HUENEME
ELEMENTARY SCHOOL DISTRICT

SUNKIST ELEMENTARY SCHOOL

RELOCATABLE CLASSROOM BUILDING & SITEWORK IMPROVEMENTS

PROJECT MANUAL

CONSTRUCTION DOCUMENTS

MAY 13, 2019

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PROJECT MANUAL
FOR
SUNKIST ELEMENTARY SCHOOL
RELOCATABLE CLASSROOM BUILDING & SITEWORK IMPROVEMENTS

HUENEME ELEMENTARY SCHOOL DISTRICT
PORT HUENEME, CALIFORNIA

SPECIFICATIONS

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DIV. OF THE STATE ARCHITECT

FILE NO. 56-12

APPL 03-119784

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DATE 05/13/2019

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SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Work covered by the Contract Documents.
2. Type of the Contract.
3. Work phases.
4. Use of premises.
5. Owner's occupancy requirements.
6. Work restrictions.
7. Specification formats and conventions.
8. Deferred Approvals.
9. Pollution Control.

B. Related Sections include the following:
1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Division 1 Section "Closeout Procedures" for mechanical and electrical Title 24 Certificate of Acceptance requirements.

1.3 SUBMITTALS

A. Contractor shall submit written statement of responsibility per CBC 1704A

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Parkview Elementary School-Administration Building Entry Renovation
1. Project Location:
Sunkist Elementary School.
1400 Teakwood Street
Port Hueneme, CA 93041

B. Owner:
1. Hueneme Elementary School District
205 North Ventura Road
Port Hueneme, CA 93041

C. Architect: PMSM/19six Architects.

D. The Work consists of the following: PREPARE SITE SPECIFIC IMPROVEMENTS FOR NEW RELOCATABLE BUILDING BY AMERICAN MODULAR SYSTEMS. WORK INCLUDES GRADING, GEOGRID PLACEMENT, ASPHALT CONCRETE PAVING, CONCRETE PAVING, SITE UTILITIES (SEWER, WATER, POWER, COMM), STANDALONE FIRE ALARM SYSTEM, FENCING, AND CANE DETECTION RAILS AT AN EXISTING DRINKING FOUNTAIN ALONG THE ACCESSIBLE PATH OF TRAVEL.

1.5 TYPE OF CONTRACT

A. Project site work and utilities connections for the entry renovation project will be constructed under a design-bid-build project delivery method. The general contractor shall construct all work related to the scope of this project.

1.6 WORK PHASES

A. The Work shall be conducted in single phase.

1.7 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
   2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.8 OWNER'S OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: Owner will occupy site and adjacent building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
   1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
   2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
   3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
   4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.9 WORK RESTRICTIONS

A. On-Site Work Hours:
   1. Comply with General Conditions.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Architect's written permission.

1.10 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 48-division format and CSI's "MasterFormat 2004" numbering system.
   1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
   2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor.

Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.11 POLLUTION CONTROL

A. Provide positive methods, means and facilities required to prevent contamination of the soil, water or atmosphere by the discharge of noxious substances from the construction operations.

1.12 MISCELLANEOUS PROVISIONS

A. General: Comply with the Project Conditions of Approval for both noise and dust control. If there is any conflict between drawings and specifications and the Project Conditions of Approval regarding noise and dust control, the Project Conditions of Approval shall govern.

B. Noise Control: The Contractor shall install noise reducing devices on construction equipment. Contractor shall comply with the requirements of the city and county having jurisdiction with regard to noise ordinances governing construction sites and activities. Construction Equipment noise at the Site shall be limited and only as permitted by applicable law, rule or regulation. If classes are in session at any point during the progress of the Work, and, in the Owner's reasonable discretion, the noise from any Work disrupts or disturbs the students or faculty, at the Owner's request, the Contractor shall schedule the performance of all such Work around normal school hours or make other arrangements so that the Work does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

C. Dust Control. The Contractor shall be fully and solely responsible for maintaining and upkeeping all areas of the Site and adjoining areas, outdoors and indoors, free from flying debris, grinding powder, sawdust, dirt and dust as well as any other product, product waste or work waste, that by becoming airborne may cause respiratory inconveniences to persons, particularly to students and Owner's personnel. Additionally, the Contractor shall take specific care to avoid deposits of airborne dust or airborne elements. Such protection devices, systems or methods shall be in accordance with the regulations set forth by the EPA and OSHA, and other applicable law, rule or regulation. Additionally, the Contractor shall be the sole party responsible to regularly and routinely clean up and remove any and all deposits of dust and other elements. Damage and/or any liability derived from the Contractor's failure to comply with these requirements shall be exclusively at the cost of the Contractor, including, without limitation, any and all penalties that may be incurred for violations of applicable law, rule or regulation, and any amounts expended by the Owner to pay such damages shall be due and payable to the Owner on demand. Contractor shall replace any damages property or part thereof and professionally clean any and all items that become covered or partially covered to any degree by dust or other airborne elements. If classes are in session at any point during the progress of Work, and, in the Owner's reasonable discretion, flying debris, grinding powder, sawdust, dirt or dust from any Work disrupts or disturbs the students or faculty or the normal operation of the college, at the Owner's request, the Contractor shall schedule the performance of all such Work around normal college hours and make other arrangements so that the Work

does not cause such disruption or disturbance. In no event shall such arrangements result in adjustment of the Contract Price or the Contract Time.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

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SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:
   1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect may issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, or Changes not affecting the Structural Safety, Access Compliance or Fire & Life Safety portions of the work, on AIA Document G710, "Architect's Supplemental Instructions" or an equivalent form acceptable to District.

