label each terminal strip(s) with panel designation. Label each phase conductor with circuit number using wire markers (Ideal or equal). Wire nuts are not an acceptable alternative to the terminal strips in these underfloor transition locations. Provide (1) spare 3/4" conduit from each gutter to its respective panelboard.
- d. MC cable shall not run directly into panelboards, distribution boards or electrical rooms.
- e. MC cabling shall be provided with its own code-approved ceiling support wires, cable hangers, individual spring steel support clips, steel trapeze hangers, threaded rods or dedicated #10 AWG drop wire. Cable supports shall be fastened to concrete slabs, beams, joists or other structural members of the building. In no case shall MC cable rest on ceilings, suspended ceilings or structures. Do not support MC cable using ceiling support wires. The use of nylon cable ties to support MC cable is not allowed.
- f. Use lock or spring nut MC cable fittings.
- g. Cable runs shall be continuous from wiring device to wiring device – no intermediate splicing J-boxes allowed.
- h. When terminating or splicing at a junction, outlet, or switch box, cut the cable with an armored cable rotary cutter such that 6-inches of free conductors remain for connections or splices. Use screw-in or spring lock connector and ensure a proper bonding by firmly tightening the connector to both the box and cable. Insert an anti-short bushing at cable ends to protect conductors from abrasion and use insulated connectors.
- i. MC cable bend radius shall not be less than seven (7) times the external diameter of the cable.
- j. MC cables passing through fire-rated walls or floors shall be firestopped as required with a UL listed system. See firestopping requirements outlined elsewhere in this specification for additional requirements.
- k. Installation shall not exceed code requirements for total current carrying conductors in multiple MC Cable runs bundled together into a single MC cable hanger or strap, unless support device is specifically listed for such purpose. Neutrals shall be counted as current carrying conductors.
- l. Maintain MC Cable clearance of at least 6 inches from hot water and any other high temperature pipes. Maintain at least 12-inches clearance

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- between MC cable(s) and telecommunication conduits and cables. MC cable shall cross telecommunication cables and conduits at right angles.
- m. MC cabling shall not be run through exposed ceilings, where open grid conditions exist, exposed on walls, or exposed to view. See Power Plan and Lighting Plan General Notes for additional requirements.
40. Installation of Electrical Nonmetallic Tubing (ENT) Cable (when use is permitted in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section generally located on the symbols list drawing).
- a. When approved for use in the Allowed Specification Deviations Section or Deductive/Additive Alternate Pricing Section, generally located on the symbols list drawing, 1/2" and 3/4" trade size ENT shall be allowed for concealed lighting branch circuits, receptacle branch circuits and miscellaneous signal system circuits within concrete floors, walls and columns within parking structures.
- b. ENT conduit shall meet the requirements of Underwriters Laboratories Standards 1479 and 1655, NEMA TC-13, and be UL-listed.
- c. All ENT conduit, ENT fittings, ENT boxes and ENT accessories shall be UL listed and manufactured by the same manufacturer so as to form a complete ENT system. ENT systems shall only be used if they are listed for use in fire resistance rated concrete floors and ceilings with resistance ratings as indicated elsewhere in the project plans. ENT system shall comply with NEC, or CEC where adopted, Article 362.
- d. All ENT fittings and ENT boxes shall be concrete-tight listed without the use of tape. Additionally, ENT fittings shall be constructed of high impact PVC and able to resist ENT conduit pull out forces of a minimum of 175 lbs. ENT fittings with fewer than 6 locking tabs for ENT connection shall utilize manufacturer approved glue as additional protection from fitting/conduit separation. ENT conduit to rigid conduit transition fittings shall be equipped with set screw fittings on the rigid conduit side of the fitting. ENT to metal box fittings shall be equipped with a threaded end and lock washer.
- e. Where tubing enters a box, fitting, or other enclosure provide a bushing or adapter to protect conductors from abrasion unless the box, fitting, or enclosure design provides equivalent protection.
- f. ENT junction boxes shall have brass screw inserts and shall be rated to support lighting fixtures weighing less than 50 lbs.
- g. Concrete tight metal boxes shall be used to support pendant hung fixtures or fixtures over 50 lbs.
- h. ENT shall be provided in continuous lengths between junction boxes without use of in-line splices or connectors and shall be clearly marked/labeled at least every 10 feet.
- i. All ENT conduit containing electrical branch circuits shall contain a code-sized equipment ground conductor.
- j. ENT shall transition to EMT, IMC, RMC, or rigid PVC, as appropriate or as called out elsewhere in this specification, for all exposed conduits within/on/under a parking structure.

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- k. ENT shall transition to appropriately sized PVC expansion joint(s) at all structure expansion or seismic joints.
- l. ENT shall be securely fastened and supported every 2 – 3 ft. and within 1 ft. of every junction box and fitting to prevent movement and sag.
- m. ENT shall be routed straight without sags, or excessive bending. Where bends are required, comply with Table 344.24 of the NEC for minimum radius of bends. Number of bends shall not exceed quantity allowed by code where used for power and lighting branch circuit and/or feeder conductors. Where utilized for communications system conductors (phones, data cabling, etc.) number of bends shall not exceed the equivalent of (2) 90 degree bends with conduit length no more than 100 feet without installation of a TIA 569-compliant pull box.
- n. Separation of ENT from fittings, excessive sags, or deflections in ENT runs that prevent pulling of wire and other ENT system product or system installation failures/errors shall be corrected by saw cutting and patching as necessary at no additional cost to the Owner. Use of surface mounted conduits and junction boxes as a repair method is unacceptable.
- o. Empty ENT runs shall be provided with a nylon pull string.
- p. Coordinate installation of raceway with structural steel and other structural members. Do not cut, notch or otherwise alter structural members without obtaining approval in writing from the Structural Engineer of record.
- q. No more than (2) 3/4" ENT conduits may cross each other within a horizontal concrete slab without obtaining approval in writing from the Structural Engineer of record.

B. Installation of 600-Volt Conductors:

- 1. All electrical wire, including signal circuits, shall be installed in conduit.
- 2. All circuits and feeder wires for all systems shall be continuous from over current protective device or switch to terminal or farthest outlet. No joints shall be made except in pull, junction or outlet boxes, or in panel or switchboard gutters.
 - a. Utilize preinsulated "winged" spring type connectors, 3M Company "Performance Plus" #O/B or #R/Y or equal as required for splices and taps in conductors #6 AWG and smaller. When a spring connector is used in an underground environment or when subject to moisture, utilize a 3M Company Scotchcast 3507G epoxy resin connector sealing pack to seal the spring connector. THE USE OF PUSH-WIRE CONNECTIORS (e.g. "WAGO" OR EQUIVILENT) IS STRICTLY PROHIBITED.
 - b. Wires #4 AWG and larger AWG shall be joined together as follows:
 - 1) When located in an underground environment or when subject to moisture, the splice shall be made with compression connector and sealed by a 3M, or equal, PST cold shrink connector insulator.
 - 2) When located in an interior environment, the splice shall be made with an IlSCO or equal dual rated, insulated splice-reducer connector or multi-tap connector-listed for use with 75/90 degree Celsius rated conductors.

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- c. Connections to busbar shall be made with dual-rated copper/aluminum one-piece compression lugs. Paralleled conductor connections shall be by mechanical lugs.
 3. Thoroughly clean all conduit and wire-ways and see that all parts are perfectly dry before pulling any wires.
 4. Install UL approved fixture wire from all lighting fixture lamp sockets into fixture outlet or junction box.
 5. For 20A branch circuit wiring, increase #12 conductors to #10 for 120 volt circuits longer than 100 feet and for 277V circuits longer than 150 feet.
 6. Conductor Support: Provide conductor supports as required by codes and recommended by cable manufacturer. Where required, provide cable supports in vertical conduits and provide lower end of conduit with a ventilator.
- C. Grounding/Bonding:
 1. Provide grounding and bonding for entire electric installation as shown on plans, as listed herein, and as required by applicable codes. Included, but not limited to, are items that require grounding/bonding:
 - a. Conduit, Raceways and Cable Trays.
 - b. Neutral or identified conductors of interior wiring system.
 - c. Panel boards, Distribution Boards, Switchgear and Switchboards.
 - d. Non-current carrying metal parts of fixed equipment.
 - e. Telephone distribution equipment.
 - f. Transformers, Inverters, UPS, PDU, RDC, Transfer Switch and Generator Systems.
 - g. Raised Flooring.
 - h. Exposed metal in maintenance holes, hand holes.
 - i. Lightning Protection Systems and Antennas.
 - j. Metal piping installed in or attached to a building/structure.
 - k. Metallically isolated structural steel.
 - l. Metallically isolated underground metal water piping.
 - m. Elevator hydraulic piston/lift case.
 2. In multi-occupancy buildings, Contractor shall bond metal water piping systems instated in, under or attached to a building and/or structure serving individual occupancies where the piping system(s) are metallically isolated from each other. Per NEC, or CEC where adopted ART. 250.104(A) (2) and (4), the bonding conductor shall be sized per Table 250.122 and connected to the switchboard/panel board serving that suite/occupancy.
 3. Use of Ground Rods: Furnish and install required number of 3/4" x 10' copper clad ground rods to meet specified resistance, all required grounding wires, conduit and clamps. The size of the grounding conductors shall be not less than that set forth in the latest edition of the California Code of Regulations, Title 24, State of California and NEC (CEC, where adopted), unless otherwise indicated. Rods shall be installed such that at least 10 feet of length is in contact with the soil. Where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from vertical or shall be buried in a trench that is at least 30 inches deep. The upper end of the electrode shall be

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flush with or below ground level unless the above ground end and the grounding electrode conductor attachments are protected against physical damage. Unless otherwise noted, connection to the grounding electrode conductor may be by compression type or exothermic process connector. Mechanical connectors shall not be used.