1.4 REQUEST FOR PROPOSAL ("RFP")

A. Owner-Initiated Proposal Requests: Architect may issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.

d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

1.5 PROPOSED CHANGE ORDER

A. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include costs of labor and supervision directly attributable to the change.
   5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
   6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.6 PROPOSED CHANGE ORDER FORMAT

A. As specified in General Conditions.

1.7 CHANGE ORDER PROCEDURES

A. On District's approval of a Proposal Request, Architect may issue a Change Order for signatures of Owner and Contractor.

1.8 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

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SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule.
   2. Submit the Schedule of Values to Architect at earliest possible date but no later than 7 days before the date scheduled for submittal of initial Applications for Payment.
   3. No payment applications will be signed by the Architect prior to the Contractor submitting, and the Architect reviewing, a schedule of values.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the 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. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value.
      1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications 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 the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. As specified in General Conditions.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

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SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Project meetings.
   2. Requests for Information (RFIs).

B. Related Sections include the following:
   1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
   2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
4. Frequency of Attendance by Architect: Limited by Architect/District Contract.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Phasing, if any.

c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Preparation of Record Documents.
l. Use of the premises.
m. Work restrictions.
n. Owner's occupancy requirements.
o. Responsibility for temporary facilities and controls.
p. Construction waste management and recycling.
q. Parking availability.
r. Office, work, and storage areas.
s. Equipment deliveries and priorities.
t. First aid.
u. Security.
v. Progress cleaning.
w. Working hours.

3. Minutes: Record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. The Contract Documents.
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility problems.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written recommendations.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.

s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) RFIs.
16) Status of proposal requests.

17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.5 RFIs:

A. General:
1. Contractor may submit a RFI to the Architect seeking clarification or interpretation of the contract documents. If in the Contractor's opinion the nature of the RFI requires a discussion, rather than simply an answer, the Contractor shall call the Architect to have such a discussion. The results of that discussion as well as all other RFI's must be presented in writing on a form approved in advanced by the Architect along with any supporting information or data, as well as the Contractor's recommended resolution. An oral RFI or a RFI presented on an unapproved form, or without adequate supporting information and Contractor's recommended solution, will be attributed solely to the contractor. Architect's review of or responses to RFI's shall not constitute an approval, direction, or procedure related to the construction means, methods, techniques, sequences, or procedures of the Contractor.
2. Architect's review of or responses to RFI's shall not constitute an approval, direction, or procedure related to the construction site safety precautions, procedures, or methodology of the Contractor.
3. The use of a RFI is limited to clarification of the contract documents. Contractor will limit each RFI to a single issue. Information which is discernable from the contract documents; construction means and methods; product substitution submittals; product submittals; and construction site safety will not be addressed by the Architect in responding to a RFI.
4. Architect's response to a RFI is not a change order or directive authorizing an increase in construction cost or time.

B. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

C. Frivolous or Unnecessary RFIs: Cost of design professional's time will be billed or deducted from progress payment.

D. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
   1. Project name.
   2. Date.
   3. Name of Contractor.
   4. Name of Architect.
   5. RFI number, numbered sequentially.
   6. Specification Section number and title and related paragraphs, as appropriate.
   7. Drawing number and detail references, as appropriate.
   8. Field dimensions and conditions, as appropriate.
   9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   10. Contractor's signature.
   11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
      a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

E. Hard-Copy RFIs: Form at end of this Section.
   1. Identify each page of attachments with the RFI number and sequential page number.

F. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow 15 days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
   1. The following RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for coordination information already indicated in the Contract Documents.
      d. Requests for adjustments in the Contract Time or the Contract Sum.
      e. Requests for interpretation of Architect's actions on submittals.
      f. Incomplete RFIs or RFIs with numerous errors.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were dropped and not submitted.
   5. RFI description.

6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. RFI Form.
   2. RFI Log.

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RFI FORM

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Project:		RFI No:
Project No:		
To:		Date:
From:		
Subject:		
Discipline:		Category
Specification Section Title:		
Section Number:	Page:	Article/Paragraph:
Sheet Number:		Detail:

Question:

Suggestion:

☐Attachment:

Undersigned certifies:

- Both drawings and specification sections were thoroughly reviewed.
- Processing time for frivolous RFIs will be charged back to Contractors at A/E billable rates.

Desired Response Date:	(However, A/E still have specified days to respond.)
Cost Impact: $	Schedule Impact: days
Drawing Impact:	Submitted by:
Signed:	Date:

Answer:

Answered by:

Signed: Date:

Copies: ☐ Owner ☐Consultants ☐ ☐
☐ File

1. A/E review of or responses to RFI's shall not constitute an approval, direction, or procedure related to the construction site safety precautions, procedures, or methodology of the Contractor.
2. The use of a RFI is limited to clarification of the contract documents. Contractor will limit each RFI to a single issue. Information that is discernable from the contract documents; construction means and methods; product substitution submittals; product submittals; and construction site safety will not be addressed by the A/E in responding to a RFI.
3. A/E response to a RFI is not a change order or directive authorizing an increase in construction cost or time.

End of RFI Form

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RFI LOG

Project:	Project Number:
Contractor:	Updated Date:

RFI Number	Submit Date	Subject of RFI	Response Date	Proposal Request No.

Submitted by: _____

Signed: _____ Date: _____

End of RFI Log

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SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's Construction Schedule.
   2. Submittals Schedule.
   3. Three Week Look-Ahead Schedule.
   4. Daily construction reports.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
   2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
   3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
   4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or review.

B. Contractor's Construction Schedule: Submit three opaque copies of schedule, large enough (minimum 11 x 17) to show entire schedule for entire construction period.

C. Daily Construction Reports: Submit two copies at weekly intervals.

1.4 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Concurrent with the development of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the submittal schedule with the Contractor's construction schedule described above.
   1. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products as well as the Contractor's construction schedule.
   2. The Architect will review the schedule and indicate which submittals may be deleted from the submission requirement. The deletion of the submittal requirement for an item does not release the Contractor from any requirements of the Construction Contract, General Conditions or Plans and Specifications.

B. Prepare the schedule in chronological order; include submittals required during the first 90 days of construction. Provide the following information:
   1. Scheduled date for the first submittal.
   2. Related Section number.
   3. Submittal category.
   4. Name of subcontractor.
   5. Description of the part of the Work covered.
   6. Scheduled date for resubmittal.
   7. Scheduled date the Architect's final release or review.

C. Distribution: Following response to initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.
   1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 15 days of the date established for "Commencement of the Work". The Construction Schedule must be submitted and accepted prior to approval of first pay application.
   1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as identified in the "Schedule of Values".
   2. Within each time bar indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate Actual Completion.
   3. Prepare the schedule on a sheet, or series of sheets, of stable reproducible media, of sufficient width to show data for the entire construction period.
   4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
   5. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
   6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by requirements for phased completion to permit work by separate Contractors and partial occupancy by the Owner prior to Substantial Completion.

C. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.

E. Cost Correlation: At the head of the schedule, provide a two item cost correlation line, indicating "pre-calculated" and "actual" costs. On the line show dollar-volume of work performed as of the dates used for preparation of payment requests.
   1. Refer to Section "Applications for Payment" for cost reporting and payment procedures.

2.3 THREE WEEK LOOK-AHEAD SCHEDULE

A. Prepare weekly (or as determined by scheduled meeting times), prior to Project meetings, a computer-generated 3-week look-ahead schedule (bar chart) which is consistent with the Contractors schedule and depicts daily labor activities. The schedule will consist of the prior week, current week and the following 3 weeks.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions.
   7. Accidents.
   8. Meetings and significant decisions.
   9. Unusual events (refer to special reports).
   10. Stoppages, delays, shortages, and losses.
   11. Meter readings and similar recordings.
   12. Emergency procedures.
   13. Orders and requests of authorities having jurisdiction.
   14. Change Orders received and implemented.
   15. Construction Change Directives received and implemented.
   16. Services connected and disconnected.
   17. Equipment or system tests and startups.
   18. Partial Completions and occupancies.
   19. Substantial Completions authorized.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At two week intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates changes, including, but not limited to, changes in durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of reviewed schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Submittals Schedule Form.

END OF SECTION 01 32 00

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SUBMITTAL SCHEDULE FORM

☐ Preliminary Submittal Schedule: Include submittals required during the first 60 days of construction.
☐ Complete Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

PMSM ARCHITECTS | nine teen SIX 196 ARCHITECTS
Legacy Future

Project:

From:

To:

Date:

Scheduled Initial Submittal Date	Spec Section No.	Spec Section Title	Type: ☐ Action ☐ Info Only	Name of Subcontractor	Description	Scheduled Date of Approval

End of Submittal Schedule Form

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SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

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

B. Consult individual sections of specifications for specific submittals required under those sections and for further details and descriptions of requirements.

C. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
   2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
   3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
   4. Division 1 Section "Quality Requirements" for submitting test and inspection reports.
   5. Division 1 Section "Closeout Procedures" for submitting warranties.
   6. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   7. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   8. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. Processing: All costs for printing, preparing, packaging, submitting, mailing, or delivering submittals for initial submittals and all costs for re-printing, re-drawing, re-drafting, re-packaging, re-submitting, and re-mailing or re-delivering as required for all re-submittals shall be included in Contract Sum.

B. Sequence: Transmit each submittal in sequence which will not result in Architect's approval having to be later modified or rescinded by reason of subsequent submittals which should have been processed earlier or concurrently for coordination.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

E. Multiple Reviews: The Contractor shall also be responsible for all costs to Architect or Architect consultants for reviews requiring more than 2 reviews for same specification section.

F. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Review: Allow 21 days for review of each submittal. Architect will request for more time if needed.

G. Identification: Place a permanent label or title block on each submittal for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
   3. Include the following information on label for processing and recording action taken:
      a. Project name.
      b. Date.
      c. Name and address of Architect.
      d. Name and address of Contractor.
      e. Name and address of subcontractor.
      f. Name and address of supplier.
      g. Name of manufacturer.
      h. Each submittal number shall be unique as follows:
         1) Format shall be as follows:

a) Sequential Number - Revision Number - Project Specification Section Number (e.g., 1-1-09910). Do not use letters.