4. Grounding System Connection:
 - a. Compression connectors shall be unplated copper, manufactured by Burndy, or approved equal, designed specifically for the intended connection.
 - b. Exothermic weld-type connectors shall be 'Cadweld' manufactured by Erico Products, or approved equal, designed specifically for the intended connection.
 - c. Mechanical connectors shall not be used.
 5. Isolated Ground Receptacles shall have an insulated ground wire connected between the receptacle and the panelboard isolated ground bus. Unless otherwise noted, this ground wire shall not be grounded at any other point, and shall be distinguished from other ground wires by a continuous yellow stripe.
 6. Provide separate green equipment ground conductor in all electrical raceways to effectively ground all fixtures, panels, controls, motors, disconnect switches, exterior lighting standards, and noncurrent carrying metallic enclosures. Use bonding jumpers, grounding bushings, lugs, busses, etc., for this purpose. Connect the equipment ground to the building system ground. Use the same size equipment ground conductors as phase conductors, up through #10 AWG. Use NEC (or CEC where adopted) Table 250.122 for conductor size with phase conductors #8 and larger, if not shown on the Drawings.
 7. Clean the contact surfaces of all ground connections prior to making connections.
 8. Ductwork: Provide a flexible ground strap, No. 6 AWG equivalent, at each flexible duct connection at each air handler, exhaust fan, and supply fan, and install to preclude vibration.
 9. Motors: Connect the ground conductor to the conduit with an approved grounding bushing, and to the metal frame with a bolted solderless lug. Bolts, screws and washers shall be bronze or cadmium plated steel.
 10. Building grounding system resistance to ground shall not exceed 25 ohms unless otherwise noted and should be confirmed by testing.
- D. Line Voltage and Low Voltage Power Supplies to all Mechanical Equipment Including Plumbing, Heating and Air Conditioning Units:
1. An electric power supply, including conduit, any necessary junction and/or outlet boxes and conductors and connection shall be furnished and installed by the Contractor for each item or mechanical equipment.
 2. Power supplies to individual items of equipment shall be terminated in a suitable outlet or junction box adjacent to the respective item of equipment, or a junction box provided by the manufacturer or the equipment and directed by the Mechanical Contractor. Allow sufficient lengths of conductor at each location to permit connection to the individual equipment without breaking the wire run.

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3. The location of all conduit terminations to the equipment is approximate. The exact location of these conduit terminations shall be located and installed as directed by the Mechanical and Plumbing Contractor.
 4. Provide power supplies to all plumbing and mechanical equipment, including but not limited to, equipment furnished and installed by Owner or Contractor such as heating and air conditioning equipment, pumps, boilers, auto valves, water coolers, trap primers etc. The installation shall produce a complete and operable system.
 5. Unless otherwise noted, the Contractor shall furnish and install all conduit, boxes, wires, etc., for line voltage wiring and low voltage wiring.
 6. It is the Contractor's responsibility to verify with the drawings of other trades regarding the extent of his responsibility for mechanical equipment. The bid must include a sum sufficient to cover the cost of the installation.
 7. The location of all power supply connection and/or terminations to the mechanical equipment is approximate. The exact locations of these terminations shall be verified with other trades during construction.
- E. Prefabricated Equipment: Installation of all prefabricated items and equipment shall conform to the requirements of the manufacturer's specifications and installation instruction pamphlets. Where code requirements affect installation of materials and equipment, the more stringent requirements, code or manufacturer's instructions and/or specifications, shall govern the work.
- F. Firestopping:
1. The Contractor shall be responsible for furnishing all material, labor, equipment, and services in conjunction with the selection and installation of a complete, fully functioning, code compliant, UL-listed, fire stop assembly/system(s) as required by project conditions.
 2. Each fire stop assembly/system shall have an "F" and/or "T" rating as required by each condition requiring fire stopping. Each fire stop assembly/system shall have a current UL listing, as indicated in the latest edition of the UL Fire Resistance Directory. Contractor shall verify acceptability of all fire stopping methods and system selections with the authority having jurisdiction prior to installation. The Contractor shall install each fire stop assembly/system in accordance with the manufacturer's printed instructions.
 3. Each fire stop assembly/system shall be labeled with fire stop manufacturer-furnished label on each side of the fire stopping systems depicting UL # etc.
- G. Housekeeping Pads
1. Provide a minimum 3" high housekeeping pad above finished floor/finished grade for all floor-mounted switchgear, switchboards, distribution boards, transformers, motor control centers, etc., flush with the face of the equipment. Located in mechanical central plant(s), other mechanical spaces, and located outdoors, pads shall be flush with the face of the equipment. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions are met regarding housekeeping pads.

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2. Unless otherwise noted above, provide a minimum 1-1/2" high housekeeping pad above finished floor/finished grade for all interior floor-mounted switchgear, switchboards, distribution boards, transformers, motor control centers, transfer switches etc., flush with the face of the equipment. All housekeeping pad heights are as measured from finished floor or grade. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions are met regarding housekeeping pads.
3. Provide a 1-1/2" high housekeeping pad above finished floor/finished for service equipment. Prior to pad rough-in, Contractor shall verify serving utility company's maximum meter height requirements and, if necessary, adjust height of housekeeping pad to comply with those requirements. In indoor applications, the pad shall be flush with the face of the switchgear. In outdoor applications, the housekeeping pad shall extend a minimum of 4 feet from the front of switchgear/switchboard's weatherproof enclosure. Confirm pad dimensions with local inspector prior to forming pad to ensure any local code interpretations/conditions are met regarding housekeeping pads.
4. All housekeeping pads located in, on or attached to a building shall be seismically braced/connected to the building structure.

END OF SECTION

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SECTION 28 31 11

FIRE ALARM SYSTEM - VOICE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. The work under this section includes all final design, all labor, material, equipment, supplies, labor, testing, and accessories required to furnish and install a complete Fire Alarm System as indicated on the drawings and as specified herein.
- C. All miscellaneous system components including, but not limited to, cables, termination equipment, punch blocks, patch panels, backboards, and any other related items shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.
- D. The Fire Alarm System shall include, but not limited to, the following subsystems / products:
 - 1. See Products Section.
- E. Basic Performance:
 - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
 - 2. Device Circuits (IDC) shall be wired Class B (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
 - 3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
 - 4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
 - 5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
 - 6. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
 - 7. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone whichever is greater.
 - 8. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
 - 9. NAC speaker circuits and control equipment shall be arranged such that loss of

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any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.

Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.

Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.

Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.

10. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Digital amplifiers shall provide built-in speaker circuits, field configurable as four Class B (Style Y), or two Class A (Style Z) circuits.
11. Digital amplifiers shall be capable of storing up to two minutes of digitally recorded audio messages and tones. The digital amplifiers shall also be capable of supervising the connection to the associated digital message generator, and upon loss of that connection shall be capable of one of the following system responses:
 - a. The digital amplifier shall automatically broadcast the stored audio message.
 - b. The digital amplifier shall switch to a mode where a local bus input on the digital amplifier will accept an input to initiate a broadcast of the stored message. This bus input shall be connected to a NAC on a local FACP for the purpose of providing an alternate means of initiating an emergency message during a communication fault condition.
 - c. Speaker circuits shall be either 25 VRMS or 70VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
 - d. Two-way emergency telephone (Fire Fighter Telephone) communication shall be supported between the Audio Command Center and up to seven (7) remote Fire Fighter's Telephone locations simultaneously on a telephone riser.
 - e. Means shall be provided to connect FFT voice communications to the speaker circuits in order to allow voice paging over the speaker circuit from a telephone handset.
 - f. The digital audio message generator shall be of reliable, non-moving parts, and support the digital storage of up to 32 minutes of tones and emergency messages, shall support programming options to string audio segments together to create up to 1000 messages, or to loop messages and parts of messages to repeat for pre-determined cycles or indefinitely.

1.2 RELATED WORK

- A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and sections of Divisions 1 and 28 of these specifications.

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- B. All applicable portions of Section 26 00 00 shall apply to this section as though written herein completely.

1.3 GENERAL REQUIREMENTS

- A. The contractor shall hold a valid State of California C-10 Low-Voltage license, shall have completed at least 20 projects of equal scope, shall have been in business of furnishing and installing systems of this scope and magnitude for at least five years, and capable of being bonded to assure the owner of performance and satisfactory service during the guarantee period.
- B. The contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction over the work.
- C. All work shall be performed under the supervision of a company accredited by the basic equipment manufacturer and such accreditation must be presented.
- D. The installing contractor shall be a factory authorized distributor and warrantee station for the brand of equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment. The installing contractor shall maintain a spare set of all major parts for the system at all times. All circuit boards, amplifiers and control sub systems shall be 100% backed up with stock at contractors shop.
- E. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. The Contractor shall furnish a letter from the manufacturer of all major equipment, which certifies that the installing contractor is the Authorized Distributor and that the equipment has been installed according to factory intended practices. The Contractor shall also furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.
- F. The fire alarm contractor shall be UL listed company under the UL classification of (UUJS). The installation company shall UL certify this installation.
- G. The fire alarm contractor shall have a NICET Certified and Technicians on staff in their facility directly involved with this project to ensure technical expertise to this project and adherence with these specifications.
- H. The fire alarm contractor shall maintain sufficient stock on hand and have a fully equipped service organization capable of guaranteeing response time within 8 hours of service calls, 24 hours a day, 7 days a week to service completed systems.
- I. Equipment, wire and materials shall only be installed by the fire alarm contractor / manufacture's distributor. A Contractor other than the manufacturer's distributor used to install the system is not acceptable.

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- J. The fire alarm contractor/distributor shall provide, install and test all equipment related to this section.

1.4 QUALITY ASSURANCE

- A. In order to maintain a high degree of quality assurance, the contractor shall, without exception, use the parts and supplies as specified in this specification.
- B. No substitution will be accepted, this is a District standard product.
- C. It is the intent of these specifications to establish a standard of quality for labor and material to be installed. The Base Bid shall include materials as specified - without exception. No substitutions will be accepted.
- D. All of the equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment with the most current software package available at the time of installation. At the time of Owner Acceptance of the installation, all equipment shall include any and all updated software revisions. In addition, when the software is available in disk format, a backup copy of the most up to date revision, in disk format, shall be handed to the Owner at the completion of the project.
- E. Conform to all of the applicable provisions of the following standards.
 - 1. NFPA 72 – National Fire Alarm Code with California Amendments
 - 2. CBC – California Building Code
 - 3. CEC – California Electrical Code
 - 4. CFC – California Fire Code
 - 5. Local and State Building Codes.
 - 6. All requirements of the Authority Having Jurisdiction (AHJ).

1.5 SUBMITTAL AND MANUAL

- A. Comply with all requirements of the General Conditions, Supplementary Conditions and applicable sections of Divisions 1 and 16 of these specifications.
- B. Additional requirements of this section are:
 - 1. Within thirty-five (35) calendar days after the date of award of the Contract, the Contractor shall submit eight copies of the complete submission to the Architect for review.
 - 2. The submission shall consist of five major sections with each section separated with index tabs. Each page in the submission shall be numbered chronologically and shall be summarized in the index.
 - 3. The first section shall be the "index" which shall include the project title and address, name of the firm submitting the proposal and name of the Architect.

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4. The second section shall include the following items:
- a. Contractor's License: A copy of the electronics contractor's valid State of California License.
 - b. Proof of Experience: Proof that the fire alarm contractor has been regularly engaged in the business of fire alarm contracting consisting of, but not limited to, engineering, fabrication, installation, and servicing of fire alarm systems of the type specified herein for at least the past ten (10) consecutive years. Provide a statement summarizing any pending litigation involving any officer or principal of/or the company, the nature of the litigation and what effect the litigation may carry as it relates to this work in the worst case scenario. Non-disclosure of this item, if later discovered, may result, at the owner's discretion, in the contractor bearing all costs and any cost related to associated delays in the progress of the work.
 - c. Insurance Certificates: Copy of fire alarm contractor's current liability insurance and state industrial insurance certificates in conformance with the contract documents.
 - d. Project List: A List containing at least ten (10) California installations completed within the last five (5) years by the fire alarm contractor that are comparable in scope and nature to that specified in the contract document.
 - e. Service Capability: Documentation indicating in detail that the fire alarm contractor has competent engineering, installation, service personnel and facilities with reasonable stock of service parts within 100 air miles of the job site.
 - f. Authorization Letters: Letters from the fire alarm equipment manufacturer stating that the fire alarm contractor is the Factory Authorized Distributor, and is trained and certified for the equipment he proposes to use on this project, and is licensed to purchase and install that software required to provide the specified functions.
 - g. Certification:
 - 1) Proof that the fire alarm contractor is Underwriters Laboratories, Inc. (UL) listed under the classification of "PROTECTIVE SIGNALING SERVICES-LOCAL, AUXILIARY, REMOTE STATION AND PROPRIETARY (UUJS).
 - 2) Copy of the following: (NICET) Certificates. Provide proof that the certificate holders are a part of the fire alarm contractor's local facility servicing this project and will be actively involved in this project.
 - a) Technician Level 2 minimum of (5).
 - b) Technician Level 4 minimum of (1)
 - h. Proof of Trained Personnel:
 - 1) Documentation that the fire alarm contractor has on staff personnel factory-trained and certified for the equipment proposed for this project. Also, provide a statement that personnel meeting these

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qualifications are in the local facility, and will be maintained at that facility throughout the project and the warranty period.

5. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished next to all of the specified equipment's features and functions as stated in the specifications and data sheets. Include CSFM listing sheet for each component.
 6. The fourth section shall contain an original factory data sheet for every component in the specifications.
 7. The fifth section shall contain a designation schedule for each Structured Cabling System location and complete 1/8" = 1'-0" scale drawing showing system wiring plans.
 - a. Riser Diagram.
 - b. Typical Device Wiring Diagram.
 - c. Wire Legend, including types for zones and devices and color coding to be utilized.
 - d. Battery Calculation for each control panel, power supply, field power supply and network annunciator.
 - e. Worst Case Voltage drop for each circuit type per building.
 - f. Floor Plans showing all conduits, sizes, quantity of conductors.
 - g. Mounting Height of each devices and back box requirement.
 - h. Zoning and address description legend.
- C. Failure to comply with all of the requirements listed above will result in the rejection of the entire submittal package.
- D. The Contractor shall provide two copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: Instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment; a schematic diagram of major components with all transistor and IC complements and replacement number.
- 1.6 GENERAL SYSTEM PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY
- A. Prior to Owner acceptance, the contractor shall provide to Owner, a manufacturers product and performance warranty. This will require a submittal of the required pre-job certification registration forms as well as the required project closing information. The Owner will only acknowledge acceptance upon submittal of a valid manufacturer's warranty.

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- B. The warranty shall commence from the date of final written acceptance by the Owner.
 - C. All conditions for obtaining the manufacturers warranty shall be the sole responsibility of the contractor.
 - D. The contractor shall maintain a competent service organization and shall, if requested, submit a service maintenance agreement to the owner after the end of the guarantee period.
 - E. A typewritten notice shall be posted at the equipment rack that shall indicate the firm, address and telephone number to call when service is necessary. The notice shall be mounted in a neatly finished metal frame with a clear plastic window and securely attached to the inside of the door.
- 1.7 SPECIFIC SYSTEM PRODUCT, INSTALLATION AND OVERALL SYSTEM WARRANTY
- A. The entire system shall be warranted free of mechanical or electrical defects for a period of one (1) year after final acceptance of the installation. Any material showing mechanical or electrical defects shall be replaced promptly at no expense to the Owner.
- 1.8 DESCRIPTION
- A. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
 - B. The facility shall have an emergency voice alarm communication system. Digitally stored message sequences shall notify the building occupants that a fire or life safety condition has been reported. Message generator(s) shall be capable of automatically distributing up to eight (8) simultaneous, unique messages to appropriate audio zones within the facility based on the type and location of the initiating event. The Fire Command Center (FCC) shall also support Emergency manual voice announcement capability for both system wide or selected audio zones, and shall include provisions for the system operator to override automatic messages system wide or in selected zones.
 - C. The system shall be support additional, alternate Fire Command Centers, which shall be capable of simultaneous monitoring of all system events. Alternate Fire Command Centers shall also support an approved method of transferring the control functions to an alternate Fire Command Center when necessary. All Fire Command Centers shall be individually capable of assuming Audio Command functions such as Emergency Paging, audio zone control functions, and Firefighter's Telephone communication functions.
 - D. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the Fire Command Center (FCC) and designated personnel in other buildings at the site via a multiplex communication network.

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- E. The fire alarm system shall be manufactured by an ISO 9001:2008 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994
 - F. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof). It's acceptable for peripheral devices to be manufactured outside of the U.S. by a division of the U.S. based parent company.
 - G. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
 - H. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.
- 1.9 POST CONTRACT MAINTENANCE:
- A. Complete maintenance and repair service for the fire detection system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
 - B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, required tests, and list pricing for any replacement products included on the bill of materials, along with the list pricing for products not on the bill of materials; if test and inspection rates are different than full service rates the bid/proposal shall include pricing for all levels for a minimum period of five (5) years Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
 - C. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

PART 2.0 PRODUCTS

2.1 MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE:

- A. Main FACP or network node shall be by GAMEWELL-FCI and shall contain a microprocessor based Central Processing Unit (CPU) and power supply. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.
- B. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:

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1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

2.2 System Capacity and General Operation

- A. The FACP shall be capable of communicating on a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels / nodes per network.
- B. The control panel shall be capable of expansion via up to 10 SLC loops. Each module shall support up to 318 analog/addressable devices for a maximum system capacity of 3180 points. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a keypad for the control of the fire alarm system. Said LCD shall also support graphic bit maps.
- C. All programming or editing of the existing program in the system shall be achieved without interrupting the alarm monitoring functions of the fire alarm control panel.
- D. The FACP shall be able to provide the following software and hardware features:
 1. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
 2. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
 3. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
 4. Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder

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- bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.
5. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
 6. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
 7. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the sensitivity testing requirements of NFPA 72.
 8. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The remainder will appear on the system display and (if enabled) will sound a piezo alarm.
 9. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop. A single change to one CPU database shall not require a database download to other CPUs.
 10. History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.
 11. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
 12. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
 13. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
 14. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
 15. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
 16. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
 17. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
 18. Local Mode: If communication is lost to the central processor the system shall

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- provide added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
19. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
 20. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.
 21. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector with up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result of all cooperating detectors chamber readings.
 22. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.
 23. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
 24. Mass Notification Override: The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.
 25. Security Monitor Points: The system shall provide means to monitor any point as a type security.
 26. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciators can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
 27. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is

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added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.

28. Permitted zone types shall be general zone, releasing zone and special zone. Each output point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
29. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
30. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
31. 100 trouble equations per device: The system shall provide support for up to 100 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
32. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.
33. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.
34. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

E. Network Communication

1. The FACP shall be capable of communicating over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels/nodes per network.

F. Central Processing Unit

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1. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
2. The Central Processing Unit shall also provide a real-time clock for time annotation, to the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.
3. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
4. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
5. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
6. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.

G. Display

1. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide eleven Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, CONTROLS ACTIVE, and CPU FAILURE.
2. The system display shall provide a keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

H. Loop (Signaling Line Circuit) Control Module:

1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Ionization, Photoelectric, or Thermal) and 159 monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. Each Loop shall be capable of operating as a NFPA Style 4 (Class B) circuit.
4. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board

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software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

I. Digital Voice Command Center

1. The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.
2. Function: The Voice Command Center equipment shall perform the following functions:
 - a. Operate as a supervised multi-channel emergency voice communication system.
Operate as a two-way emergency telephone system control center.
 - b. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
 - c. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
 - d. Provide all-call Emergency Paging activities through activation of a single control switch.
 - e. As required, provide vectored paging control to specific audio zones via dedicated control switches.
 - f. Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
 - g. Provide a software utility capable of off-line programming for the DVC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the DVC shall not inhibit the emergency operation of other nodes on the fire alarm network.
 - h. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SLC controlled switching.
 - i. The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
 - j. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

J. Power Supply:

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1. The Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. The Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.
3. The Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.
4. The Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Main Power Supply shall be power-limited per UL864 requirements.
6. The Main Power Supply shall communicate power supply, line voltage, battery status and charger status to the local LCD display. Any abnormal condition shall be annunciated and logged to the system alarm history log.
7. Addressable Charger Power Supply: The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24 VDC power.
8. The addressable power supply for the fire detection system shall provide up to a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 10.0 amps of 24 volt DC general power. The power supply shall have an additional 0.5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 12 - 200 amp hour batteries.
9. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as Class "A" or Class "B" circuits. All circuits shall be power-limited per UL 864 requirements.
10. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
11. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
12. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.
13. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
14. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of zero, two, eight or sixteen hours shall be programmable.