2) Submittal number shall be sequential starting with 1 (e.g., 1-#-#####).

3) First submittal for each section shall have number 1 as the "revision" number. (e.g., #-1-#####)

4) Resubmittal for same specification section shall have same first digit as the original submittal and sequential second digit revision number (e.g., #-2-##### as in second submittal).

5) Sample submittal log would look like the following in the submittal number column: Note that 1-2-09910 is second submittal.

Submittal Number
1-1-09 91 00
1-2-09 91 00 (revised submittal: shown for clarity)
2-1-05 50 00
3-1-04 20 00

i. Number and title of appropriate Specification Section.

j. Drawing number and detail references, as appropriate.

k. Location(s) where product is to be installed, as appropriate.

l. Other necessary identification.

H. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

I. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

J. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Use AIA Document G810.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

K. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Approved" or "Furnish as Noted".

L. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

M. Use for Construction: Use only final submittals with mark indicating approval by Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
   a. Circle items applicable.
   b. Cross-out items not applicable.
   c. Select item number if required.
3. Submittal data must include complete documentation relating to all the specified features
4. Include the following information, as applicable:
   a. Manufacturer's Submittal Form with all the options selected when available.
   b. Manufacturer's written recommendations.
   c. Manufacturer's product specifications.
   d. Manufacturer's installation instructions.
   e. Standard color charts.
   f. Manufacturer's catalog cuts.
   g. Wiring diagrams showing factory-installed wiring.
   h. Printed performance curves.
   i. Operational range diagrams.
   j. Mill reports.
   k. Standard product operation and maintenance manuals.
   l. Compliance with specified referenced standards.
   m. Testing by recognized testing agency.
   n. Application of testing agency labels and seals.
   o. Notation of coordination requirements.
5. Submit Product Data before or concurrent with Samples.
6. Number of Copies: Submit 6 copies of Product Data, unless otherwise indicated. Architect will return 2 copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Dimensions.

b. Do not use words "by others." Use words which depict exactly who is responsible for the work.
c. Identification of products.
d. Fabrication and installation drawings.
e. Roughing-in and setting diagrams.
f. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
g. Shopwork manufacturing instructions.
h. Templates and patterns.
i. Schedules.
j. Design calculations.
k. Compliance with specified standards.
l. Notation of coordination requirements.
m. Notation of dimensions established by field measurement.
n. Relationship to adjoining construction clearly indicated.
o. Seal and signature of professional engineer if specified.
p. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
3. Number of Copies: Submit 4 sets of prints.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
a. Number of Samples: Submit 1 full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the

following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
   1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
   2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product.
   2. Number and name of room or space.
   3. Location within room or space.
   4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.
      a. Mark up and retain one returned copy as a Project Record Document.

F. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
   1. Number of Copies: Submit 2 copies of each submittal, unless otherwise indicated. Architect will not return copies.
   2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
   1. Name of evaluation organization.
   2. Date of evaluation.
   3. Time period when report is in effect.
   4. Product and manufacturers' names.
   5. Description of product.
   6. Test procedures and results.
   7. Limitations of use.

L. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."

M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

2.3 DEFERRED APPROVALS AND DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit 3 copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
   1. Coordinate the work; do not delegate responsibility for coordination to any subcontractor.
   2. Anticipate the interrelationship of all subcontractors and their relationship with the total work.
   3. Resolve differences or disputes between subcontractors and materials suppliers concerning coordination, interference, or extent of work between sections.
   4. Trade submittals with "By Others", "By General Contractor", or similar coordination and work scope are not allowed. Identify, acknowledge, and resolve scope of work prior to submittal by Contractor. No extras will be allowed. Provide complete and coordinated submittals.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

F. Architect's and Consultant's review shall neither be construed as complete check nor relieve the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract unless the Contractor has, in writing, called the Architect's attention to the deviations at the time of submission as specified.

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. For Testing and Inspection Requirements for School Projects, comply with requirements of Division 1 Section "Testing and Inspection Requirements for School Projects".

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

D. Related Sections include the following:
   1. Division 1 Section "Testing and Inspection Requirements for School Projects" for DSA certified project inspections.
   2. Division 1 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
   3. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups:
1. Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
2. Comprehensive, completely integrated mockups of separate trades showing interface conditions, transitions, and relationships between materials and finishes.
3. Areas: As indicated on Drawings.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

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

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A licensed professional engineer who is legally qualified to practice in California and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An DSA approved NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect 7 days in advance of dates and times when mockups will be constructed.

3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

A. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

E. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
   1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

F. All work shall be in compliance with 2016 Title 24, Parts 1-6 and 8 through 11.

G. 2016 Title 24, Parts 1-5 shall be kept on site during construction.

H. Construction Change Documents must be signed by the A/E of Record, Structural Engineer (when applicable), Delegated Professional Engineer (when applicable), and DSA per Section 4-338, Part 1, Title 24.

I. Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the DSA approved documents wherein the finished work will not comply with Title 24, California Code of Regulations, a construction change document, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work per Title 24, Part 1, Section 4-317 (c).

1.8 SPECIAL TESTS AND INSPECTIONS

A. DSA Required Tests and Inspections: Comply with requirements of Section "Testing and Inspection Requirements for School Construction".

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 41 00-TESTING AND INSPECTION REQUIREMENTS FOR SCHOOL CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for testing and inspection requirements for school construction.

1.3 SUBMITTALS

A. Reports: Prepare and submit certified written reports that include the following:
   1. Reports from testing laboratories.
   2. Verified reports by testing laboratories.

1.4 TESTS

A. General: Tests of materials are required as set forth in these regulation. Whenever there is insufficient evidence of compliance with any of the provisions of this code or evidence that any material or construction does not conform to the requirements of this code, DSA may require tests as proof of compliance to be made at no expense to DSA. Test method shall be as specified by this code or by other recognized and accepted test standards. If there are no recognized and accepted test methods for the proposed alternate, the architect or engineer shall submit written test procedure for review and acceptance by DSA.

B. Tests and Inspections - Chapter 17A:
   1. All tests shall be performed by a testing facility acceptable to the architect and DSA. The testing facility shall be directly employed by the school district and no other entity or individual. Section Title 24, Part 1, Section 4-335(b).
   2. Test reports shall be addressed to, and sent to, the school district by the testing facility. Copies of all test reports shall be sent to DSA, the architect, the structural engineer, and the project inspector by the testing facility. All reports shall be sent within 14 days of the date of the test. See Title 24, Part 1, Section 4-335(d).
   3. A Verified Report, sighed by the California licensed civil engineer in charge of the testing facility which conducted the tests, shall be submitted to DSA upon completion of the project. The verified report shall state that all tests and inspections were made as required by the DSA approved documents. If the tests or inspections indicate that

materials or workmanship did not meet the requirements of the DSA approved documents, the Verified Report shall list all noncompliant work. A copy of all test reports involving unresolved noncompliant work shall be attached to the Verified Report. In the event that not all required tests or inspections were made by the testing facility making this verified report, those tests and inspections not made shall be listed on the Verified Report. See Title 24, Part 1, Section 4-335(e).

C. All tests shall be made by an approved agency. Where job conditions warrant, the architect or registered engineer may waive certain tests with the approval of DSA. A copy of the list of structural tests and inspections prepared by the responsible architect or structural engineer and acceptable to DSA shall be provided to the designated testing agency and the project inspector prior to the start of construction.

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

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

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

G. The Owner will select and pay testing laboratory costs for all tests and inspections, but may be reimbursed by the Contractor for such cost under the Contract documents.

H. See DSA Form 103 for list of required structural tests and special inspections.

I. The Project Inspector and testing lab must be employed by the owner and approved by the A/E of Record, Structural Engineer of Record (when applicable), and DSA.

1.5 TEST REPORTS

A. One copy of all test reports shall be forwarded to the Division of the State Architect, the Architect, the Structural Engineer, and the Project Inspector by the testing agency. Such reports shall include all tests made, regardless of whether such tests indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall be also reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of Title 24 and with the approved specifications. Test reports shall show the specified design strength. They shall also state definitely whether or not the material or materials tested comply with requirements.

1.6 VERIFICATION OF TEST REPORTS

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

B. Any person who continues working on the cited work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to penalties as prescribed by law.

1.7 INSPECTION BY THE OWNER

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

B. The Owner shall have the right to reject materials and workmanship, which are defective, or to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the Owner may correct same and charge the expense to the Contractor.

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

1.8 INSPECTOR - OWNER'S

A. A DSA certified Project Inspector and Special Inspector, when needed, shall be employed by the Owner in accordance with the requirements of the California Code of Regulations, Title 24, Part 1, will be assigned to the work. His duties are specifically defined in Section 4-342, 4-336, and 4-337 of Title 24, Part 1.

B. Selection of Project Inspector will be approved by Architect of Record, Structural Engineer, and DSA.

C. The work of construction in all stages of progress shall be subjected to personal continuous observation of the Inspector. He shall have free access to any or all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner

of work and character of the materials. Inspection of the work shall not relieve the Contractor from any obligation to fulfill his Contract.

1.9 INSPECTOR - OWNER - FIELD OFFICE

A. The Contractor shall provide for the use of the Owner's Inspector a temporary office to be located as directed by the Inspector and to be maintained until removal is authorized by the Owner. This office shall be of substantial waterproof construction with adequate natural light and ventilation by means of stock design windows. The door shall have a lock. A table satisfactory for the study of plans and two chairs shall be provided by the Contractor. The Contractor shall provide and pay for adequate electric lights, private local telephone service with a loud exterior bell, and adequate heat for this field office until the completion of the Contract.

1.10 CERTIFICATION OF CONSTRUCTION

A. Observation by Architect or Registered Engineer, inspection by project inspector, and special inspection: Per Title 24, Part 1 Section 4-333.

B. Verified Reports: Per Title 24, Part 1 Section 4-336 and 4-341 (f).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 41 00

DSA DIVISION OF THE STATE ARCHITECT DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #		DSA File No.:	56-12
		Application No.:	03-119784
Date Submitted:	5/13/2019	Revised:	
		Revised:	

School Name	Sunkist ES Relocatable Building & Sitework Improvements	District	Hueneme Elementary School District

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.
NOTE: This form is also available for projects submitted for review under the 2007, 2010, and 2013 CBC.