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15. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be programmable.
16. The addressable power supply mounts in either the FACP backbox or its own dedicated surface mounted backbox with cover.
17. Each of the power supply's four output circuits shall be programmed- for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
18. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24 VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
19. When selected for Notification Appliance Circuits, the output circuits shall be individually programmable for Steady, March Time, Dual Stage or Temporal.
20. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
21. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
22. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

K. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power () for distribution to speaker circuits.
2. Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
3. The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:
 - a. Earth Fault on DAP A (Digital Audio Port A)
 - b. Earth Fault on DAP B (Digital Audio Port B)
 - c. Audio Amplifier Failure Detected Trouble
 - d. Active Alarm Bus input
 - e. Audio Detected on Aux Input A
 - f. Audio Detected on Aux Input B
 - g. Audio Detected on Firefighter's Telephone Riser
 - h. Receiving Audio from digital audio riser
 - i. Short circuit on speaker circuit 1
 - j. Short circuit on speaker circuit 2
 - k. Short circuit on speaker circuit 3
 - l. Short circuit on speaker circuit 4
 - m. Data Transmitted on DAP A
 - n. Data Received on DAP A

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- o. Data Transmitted on DAP B
 - p. Data Received on DAP B
 - q. Board failure
 - r. Active fiber optic media connection on port A (fiber optic media applications)
 - s. Active fiber optic media connection on port B (fiber optic media applications)
 - t. Power supply Earth Fault
 - u. Power supply 5V present
 - v. Power supply conditions - Brownout, High Battery, Low Battery, Charger Trouble
4. The audio amplifier shall provide the following built-in controls:
- a. Amplifier Address Selection Switches
 - b. Signal Silence of communication loss annunciation Reset
 - c. Level adjustment for background music
 - d. Enable/Disable for Earth Fault detection on DAP A
 - e. Enable/Disable for Earth Fault detection on DAP A
 - f. Switch for 2-wire/4-wire FFT riser
5. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
6. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
7. System shall be capable of backing up digital amplifiers.
8. One-to-one backup shall be provided by either a plug-in amplifier card or a designated backup amplifier of identical model as the primary amplifier.
9. One designated backup amplifier shall be capable of backing up multiple primary amplifiers mounted in the same or adjacent cabinets.
10. Multi-channel operation from a single amplifier shall be supported by the addition of an optional plug-in amplifier card.
- L. Audio Message Generator (Prerecorded Voice)/Speaker Control:
- 1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.
 - 2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
 - 3. A built-in microphone shall be provided to allow paging through speaker circuits.
 - 4. System paging from emergency telephone circuits shall be supported.
 - 5. The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:
 - a. Lamp Test
 - b. Trouble
 - c. Off-Line Trouble

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- d. Microphone Trouble
- e. Phone Trouble
- f. Busy/Wait
- g. Page Inhibited
- h. Pre/Post Announcement Tone

M. Controls with associated LED Indicators:

1. Speaker Switches/Indicators

- a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
- b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.\

2. Emergency Two-Way Telephone Control Switches/Indicators

- a. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
- b. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

N. Remote Transmissions:

- 1. Provide local energy or polarity reversal or trip circuits as required.
- 2. The system shall be capable of operating a polarity reversal or local energy or fire alarm transmitter for automatically transmitting fire information to the fire department.
- 3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.
- 4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.

O. Field Programming

- 1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.
- 2. All field defined programs shall be stored in non-volatile memory.

P. Specific System Operations

- 1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

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2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
- Q. System Point Operations:
1. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
 2. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
 3. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:
 - a. Device Status.
 - b. Device Type.
 - c. Custom Device Label.
 - d. Software Zone Label.
 - e. Device Zone Assignments.
 - f. Analog Detector Sensitivity.
 - g. All Program Parameters.
 4. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.
 5. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
 6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
 7. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
 8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

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2.3 SYSTEM COMPONENTS:

A. Conventional Aspirating Detection

1. An optional air aspiration detection system shall be available.
2. The aspirating system shall support multiple sensitivity settings.
3. The aspirating system shall operate from 24 VDC.
4. The aspirating system shall provide alarm and trouble relays used to activate a fire alarm control panel.

B. Aspiration System Interface:

1. The system shall be capable of supporting Interface Modules for integrating Vesda Aspiration detectors into SLC loop of the fire alarm control panel. The Interface Module shall support up to 19 detectors, each SLC loop shall support one interface module.

C. High Level Aspiration System Interface:

1. The system shall be capable of supporting a High Level Interface for Vesda Aspirating Detection Systems. The interface shall support up to 100 detectors and allow the fire alarm network to monitor and control events on the aspiration system.

D. Portable Emergency Telephone Handset Jack

1. Portable emergency telephone handset jacks shall be flush mounted on stainless steel plates as indicated on plans. Handset jacks shall be approved for emergency telephone system application.
2. Insertion of a remote handset plug into a jack shall send a signal to the fire command center which shall audibly and visually indicate the on-line condition, and shall sound a ring indication in the handset.
3. The two-way emergency telephone system shall support a minimum of seven (7) handsets on line without degradation of the signal.

E. Fixed Emergency Telephone Handset

1. The telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.
2. The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.
3. The two-way emergency telephone system shall support a maximum of seven (7) handsets on line (off hook) without degradation of the signal.

F. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.

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1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
3. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.
4. Communication shall include vital system status such as:
 - a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - b. Independent Addressable Device Status
 - c. AC (Mains) Power Loss
 - d. Low Battery and Earth Fault
 - e. System Off Normal
 - f. 12 and 24 Hour Test Signal
 - g. Abnormal Test Signal (per UL requirements)
 - h. EIA-485 Communications Failure
 - i. Phone Line Failure
5. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 3,064 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
6. The UDACT shall be capable of being programmed with the same programming utility as the host FACP, and saved, edited and uploaded and downloaded using the utility. UDACT shall be capable of being programmed online or offline. The programming utility shall also support upgrading UDACT operating firmware.
7. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.
8. An IP or IP/GSM Communicator option shall be available to interface to the UDACT and be capable of transmitting signals over the internet/intranet or Cellular (GSM) network to a compatible receiver.

G. Field Wiring Terminal Blocks

1. For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

H. Printer

1. The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The

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printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.

2. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.
3. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

I. Smoke Control Annunciator

1. On/Auto/Off switches and status indicators (LEDS) shall be provided for monitoring and manual control of each fan, damper, HVAC control unit, stairwell pressurization fan, and smoke exhaust fan. To ensure compliance the units supplied shall meet the following UL categories: UUKL, PAZX, UDTZ, QVAX as well as the requirements of NFPA 90A, HVAC, and NFPA 92A & 92B, Smoke Control. The control System shall be field programmable for either 90A operation or 92A/B operation to allow for future use and system expansion.
2. The OFF LED shall be Yellow, the ON LED shall be green, the Trouble/Fault LED shall be Amber/Orange for each switch. The Trouble/Fault indicator shall indicate a trouble in the control and/or monitor points associated with that switch. In addition, each group of eight switches shall have two LEDS and one momentary switch which allow the following functions: An Amber LED to indicate an OFF-NORMAL switch position, in the ON or OFF position; A Green LED to indicate ALL AUTO switch position; A Local Acknowledge/Lamp Test momentary switch.
3. Each switch shall have the capability to monitor and control two addressable inputs and two addressable outputs. In all modes, the ON and OFF indicators shall continuously follow the device status not the switch position. Positive feedback shall be employed to verify correct operation of the device being controlled. Systems that indicate on/off/auto by physical switch position only are not acceptable.
4. All HVAC switches (i.e., limit switches, vane switches, etc.) shall be provided and installed by the HVAC contractor.
5. It shall be possible to meet the requirements mentioned above utilizing wall mounted custom graphic.

2.4 Gateway & Webserver Options

- A. Common Alerting Protocol (CAP) Gateway: The system shall support an optional CAP Gateway (Common Alerting Protocol). The CAP Gateway translates fire system

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messages to industry standard CAP messages for integration with CAP-compliant clients. A CAP gateway shall be available from the fire alarm control panel manufacturer.

- B. LEDSIGN Gateway: The system shall support an optional and proprietary LEDSIGN Gateway to interface to LED signs that will automatically display emergency messages. The signs shall be capable of storing up to 100 messages that can be activated via system programming with the ability to be manually overridden. The Sign Gateway shall support up to 10 independent signs, each sign capable of playing an independent message. Multiple LEDSIGN Gateways can be used in network applications. An LEDSIGN gateway shall be available from the fire alarm control panel manufacturer.
- C. BACnet Interface Gateway: The system shall be capable of being interfaced with BACNet compliant clients. A BACnet interface supporting BACnet/IP communication shall be available from the fire alarm control panel manufacturer.
- D. MODbus Interface Gateway: The system shall be capable of being interfaced with MODbus compliant clients. A MODbus interface supporting MODbus/TCP communication shall be available from the fire alarm control panel manufacturer.
- E. Noti-Fire-Net Gateway: The system shall support an IP based gateway to enable the panel or local Noti-Fire-Net to be connected to an ONYXWorks workstation via the Internet or Intranet. This gateway shall also support the ability to integrate the system to an interactive firefighter's display. The Noti-Fire-Net Gateway shall be available from the fire alarm control manufacturer.
- F. Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history, event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.
- G. Web Portal Interface: The system shall be capable of being interfaced with a web portal to integrate with Inspection and Service Manager utilities. The web portal and inspection and service manager utilities shall be available from the fire alarm control panel manufacturer.

2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

- A. Addressable Devices – General
 1. Addressable devices shall provide an address-setting means using rotary decimal switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.
 2. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
 3. Addressable devices, which use a binary-coded address setting method, such as a

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- DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
4. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
 5. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
 6. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
 7. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
 8. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
 9. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications. The system shall also support an intelligent programmable sounder base, the programmable sounder base shall be capable of providing multiple tones based on programming and at a minimum be capable of providing a Temp-4 tone for CO (Carbon Monoxide) activation and a Temp-3 tone for fire activations and be capable of being synchronized with other programmable sounder bases and common area notification appliances; 85 DBA minimum.
 10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
 11. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
 12. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
 13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
 14. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

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- B. Addressable Manual Fire Alarm Box (manual station)
1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
 2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
- C. Intelligent Photoelectric Smoke Detector: The intelligent photoelectric smoke detector shall be GAMEWELL-FCI model and shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent VIEW® Laser Photo Smoke Detector: The intelligent laser photo smoke detector shall be a spot type detector, GAMEWELL-FCI model, that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.
1. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.
 2. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.02 percent per foot.
 3. The laser detector shall not require expensive conduit, special fittings or PVC pipe.
 4. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.
 5. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.
 6. The laser photo detector shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.
- E. Intelligent Ionization Smoke Detector: The intelligent ionization smoke detector shall be GAMEWELL-FCI model and shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.
- F. Intelligent Multi Criteria Acclimating Detector: The intelligent multi-criteria Acclimate® Plus™ detector shall be an addressable device, GAMEWELL-FCI model, that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device.

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The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.

1. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
 2. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.
- G. Intelligent Thermal Detectors: The intelligent thermal detectors shall be GAMEWELL-FCI addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.
- H. Intelligent Duct Smoke Detector: The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system. The Intelligent Duct Smoke Detector shall support the installation of addressable Photoelectric detector capable or being tested remotely. The remote test capable photoelectric smoke detector shall be GAMEWELL-FCI model.
- I. Multi-Criteria Intelligent Detector
1. Intelligent multi-criteria fire detector shall be a GAMEWELL-FCI model. Smoke detector shall be an addressable intelligent multi-criteria smoke detector. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical carbon monoxide (CO) sensor, a daylight-filtered infrared sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
 2. The intelligent multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in an effort to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The product design shall be capable of selecting the appropriate sensitivity levels based on the environment type chosen by user in which it is installed (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the

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environment changes.

3. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The device shall provide unique signals to indicate when 20% of the drift range is remaining, when 100% of drift range is used, and when there is a chamber fault to show unit requires maintenance.
4. The detector shall indicate CO trouble conditions including 6 months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self test failure, IR self test failure, and freeze warning.
5. The detectors shall provide address-setting means on the detector head using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or DIP switches to set the detector address are not acceptable. The detectors shall also store an internal identifying code that the control panel shall use to identify the type of detector. Systems that require a special programmer to set the detector address (including temporary connection at the panel) are labor intensive and not acceptable. Each detector occupies any one of at least 99 possible addresses on the signaling line circuit (SLC) loop. It responds to regular polls from the system and reports its type and status.
6. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel. There are three test methods: functional magnet, smoke entry aerosol, or direct heat method.
7. The detectors shall provide two LEDs to provide 360° visibility. The LEDs are placed into steady red illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED, sounder base, and / or relay base (optional accessories). The external remote alarm can be interconnected to other sounder or relay bases for activating all devices in a space via a single alarming unit.
8. Two LEDs on the sensor are controlled by the panel to indicate sensor status. Coded signals, transmitted from the panel, can cause the LEDs to blink, latch on, or latch off. Refer to the control panel technical documentation for sensor LED status operation and expected delay to alarm.
9. The detectors shall be ceiling-mount and shall be plug-in mounted into a twist-lock base. These detectors shall be constructed of off-white UV resistant polymer and shall be detachable from the mounting base to simplify installation, service and maintenance. Mounting base wiring connections shall be made by means of SEMS screws. The detector shall allow pre-wiring of the base and the head shall be a plug-in type. Mounting base shall be mounted on junction box which is at least 1.5 inches (3.81 cm) deep. Mounting base shall be available to mount to standard junction boxes. Suitable boxes include:
 - a. 4.0" (10.16 cm) square box with and without plaster ring.
 - b. 4.0" (10.16 cm) octagonal box.
 - c. 3.5" (8.89 cm) octagonal box.

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d. Single-gang box.

10. Meets Agency Standards

- a. ANSI/UL 268 -Smoke Detectors for Fire Alarm Signaling Systems
- b. CAN/ULC-S529- Smoke Detectors for Fire Alarm Systems
- c. FM 3230-3250- Smoke Actuated Detectors for Automatic Fire Alarm Signaling

J. Multi-Criteria Intelligent Fire/CO Detector

- 1. Multi-Criteria Fire/CO detector shall be GAMEWELL-FCI model and shall be an addressable advanced multi-criteria smoke detector with a separate signal for carbon monoxide (CO) detection per UL 2075 standards.
- 2. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical CO sensor, a daylight-filtered infrared (IR) sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
- 3. The advanced multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in order to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The detector shall be capable of selecting the appropriate sensitivity levels based on the environment type (office, manufacturing, kitchen, etc.) in which it is installed, and then have the ability to automatically change the setting as the environment changes.
- 4. The CO detector component shall be capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.
- 5. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The device shall provide unique signals to indicate when 20 percent of the drift range is remaining, when 100 percent of drift range is used, and when there is a chamber fault to show the unit requires maintenance.
- 6. The detector shall indicate CO trouble conditions, including six months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self test failure, IR self test failure, and freeze warning.
- 7. The detector shall provide address-setting means on the detector head using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or DIP switches to set the detector address are not acceptable. The detector shall also store an internal identifying code that the control panel shall use to identify the type of detector. Systems that require a special programmer to set the detector address (including temporary connection at the panel) are labor intensive and not acceptable. Each detector occupies any one of at least 159 possible addresses on the signaling line circuit (SLC) loop. It responds to regular polls from the system and reports its type and status.
- 8. The detector shall provide a test means whereby it will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the

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control panel. There shall be four test methods: functional magnet, smoke entry aerosol, carbon monoxide aerosol or direct heat method.

9. The detector shall provide two LEDs to provide 360° visibility. The LEDs shall be placed into steady red illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED. The detector must be capable of connecting to a sounder base that provides both temporal 3 and temporal 4 patterns for fire and CO alarm.
 10. Two LEDs on the sensor shall be controlled by the panel to indicate sensor status. Coded signals, transmitted from the panel, shall cause the LEDs to blink, latch on, or latch off. Refer to the control panel technical documentation for sensor LED status operation and expected delay to alarm.
 11. The detector shall be plug-in mounted into a twist-lock base. The detector shall be constructed of off-white, UV-resistant polymer and shall be detachable from the mounting base to simplify installation, service and maintenance. Mounting base wiring connections shall be made by means of SEMS screws. The detector shall allow pre-wiring of the base and the head shall be a plug-in type. The mounting base shall be mounted on a junction box that is at least 1.5 inches (3.81 cm) deep. The mounting base shall be available to mount to standard junction boxes. Suitable boxes include:
 - a. 4.0" (10.16 cm) square box with and without plaster ring.
 - b. 4.0" (10.16 cm) octagonal box.
 - c. 3.5" (8.89 cm) octagonal box.
 - d. Single-gang box.
 - e. Double-gang box
 12. Meets Agency Standards
 - a. ANSI/UL 268 -Smoke Detectors for Fire Alarm Signaling Systems
 - b. CAN/ULC-S529- Smoke Detectors for Fire Alarm Systems
 - c. FM 3230-3250- Smoke Actuated Detectors for Automatic Fire Alarm Signaling
 - d. UL 2075 – Gas and Vapor Detector and Sensors – Systems Connected
- K. Intelligent Addressable Aspiration Detector: The intelligent aspiration detector shall be GAMEWELL-FCI model an addressable aspiration detector that communicates directly with the fire alarm control panel via the SLC communication protocol, no modules or high level interfaces shall be required. The fire alarm control panel shall support up to thirty one intelligent aspiration detectors per SLC loop. The aspiration detector shall have dual source (blue LED and infra-red laser) optical smoke detection for a wide range of fire detection with enhanced immunity to nuisance particulates. The FACP shall be capable of monitoring and annunciating up to five smoke event thresholds and eleven trouble conditions. Each event threshold shall be capable of being assigned a discrete type ID at the FACP.
- L. Intelligent Addressable Reflected Beam Detector

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1. The intelligent single-ended reflected beam smoke detector shall connect with two wires to the fire alarm control panel signaling line circuit (SLC). The detectors shall consist of a transmitter/receiver unit and a reflector and shall send data to the panel representing the analog level of smoke density. The detector shall be capable of being tested remotely via a keyswitch. Model shall be equipped with an integral sensitivity test feature.

M. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs. The addressable monitor module shall be GAMEWELL-FCI model Class A or B.
2. The IDC zone shall be suitable for Style D/Class A or Style B/Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
4. For multiple dry contact monitoring a module shall be available that provides 10 Style B or 5 Style D input circuits; GAMEWELL-FCI model.

N. Two Wire Detector Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device); GAMEWELL-FCI model.
2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For multiple 2-wire smoke detector circuit monitoring a module shall be available that provides 6 Style B/Class A or 3 Style D/Class B input circuits; GAMEWELL-FCI model.

O. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional circuit of compatible Notification Appliances, 24 VDC powered, polarized audio/visual notification appliances; GAMEWELL-FCI model.
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with a current rating of 2 Amps for Style Z and 3 Amps for Style Y;
3. Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.
4. For multiple circuit control a module shall be available that provides 6 Style Y (Class B) or 3 Style Z (Class A) control circuits; GAMEWELL-FCI model.