INSTRUCTIONS: Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests and inspections finally selected.
For more information on use of this form, see DSA-103.INSTR.

Note: References are to the 2016 edition of the California Building Code (CBC) unless otherwise noted.

REQUIRED	TEST OR SPECIAL INSPECTION	TYPE [1]	PERFORMED BY [2]	CODE REFERENCE AND NOTES
-	**SOILS**			
-	**1. GENERAL:**	**Table 1705A.6**		
X	a. Verify that: • site has been prepared properly prior to placement of controlled fill and/or excavations for foundations, • foundation excavations are extended to proper depth and have reached proper material, and • materials below footings are adequate to achieve the design bearing capacity.	**Periodic**	**GE***	* By geotechnical engineer or his or her qualified representative. (See Appendix for exemptions.)
-	**2. COMPACTED FILLS:**	**Table 1705A.6**		
X	a. Perform classification and testing of fill materials.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer.
X	b. Verify use of proper materials, densities and inspect lift thicknesses, placement, and compaction during placement of fill.	**Continuous**	**GE***	* By geotechnical engineer or his or her qualified representative.
X	c. Test compaction of fill.	**Test**	**LOR***	* Under the supervision of the geotechnical engineer.
-	**6. OTHER SOILS:**			
X	c. Geogrid	Periodic	GE*	* By geotechnical engineer or his or her qualified representative.
-	**CONCRETE**	**Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13**		
+	**MASONRY**	**TMS 402-13/ACI 530-13/ASCE 5-13 Table 3.1.3 & TMS 602-13/ACI 530.1-13/ASCE 6-13 Table 5**		
-	**STEEL, ALUMINUM**	**Table 1705A.2.1, AISC 303-10, AISC 360-10, AISC 341-10, AISC 358-10, AISI S100-07/S2-10**		
-	**17. STRUCTURAL STEEL, COLD-FORMED STEEL, AND ALUMINUM USED FOR STRUCTURAL PURPOSES**			

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.: 56-12
Application No.: 03-119784
Date Submitted: 5/13/2019
Revised:
Revised:

	Material Verification:			
X	**a.** Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements, • Material sizes, types and grades comply with requirements.	**Periodic**	*	**2203A.1** (2203.1+), **Table 1705A.2.1 Item 3a-3c;** AISI S100-07/S2-10 Section A2.1 & A2.2, AISI S200-12 Section A3, AISI S220-11 Section A4. * By special inspector or qualified technician when performed off-site.
X	**b.** Test unidentified materials	**Test**	**LOR**	**2203A.1** (2203.1+).
X	**c.** Examine seam welds of HSS shapes	**Periodic**	**SI**	DSA IR 17-3.
	Inspection:			
X	**e.** Verify and document steel fabrication per DSA approved construction documents.	**Periodic**	**SI**	Not applicable to cold-formed steel light-frame construction, except for trusses (**1705A.2.4**).
-	**19. WELDING:**			**1705A.2.5, Table 1705A.2.1 Items 4 & 5;** DSA IR 17-3, AWS D1.1 and AWS D1.8 for structural steel, AWS D1.2 for Aluminum, AWS D1.3 for cold-formed steel, AWS D1.4 for reinforcing steel. (See Appendix for exemptions.)
	Verification of Materials, Equipment, Welders, etc:			
X	**a.** Verify weld filler material identification markings per AWS designation listed on the DSA approved documents and the WPS.	**Periodic**	**SI**	DSA IR 17-3.
X	**b.** Verify weld filler material manufacturer's certificate of compliance.	**Periodic**	**SI**	DSA IR 17-3.
X	**c.** Verify WPS, welder qualifications and equipment.	**Periodic**	**SI**	DSA IR 17-3.
-	**19.1 SHOP WELDING:**			
X	**a.** Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds	**Continuous**	**SI**	**Table 1705A.2.1 Item 5a1-4.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	**b.** Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds	**Periodic**	**SI**	**1705A.2.2, Table 1705A.2.1 Item 5a.5 & 5a.6.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	**c.** Inspect welding of stairs and railing systems.	**Periodic**	**SI**	**1705A.2.1.** Per AISC 360-10 (and AISC 341-10 as applicable). AWS D1.1 & D1.3. DSA IR 17-3.
-	**20. NONDESTRUCTIVE TESTING:**			
X	**a.** Ultrasonic	**Test**	**LOR**	**1705A.2.1 & 1705A.2.5.** AISC 360-10 N5.5, AISC 341-10 J6.2. AWS D1.1, D1.8. ANSI/ASNT CP-189, SNT-TC-1A. DSA IR 17-2.
X	**b.** Magnetic Particle	**Test**	**LOR**	
+	**WOOD**			
+	**OTHER**			

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #		DSA File No.:	56-12
		Application No.:	03-119784
Date Submitted:	5/13/2019	Revised:	
		Revised:	

List of required verified report(s):

1 Soils testing and Inspection: Geotechnical Verified Report - Form DSA-293
2 All Structural Testing: Laboratory Verified Report - Form DSA-291
3 Shop Welding Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292

KEY to Columns

1 Type -	2 Performed By -
Continuous – Indicates that a continuous special inspection is required	**GE** – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
Periodic – Indicates that a periodic special inspection is required	**LOR** – Indicates that the test or inspection is to be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See section 4-335, 2013 CCR Title 24, Part 1.
Test – Indicates that a test is required	**SI** – Indicates that the special inspection is to be performed by a special inspector