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- P. Addressable Releasing Control Module
1. An addressable releasing module shall be available to supervise and control compatible releasing agent solenoids; GAMEWELL-FCI model.
 2. The module shall operate on a redundant protocol for added protection.
 3. The module shall be configurable for Style Z or Style Y (Class A/B) and support one 24 volt or two 12 volt solenoids. Add FMM-4-20
- Q. Addressable 4-20 mA module shall be available to monitor industry-standard, linear-scale, 4-20 mA protocol sensors. The module converts the sensor output to communication protocol that can be interpreted by the FACP for monitoring and display; GAMEWELL-FCI model.
1. The module shall support programming of up to five programmable event thresholds.
 2. The System shall be Factory Mutual approved as a Gas Detection system when employed with the monitor module and industry standard 4-20 mA gas detectors.
- R. Addressable Relay Module:
1. Addressable Relay Modules shall be available for HVAC control and other network building functions; GAMEWELL-FCI model
 2. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
 3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary devices energize at the same time on the same pair of wires;
 4. For multiple relay control a module shall be available that provides 6 programmable Form-C relays; GAMEWELL-FCI model.
- S. Addressable Two-In / Two-Out Monitor/Relay Module:
1. An addressable Two-In / Two-Out module shall be available.
 2. The two-in/two-out module shall provide two Class B/Style B dry-contact input circuits and two independent Form-C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
- T. Isolator Module: Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building; GAMEWELL-FCI model.
1. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
 2. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module

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after its normal operation.

3. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

U. Serially Connected Annunciator Requirements

1. The annunciator shall communicate to the fire alarm control panel via an EIA 485 (multi-drop) two-wire communications loop. The system shall support two 6,000 ft. EIA-485 wire runs. Up to 32 annunciators, each configured up to 96 points, may be connected to the connection, for a system capacity of 3,072 points of annunciation.
2. An EIA-485 repeater shall be available to extend the EIA-485 wire distance in 3,000 ft. increments. The repeater shall be UL864 approved.
3. Each annunciator shall provide up to 96 alarm and 97 trouble indications using a long-life programmable color LED's. Up to 96 control switches shall also be available for the control of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge and lamp test switch, and custom zone/function identification labels.
4. The annunciator may be field configured to operate as a "Fan Control Annunciator". When configured as "Fan Control," the annunciator may be used to manually control fan or damper operation and can be set to override automatic commands to all fans/dampers programmed to the annunciator.
5. Annunciator switches may be programmed for System control such as, Global Acknowledge, Global Signal Silence, Global System Reset, and on/off control of any control point in the system.
6. An optional module shall be available to utilize annunciator points to drive EIA-485 driven relays. This shall extend the system point capacity by 3,072 remote contacts.
7. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

V. SpectrAlert Advance Speakers

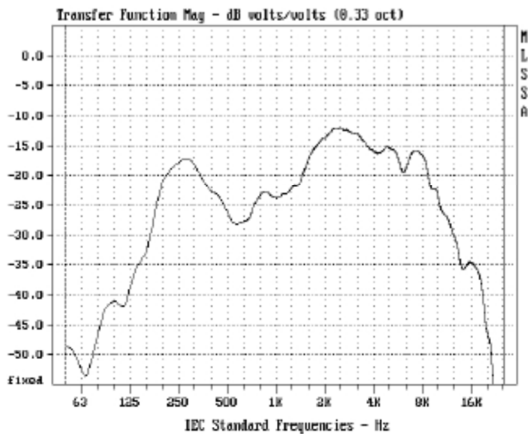
1. The Speaker appliance shall be System Sensor SpectrAlert Advance Speaker. The speaker shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dual-voltage transformer speaker capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.
3. Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.
4. The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86

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5. dB at 10 feet and shall incorporate an open back construction.
All notification appliances shall be backward compatible.

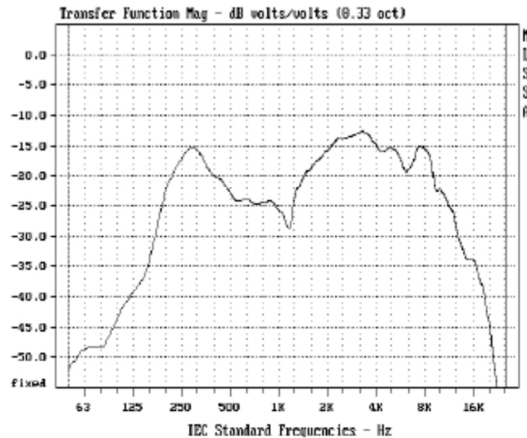
Ceiling Speaker

Wide Band Frequency Response



Wall Speaker

Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

W. SpectrAlert Advance Speaker Strobes

1. The Speaker Strobe appliance shall be System Sensor SpectrAlert Advance Speaker Strobe. The speaker strobe shall be listed to UL 1971 and UL 1480 and be approved for fire protective signaling systems. It shall be a dual-voltage transformer speaker strobe capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker strobe products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes and the Sync•Circuit™ Module MDL3 accessory, if used, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts (includes fire alarm panels with built in sync). When used with the Sync•Circuit Module MDL3, 12-volt rated notification appliance circuit outputs shall operate between 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 to 33 volts. If the notification appliances are not UL 9th edition listed with the corresponding panel or power supply being used, then refer to the compatibility listing of the panel to determine maximum devices on a circuit.
3. Speaker strobes shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker strobe design shall isolate speaker components to reduce ground fault incidents.
4. The speaker strobe shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction. The strobe shall

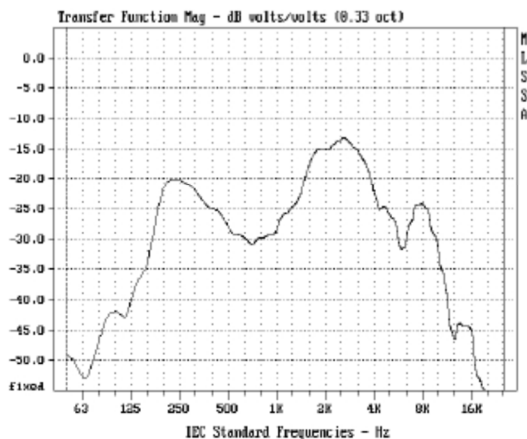
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consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, or 115 when operating on 24V. The strobe shall comply with NFPA 72 and the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range.

5. All notification appliances shall be backward compatible.

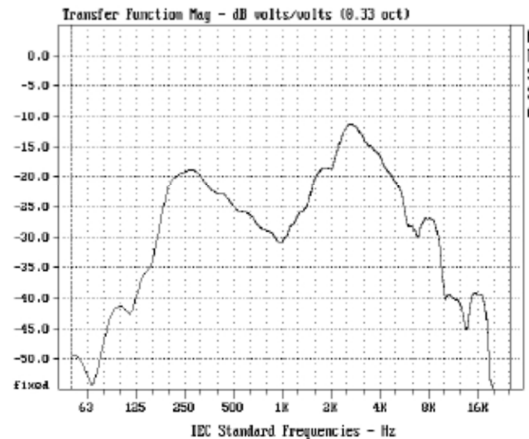
Ceiling Speaker Strobe

Wide Band Frequency Response



Wall Speaker Strobe

Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

6. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and be fully synchronized.

PART 3.0 - EXECUTION

3.1. GENERAL INSTALLATION REQUIREMENTS:

- A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the contractor shall notify the architect before making any changes. It shall be the responsibility of the factory-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.
- B. Furnish all conduit, junction boxes, conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.

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- C. The cables within the rack or cabinets shall be carefully cabled and neatly dressed with hook-and-loop type fasteners or tie-wraps. All cables shall be numbered for identification.
- D. Splicing of conductors in underground pull boxes is not permitted.
- E. The labor employed by the contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the owner and architect to engage in the installation and service of this system.
- F. The contractor shall thoroughly clean all equipment and materials. All exposed parts of the equipment, cabinets, and other equipment shall be left in a clean condition, unblemished and free of all dirt, dust, smudges, spots, fingerprints, etc., the contractor shall remove all debris and rubbish occasioned by the electronic systems work from the site. The contractor shall thoroughly clean all buildings of any dirt, debris, rubbish, marks, etc., caused by the performance of this work.
- G. The system must meet all local and other prevailing codes.
- H. All cabling installations shall be performed by qualified technicians.
- I. All cabling shall be splice free.
- J. In order to ensure the least amount of cable untwisting, it is required that all cables shall be stripped using a special tool.
- K. Prior to the use of lubricants (i.e. Polywater) to facilitate the installation of cables, the contractor shall verify the acceptability of the lubricant to be used with the cable manufacturer, prior to using such a lubricant.
- L. All firewalls penetrated by structured cabling shall be sealed by use a non-permanent fire blanket or other method in compliance with the current edition of National Fire Protection Association (NFPA) and the National Electrical Code (NEC), California Electrical Code (CEC), or other prevailing code. The contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wireways or conduits. Contractors who use this method will be required to replace all cables affected and provide the original specified access to each effected area.
- M. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- N. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

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- O. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- P. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 SPECIFIC SYSTEM INSTALLATION REQUIREMENTS

- A. The entire system shall be installed in a workmanlike manner in accordance with approved manufacturers manuals and wiring diagrams. The contractor shall furnish all wiring, conduit, outlet boxes, junction boxes, terminal cabinets and similar devices necessary for the completed installation..
- B. Installation off conduit, outlet boxes, junction boxes, terminal cabinets, special back boxes and similar devices shall comply with the requirements of Section 26 00 00 General Electrical Materials.
- C. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detector heads shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- D. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Verify with the Project Architect prior to any surface mounted installations.
- E. All penetrations of floor slabs and fire walls, shall be fire stopped in accordance with the electrical specifications.
- F. Duct mounted Smoke Detectors (when permitted for installation in writing by the engineer and District) shall be furnished and wired by this Contractor and installed by the Mechanical Contractor. All shutdown and interface wiring shall be performed by the Electrical Contractor. All air pressure differential testing shall be performed by the Mechanical/Air Balance Contractor.
- G. The sprinkler flow and tamper switches shall be furnished, installed and adjusted by the Sprinkler Contractor, wired and tested by this Contractor.

3.3 GENERAL TESTING REQUIREMENTS

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- A. Provide all instruments for testing and demonstrating in the presence of the owner's inspector that the frequency response is as stated in the factory data sheets. Check all circuits and wiring to verify they are free of shorts and grounds.

3.2. SPECIFIC SYSTEM TESTING REQUIREMENTS

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

- A. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
- B. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
- C. Verify activation of all waterflow switches.
- D. Open initiating device circuits and verify that the trouble signal actuates.
- E. Open and short signaling line circuits and verify that the trouble signal actuates.
- F. Open and short notification appliance circuits and verify that trouble signal actuates.
- G. Ground all circuits and verify response of trouble signals.
- H. Check presence and audibility of tone at all alarm notification devices.
- I. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
- J. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
- K. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.
- L. Contractor shall provide all DSA required testing and certification at no cost to the Owner.
- M. Final Acceptance

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1. The Owner or Owner's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.
2. The Owner or Owner's representative will conduct a final job review once the contractor has finished the job. This review will take place within one week after the contractor notifies the owner.
3. Two copies of all certification data and drawings for all identifications shall be provided to the Owner before the owner's review.
4. The Owner or Owner's representative will review the installation and certification data prior to the system acceptance.
5. The Owner or Owner's representative may test some of the systems features to ensure that the certification data is correct. If a substantial discrepancy is found, the Owner reserves the right to have an independent consultant perform a certification of the entire system. If such a procedure is undertaken, the cost of the testing will be billed back to the contractor.
6. In the event that repairs or adjustments are necessary, the contractor shall make these repairs at his own expense. All repairs shall be completed within ten (10) days from the time they are discovered.
7. The contractor shall provide not less than eight (8) hours for site instruction of personnel in the operation and maintenance of the installed systems. This instruction time shall be divided as directed by the Owner.
8. The contractor shall hand to the owner a copy of any applicable installation specific software configurations in disk format.
9. The contractor shall commission the entire system and all components in accordance with this document, the Construction Documents and Commissioning Plan, and Section 28 08 00 Commissioning of Electronic Safety and Security Systems.

3.3. FINAL INSPECTION:

- A. At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4. INSTRUCTION:

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION

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SECTION 31 11 00

CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SUMMARY

- A. Clearing vegetation, debris, trash and other materials within limits indicated.
- B. Grubbing of vegetation within limits indicated.

1.02 RELATED DOCUMENTS

- A. Caltrans Standard Specifications.
 - 1. Section 17-2, Clearing and Grubbing.
- B. California Building Code: Chapter 33 – Site Work, Demolition and Construction.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

- A. Locate and clearly flag vegetation to remain or to be relocated.

3.02 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.

3.03 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

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 - GENERAL

1.01 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.

1.02 SECTION EXCLUDES

- A. Earthwork related to underground utility installation, see Section 31 23 33 – Trenching and Backfilling.

1.03 RELATED DOCUMENTS

A. ASTM:

- 1. D 1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- 2. D 1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.
- 3. D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- 4. D 3740, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- 5. D 4318. Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- 6. E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing or special Inspection.

B. California Code of Regulation Title 24, Part 2, California Building Code:

- 1. Chapter 11B – Accessibility to Public Buildings.
- 2. Chapter 33 – Safeguards During Construction.

C. Caltrans Standard Specifications:

- 1. Section 10-6, Watering.
- 2. Section 19, Earthwork.

- D. CAL/OSHA, Title 8.

1.04 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.
 - 2. Unauthorized Over-Excavation: Excavation below subgrade elevations or beyond indicated horizontal dimensions. Unauthorized excavation shall be without additional compensation.
- C. Structural Backfill: Soil materials used to fill excavations resulting from removal of existing below grade facilities, including trees. Any fill soil or aggregate base or crush rock under the building shall not contain recycled asphalt, asphalt grindings, or soil with petroleum products. See Section 31 23 33 – Trenching and Backfilling.
- D. Structural Fill: Soil materials used to raise existing grades.
- E. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material $\frac{3}{4}$ -cubic yards or more in volume that, according to ASTM D 1586, exceeds a standard penetration resistance of 100 blows/2-inches.
- F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below grade.
- G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, base or topsoil materials.
- H. Unsuitable Material: Any soil material that is not suitable for a specific use on the Project.
- I. Utilities: onsite underground pipes, conduits, ducts and cables.

1.05 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.

1.06 QUALITY ASSURANCE

- A. Conform all work to the appropriate portion(s) of the California Code of Regulations, Title 24 and Caltrans Standard Specifications, Sections 10-6 and 19.
- 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. 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.
- D. Finish soil grade tolerance at completion of grading:
 - 1. Building and paved areas: +0.05
 - 2. Other areas: ± 0.10 feet.
- E. The project geotechnical engineer shall be notified of the construction schedule at least one week prior to the beginning of major site construction, and notified at least 48 hours (working days) before being required to perform field observation and testing.

1.07 PROJECT CONDITIONS

- A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the construction documents. 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 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 for Cleaning and Waste Management.
- 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

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from on-site excavations.
- B. 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 rocks or rock fragments over 4 inches in greatest dimension and not more than 15 percent shall be over 2-1/2 inches in greatest dimension and with an organic content less than 3.0 percent by weight.
- C. 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

3.01 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.

3.02 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 Owner'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.

3.03 WET WEATHER CONDITIONS

- A. Do not prepare subgrade, place or compact soil materials if above optimum moisture content.

3.04 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 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.

3.05 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.

3.06 REMOVAL OF EXISTING FILLS AND UNSUITABLE MATERIAL

- A. Over-excavate areas of existing fills and other unsuitable material encountered during mass grading.
- B. Compensation for increased removal widths and depths that are not required will not be considered, except when such increase is necessary for protection of life and property as determined by and approved by the Owner.

3.07 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.

3.08 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 6 inches below final subgrade elevations and 5-feet beyond edge of pavement. Uniformly moisture condition to obtain optimum moisture contents. Break clods and condition surface by harrowing or dry rolling. 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.

3.09 PLACEMENT OF STRUCTURAL FILL

- A. Place structural fill on prepared subgrade.
- B. Spread structural fill material in uniform lifts not more than 8-inches in un-compacted thickness and compact.
- C. Place structural fill material to suitable elevations above grade to provide for anticipated settlement and shrinkage.
- D. Overbuild fill slopes to obtain required compaction. Remove excess material to lines and grades indicated.
- E. Do not drop fill on structures. Do not backfill around, against, upon concrete, or masonry structures until structure has attained sufficient strength to withstand loads imposed and the horizontal structural system had been installed.
- F. Backfill in uniform lifts not exceeding 8 inches in uncompacted thickness. Each lift should be brought to a uniform moisture content of at least 1 percent above optimum prior to compacting by either spraying the soil with water if it is too dry or aerating the material if it is too wet.

3.10 KEYWAYS AND BENCHES

- A. Provide keyways as indicated for fill slopes steeper than 6 horizontal to 1 vertical. Extend keyway -feet minimum into competent, undisturbed soil or 3-feet minimum into competent, undisturbed rock.
- 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.

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.
- C. Perform compaction using rollers, pneumatic or vibratory compactors.
- D. Compaction requirements:
 - 1. Compact structural fills less than 5-feet thick to 90 percent compaction.
 - 2. Compact structural fill 5-feet thick or greater to 95 percent compaction.
 - 3. Compact the upper 6 inches of subgrade soils beneath pavements, curbs and gutters to 95 percent compaction. Extend compaction 5-feet beyond pavement.
 - 4. Compact the upper 6-inches of subgrade soils to the following percentage of compaction: 95 percent under walks and pavements; 93 percent for foundations; and 90 percent for areas to receive structural fill.”

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

1.01 SECTION INCLUDES

- A. Excavation, bedding, and backfill for underground storm drain, sanitary sewer, and water piping and associated structures.

1.02 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.

1.03 RELATED DOCUMENTS

A. ASTM:

1. C 33, Standard Specification for Concrete Aggregates.
2. C 150, Standard Specification for Portland Cement.
3. C 260, Standard Specification for Air-Entraining Admixtures for Concrete.
4. C 618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
5. D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
6. D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
7. D 2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
8. D 3740, Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
9. E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
10. E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.

B. California Code of Regulation Title 24, Part 2, California Building Code:

1. Chapter 11B – Accessibility to Public Buildings.

2. Chapter 33 – Safeguards During Construction.
- C. Caltrans Standard Specifications:
1. Section 19, Earthwork.
 2. Section 26, Aggregate Bases.
 3. Section 68, Subsurface Drains.
 4. Section 96, Geosynthetics.
- D. CAL/OSHA, Title 8.

1.04 DEFINITIONS

- A. AC: Asphalt Concrete.
- B. ASTM: American Society for Testing and Materials.
- 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.
 2. Unauthorized Trench Over-Excavation: Excavation below trench subgrade elevations or beyond indicated horizontal trench dimensions. 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.

1.05 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, 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.
 2. Provide materials from same source throughout work. Change of source requires approval of the Owner.

1.06 QUALITY ASSURANCE

- A. Conform all work to the appropriate portion(s) of the Caltrans Standard Specifications, Section 19.
- 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. Conform work to the requirements of the California Building Code.
 1. Section 1809A.14 – Pipe and Trenches.

1.07 PROJECT CONDITIONS

- A. Promptly notify the Owner of surface or subsurface conditions differing from those disclosed in the construction documents. 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 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 Division 1 General Requirements for Cleaning and Waste Management.

PART 2 - PRODUCTS

2.01 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(3) of Caltrans Standard Specifications, Class 2 permeable.
- C. Class 2 Aggregate Base: Conform to Section 26 of Caltrans Standard Specifications, 3/4-inch maximum. Material shall also be non-expansive and predominantly granular soil or soil-rock mixture "(percent of passing #200: 50 maximum, 5 minimum)" with plasticity index of 15 or less.
- D. Sand: Conform to Section 19-3.02F(2) of Caltrans Standard Specifications.

2.02 WARNING TAPE

- A. See Section 33 10 00 – Water Utilities.

2.03 SUBSEQUENT BACKFILL

- A. Conform to on-site or imported structural backfill in Section 31 23 00 – Excavation and Fill.

2.04 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.

2.05 CONCRETE STRUCTURE BEDDING AND BACKFILL

- A. Precast Structures: Same materials to the same heights as specified for pipe bedding and backfill.
- B. Poured-in-Place Structures:
 - 1. Bedding: 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.

2.06 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.

PART 3 - EXECUTION

3.01 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, 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.
 - 2. Nominal pipe diameter of 30-inches through 36-inches: Minimum of the outside pipe diameter plus 2-feet.

3. Nominal pipe diameter of 42-inches through 60-inches: Minimum of the outside pipe diameter plus 3-feet.
- 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. 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.

3.02 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.
- B. Dewater during backfilling operation so that groundwater is maintained a least one foot below level of compaction effort.
- C. Reroute surface water runoff away from open trenches and excavations. Do not allow water to accumulate in trenches and excavations.
- D. Maintain dewatering system in place until dewatering is no longer required.

3.03 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 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.

3.04 PIPE BEDDING

- A. 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 95% relative compaction unless specified otherwise on the. Compact by pneumatic tampers or other mechanical means. Jetting or ponding of bedding material will not be permitted.

3.05 WARNING TAPE

- A. Install in accordance with Section 33 10 00 – Water Utilities.

3.06 BACKFILLING

- A. 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. Compact by pneumatic tampers or other mechanical means. Jetting or ponding of initial backfill material will not be permitted.
- B. 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, unless specified otherwise on the Plans. Compact by pneumatic tampers or other mechanical means. Jetting or ponding of subsequent backfill material will not be permitted.
- C. Do not use compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive pipe displacement or damage the pipe.

3.07 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.
- B. See Section 01 74 00 – Refer to Division 1 General Requirements for Cleaning and Waste Management for further cleanup requirements.

END OF SECTION

SECTION 32 11 00

BASE COURSES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Aggregate subbase.
- B. Aggregate base.
- C. Cement treated base.
- D. Lime stabilization.

1.02 RELATED DOCUMENTS

- A. ASTM:
 - 1. D 3740, Standard Practice for Minimum Requirement for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - 2. E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
 - 3. E 548, Standard Guide for General Criteria Used for Evaluating Laboratory Competence.
- B. Caltrans Standard Specifications:
 - 1. Section 24-2, Lime Stabilized Soil.
 - 2. Section 25, Aggregate Subbases.
 - 3. Section 26, Aggregate Bases.
 - 4. Section 27, Cement Treated Bases.

1.03 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 $\frac{3}{4}$ -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.

1.04 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.

1.05 QUALITY ASSURANCE

- A. 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.
- B. Do not mix or place cement treated base when the temperature is below 36 degrees F or when the ground is frozen.
- C. Finish surface of material to be stabilized prior to lime treatment shall be as specified in Section 24-2.01D(1)(a) of Caltrans Standard Specifications.
- D. Finish surface of the stabilized material after lime treatment shall be as specified in Section 24-2.03F of Caltrans Standard Specifications.
- E. Finish surface of cement treated base shall be as specified in Section 27 of Caltrans Standard Specifications.
- F. Do not project the finish surface of aggregate subbase above the design subgrade.
- G. Finish grade tolerance at completion of base installation: +0.05'

1.06 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

2.01 AGGREGATE SUBBASE

- A. Material: Caltrans Standard Specification Section 25.
 - 1. Class 1, 2, or 3: Section 25-1.02B.
 - 2. Class 4: Section 25-1.02C.
 - 3. Class 5: Section 25-1.02D.

2.02 AGGREGATE BASE

- A. Material: Caltrans Standard Specification Section 26.
 - 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.

2.03 CEMENT TREATED BASE

- A. Materials: Caltrans Standard Specification Section 27-1.02.

2.04 LIME STABILIZATION

- A. Lime Treatment Material: Conform to Section 24-2.03B and 24-2.03C of Caltrans Standard Specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Placement and compaction of material by flooding, ponding, or jetting will not be permitted.

3.02 WET WEATHER CONDITIONS

- A. Do not place or compact subgrade if above optimum moisture content.

3.03 AGGREGATE SUBBASE

- A. Spreading and Compacting: Sections 25-1.03D and 25-1.03E of Caltrans Standard Specifications.

3.04 AGGREGATE BASE

- A. Spreading and Compacting: Section 26-1.03D and 26-1.03E of Caltrans Standard Specifications.

3.05 CEMENT TREATED BASE

- A. Cement treated base shall be as follows: Proportioning and Mixing Plant-Mixed: Section 27-1.03D of Caltrans Standard Specifications.

3.06 LIME STABILIZATION

- A. Performing the stabilization shall conform to Section 24-2.03C through 24-2.03F of Caltrans Standard Specifications and the following:
 1. Add lime in the amount specified by a Geotechnical Consultant.
 2. Lime treat subgrade soils from back of curb to back of curb to a depth specified by a 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 36 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 95 percent 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 24-2.03A 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 a Geotechnical Consultant.

3.07 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

1.01 SECTION INCLUDES

- A. Prime coat.
- B. Tack coat.
- C. Asphaltic concrete paving.
- D. Asphaltic concrete overlay and slurry seals.
- E. Speed bumps.
- F. Asphalt curbs.
- G. Pavement grinding.

1.02 RELATED DOCUMENTS

- A. ASTM:
 - 1. D 979: Standard Practice for Sampling Bituminous Paving Mixtures.
 - 2. D 1073: Standard Specification for Fine Aggregate for Asphalt Paving Mixtures.
 - 3. D 1188: Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
 - 4. D 2041: Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
 - 5. D 2726: Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures.
 - 6. D 2950: Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
 - 7. D 3549: Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
 - 8. D 3666: Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Mixtures.
- B. Caltrans Standard Specifications.
 - 1. Section 37: Bituminous Seals.
 - 2. Section 39: Asphalt Concrete.
 - 3. Section 96: Geosynthetics.
 - 4. Section 92: Asphalt Binders.
 - 5. Section 94: Asphaltic Emulsions.
- C. California Building Code:
 - 1. Chapter 11B – Accessibility to Public Buildings, Public Accommodations, Commercial Buildings, and Public Housing.
 - 2. Section 1127B – Exterior Routes of Travel.

1.03 DEFINITIONS

- A. ASTM: American Society for Testing Materials.

1.04 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.

1.05 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.

1.06 PROJECT CONDITIONS

- A. Environmental Limitations:
 - 1. Prime Coat: Minimum surface temperature of 60 deg F at application.
 - 2. Tack Coat: Minimum surface temperature of 60 deg F at application.
 - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at application.
 - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at application.
 - 5. Reinforcing Fabric: Air temperature is 50 deg F and rising and pavement temperature is 40 deg F and rising.

PART 2 - PRODUCTS

2.01 ASPHALTIC CONCRETE

- A. Caltrans Standard Specifications Section 39, Type B.
- B. Asphalt Materials:
 - 1. Asphalt: Caltrans Standard Specification Section 92, steam refined paving asphalt.
 - (a) Asphalt Curbs: use grade PG 70-10
 - (b) All other asphalt products: use grade PG 64-10.
 - 2. Prime Coat: Caltrans Standard Specification Section 93, SC-70.
 - 3. Tack Coat: Caltrans Standard Specification Section 94, SS1.
 - 4. Asphaltic Emulsion: Caltrans Standard Specification Section 94, quick-setting type, Grade QS1h anionic or CQS1h cationic.
- C. Aggregates: Conform to Caltrans Standard Specification Sections 37-3.02B(2) and 39-2.02 as applicable.
- D. Storing, Proportioning and Mixing Materials: Caltrans Standard Specification Section 39-3.
- E. Pavement Reinforcing Fabric: Caltrans Standard Specification Section 96.
- F. Sand: ASTM D 1073, Grade No. 2 or 3.

PART 3 - EXECUTION

3.01 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.

3.02 PAVEMENT GRINDING

- A. Clean existing paving surface of loose or deleterious material immediately before pavement grinding.
- B. Grind conforms as indicated.

3.03 SOIL STERILANT

- A. Furnish and apply to areas indicated in accordance with Section 31 31 19 – Vegetation Control.

3.04 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. Prime Coat: Apply uniformly over surface of compacted-aggregate base according to the Caltrans Standard Specification Section 39-4.02. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 24 hours minimum.
 - 1. If prime coat is not entirely absorbed within 8 hours after application, spread excess prime coat with hand tools and broadcast sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
 - 2. Protect primed substrate from damage until ready to receive paving.
- C. 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.

3.05 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 1/8-inch wide: Clean of all dirt by compressed air jet, spray and seal with RS-1 asphaltic emulsion.
 - 2. Wider than 1/8-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 including roots prior to applying binder of paving asphalt to existing surface.
- D. Oil spots shall be removed with brush and detergents and covered with Oil Spot Sealer by OverKote or an equal product.
- E. Prior to first application in exceptionally hot weather, dampen surface with water. Remove excess water and leave surface slightly damp.

3.06 APPLYING ASPHALT PAVEMENT OVERLAYS AND SLURRY SEALS

- A. Use OverKote Asphalt Pavement Coating or equal product.
- B. Apply at a rate of 25 gallons per 1,000 sf of surface area.
- C. Follow all manufacturers' recommendations for preparation and applications procedure of the products used.
- D. Apply second coat as soon as first coat is dry.

3.07 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.

3.08 ASPHALTIC CONCRETE SPREADING AND COMPACTING EQUIPMENT

- A. Spreading Equipment: Caltrans Standard Specification Section 39-5.01.
- B. Compaction Equipment: Caltrans Standard Specification Section 39-5.02.

3.09 ASPHALTIC CONCRETE PLACEMENT

- A. Place, spread and compact asphaltic concrete to required grade, cross section, and thickness according to the Caltrans Standard Specification Sections 39-6.01, 39-6.02 and 39-6.03.
- 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.

3.10 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections according to the Caltrans Standard Specification Sections 39-6.01 and 39-6.02.
 - 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.

3.11 COMPACTION

- A. 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 39-6.01 and 39-6.03.
- B. 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.
- C. Finish Rolling: Finish roll paved surfaces to remove roller marks while asphalt is still warm.
- D. 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.
- E. 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.
- F. 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.

3.12 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.

3.13 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.

3.14 INSTALLATION TOLERANCES

- A. Asphalt Pavement:
 - 1. Course thickness and surface smoothness within the tolerances in the Caltrans Standard Specification Sections 39-6.01, 39-6.02 and 39-6.03.
 - 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