Rosa E. Alvarado
Name of Architect or Engineer in general responsible charge

Name of Structural Engineer (When structural design has been delegated)

Signature of Architect or Structural Engineer — date 05/13/2019

IDENTIFICATION STAMP
DIV OF THE STATE ARCHITECT
APP. # **03-119784**

AC **N/A** F/LS **N/A** SS

DATE

LICENSED ARCHITECT
ROSA E. ALVARADO
C-29353
REN. 09-30-19
STATE OF CALIFORNIA

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #		DSA File No.:	56-12
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Date Submitted:	5/13/2019	Revised:	
		Revised:	

Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing

Exempt items given in IR A-22 or the 2016 CBC (including DSA amendments) and those items identified below with an "X" by the design professional are NOT subject to DSA requirements for the structural tests or special inspections noted. Items marked as exempt shall be identified by either: 1) listing specific details/sheets noted in the spaces provided below OR 2) on the approved construction documents. The project inspector shall verify all construction complies with the approved construction documents.

Exempted by Design Prof.	Soils:
X	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per 2016 CBC Table 1806A.2 and having no geotechnical report for the following types of structures: free standing sign, scrolling message sign, scoreboard, covered walkway or shade structure with dead load less than 5 psf and other light-weight structures of which the apex is less than 8' above the highest adjacent grade.
X	2. Shallow foundations meeting the exception item #1 criteria specified in 2016 CBC Section 1803A.2.
(Optional) List details for applicable exempt items:	
	Concrete/Masonry:
X	1. Post-installed anchors for the following: 1) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding") given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) or 2) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
X	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
X	3. Masonry retaining walls less than 4'-0" above the top of foundation not supporting a surcharge and free standing nonbearing non-shear masonry walls up to 6'-0" above adjacent grade do not require grout, mortar or masonry core testing or DSA special inspection.

Exempted by Design Prof.	Welding:
X	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
X	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds cannot be ground flush.
X	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
X	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	7. Any support for exempt non-structural components given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) meeting the following: 1) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) <= 4' above supporting floor/roof, 2) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #	
DSA File No.:	56-12
Application No.:	03-119784
Date Submitted:	5/13/2019
Revised:	
Revised:	

X	4. Epoxy shear dowels in site flatwork.	(Optional) List details for applicable exempt items:

(Optional) List details for applicable exempt items:

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "AHJ": Agency having jurisdiction.

C. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

D. "Compatible": When used for products, it shall comply with requirements including products recommended/ required by the manufacturer for warrantee acceptance.

E. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

J. "Owner": As defined in Division 1 section "Summary".

K. "Provide": Furnish and install, complete and ready for the intended use.

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

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
2. Copies of standards and applicable building codes (Title 24 Parts 1-5) shall be kept on-site during construction.

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations.

E. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized names.

F. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized names.

G. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized names.

1.4 QUALITY ASSURANCE

A. Reference Standards:
1. Part 1 2016 California Building Standards Administrative Code, Title 24 C.C.R.
2. Part 2 2016 California Building Code, Title 24 C.C.R.
3. (2015 International Building Code of the International Code Council, with California Amendments)
4. Part 3 2016 California Electrical Code, Title 24 C.C.R.
5. (2014 National Electrical Code of the National Fire Protection Association, NFPA)
6. Part 4 2016 California Mechanical Code, Title 24 C.C.R.
7. (2015 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)

8. Part 5 2016 California Plumbing Code, Title 24 C.C.R.
9. (2015 Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
10. Part 6 2016 California Energy Code, Title 24 C.C.R.
11. Part 7 currently vacant
12. Part 8 2016 California Historical Building Code, Title 24 C.C.R.
13. Part 9 2016 California Fire Code, Title 24 C.C.R.
14. (2015 International Fire Code of the International Code Council)
15. Part 10 2016 California Existing Building Code, Title 24 C.C.R.
16. (2015 International Existing Building Code of the International Code Council, with amendments)
17. Part 11 2016 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
18. Part 12 2016 California Referenced Standards Code, Title 24 C.C.R.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

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SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:
1. Division 1 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 1 Section "Execution Requirements" for progress cleaning requirements.
4. Divisions 2 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service:
1. Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service:
1. Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service:
1. Pay electric power service use charges for electricity used by all entities for construction operations.

E. Sanitary Facilities: Pay sanitary service use charge for temporary toilets, wash facilities, and drinking water for use of construction personnel.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with 2016 CEC.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts.

B. Wind Screen Fabric: Green.

2.2 TEMPORARY FIELD OFFICES

A. Contractor will be allowed to use existing on-site facilities under conditions provided and acceptable to Owner.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, electric, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Install temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Install temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Install temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction

from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Install electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Install temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

3.3 SUPPORT FACILITIES INSTALLATION

A. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

B. Parking: Provide temporary or use designated areas of Owner's existing parking areas if approved for construction personnel.

C. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

D. Project Identification and Temporary Signs: Provide Project identification. Install signs where directed to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
   1. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.
   3. Provide a 4'-0" x 8'-0" project sign constructed of 1/2 inch plywood or 10 mil corrugated mounted to 4"x4" posts 8'-0" long set 2'-0" deep into earth.
   4. Project sign shall include a graphic of the building (available from the Architect), Architect, Consultants, District, project, funding members with titles, and Contractor with contact information for the contractor. Text and layout shall be submitted for approval prior to installation.
   5. Location of project sign shall be coordinated with District's representative.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Division 1 Section "Summary."

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
   1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations or as indicated on Drawings.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

F. Install full coverage with green wind screen fabric to block viewing through construction fencing.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Covered Walkway: Erect structurally adequate, protective, covered walkway for passage of individuals along adjacent public street(s). Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
   1. Construct covered walkways using scaffold or shoring framing.
   2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
   3. Extend back wall beyond the structure to complete enclosure fence.
   4. Paint and maintain in a manner approved by Owner and Architect.

J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

K. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
   2. Construct dustproof partitions with 2 layers of 3-mil polyethylene sheet on each side. Cover floor with 2 layers of 3-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
      a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
   3. Insulate partitions to provide noise protection to occupied areas.
   4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
   5. Protect air-handling equipment.
   6. Weather strip openings.
   7. Provide walk-off mats at each entrance through temporary partition.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with 2010 CFC Article 87.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
   4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."

END OF SECTION 01 50 00

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SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and product substitutions.

B. Related Sections include the following:
   1. Division 1 Section "References" for applicable industry standards for products specified.
   2. Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.
   3. Divisions 2 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor. Proposed products by manufacturers not listed in Manufacturers list.

C. Basis-of-Design: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating “or equal” products of other named manufacturers.

D. District Standard: Where a specific manufacturer's product is named and accompanied by the words "District Standard," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics pre-selected by the District.
   1. District seeks to match products currently in use on other campuses; No substitution allowed.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
   1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
   2. Form: Tabulate information for each product under the following column headings:
      a. Specification Section number and title.
      b. Generic name used in the Contract Documents.
      c. Proprietary name, model number, and similar designations.
      d. Manufacturer's name and address.
      e. Supplier's name and address.
      f. Installer's name and address.
      g. Projected delivery date or time span of delivery period.
      h. Identification of items that require early submittal approval for scheduled delivery date.
   3. Completed List: Submit 3 copies of completed product list within days specified in General Conditions. Include a written explanation for omissions of data and for variations from Contract requirements.
   4. Architect's Action: Architect will respond in writing to Contractor within 21 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.

B. Substitution Requests: Submit 4 copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form provided at end of Section.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified material or product cannot be provided.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, environmental, and specific features and requirements indicated.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: Architect will notify Contractor of acceptance or rejection of proposed substitution within 21 days of receipt of request.
   a. Form of Acceptance: Change Order.
   b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. The cost for any additional design or engineering required to gain DSA approval of a substitution shall be borne solely by the contractor. Any delay impacts resulting from DSA review and approval of substitutions shall be borne solely by the contractor.

D. Named Product and Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

E. District Standard Products Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Reference Standards:
1. Part 1 2016 California Building Standards Administrative Code, Title 24 C.C.R.
2. Part 2 2016 California Building Code, Title 24 C.C.R.
3. (2015 International Building Code of the International Code Council, with California Amendments)
4. Part 3 2016 California Electrical Code, Title 24 C.C.R.
5. (2014 National Electrical Code of the National Fire Protection Association, NFPA)
6. Part 4 2016 California Mechanical Code, Title 24 C.C.R.

7. (2015 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
8. Part 5 2016 California Plumbing Code, Title 24 C.C.R.
9. (2015 Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
10. Part 6 2016 California Energy Code, Title 24 C.C.R.
11. Part 7 currently vacant
12. Part 8 2016 California Historical Building Code, Title 24 C.C.R.
13. Part 9 2016 California Fire Code, Title 24 C.C.R.
14. (2015 International Fire Code of the International Code Council)
15. Part 10 2016 California Existing Building Code, Title 24 C.C.R.
16. (2015 International Existing Building Code of the International Code Council, with amendments)
17. Part 11 2016 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
18. Part 12 2016 California Referenced Standards Code, Title 24 C.C.R.

B. Changes to the approved drawings and specifications shall be made by an addendum or a change order approved by the Division of the State Architect, as required by Section 4-338, Part 1, Title 24, CCR.

C. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.

5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
   3. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Warranty Period: Warranty period specified in each sections are minimum requirements. Do not modify manufacturer's standard warranty period if the manufacturer's warranty has longer warranty period.

D. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:
1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or an equal product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with “or equal”.
6. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Product Substitutions" Article to obtain approval by Architect for use of an unnamed product.
7. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
8. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include custom or premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes standard, custom, and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 35 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction and has paid any fees.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
11. Furnish samples upon requested by Architect.
12. Attached Request for Substitution Form shall used for substitution requests.

C. Substitutions for products or systems involving structural, fire/life safety and access compliance will be considered a Change Order or Addendum, and will require DSA approval. This will add time required to review those substitutions requiring DSA approval. Contractor is solely responsible for all documentation and time required to obtain DSA approval.
1. The use of a product other than specified or noted on the Drawings will require the Contractor to get Engineer, Architect and DSA approval.
2. The Contractor shall be responsible to provide any information, calculations or drawings to show compliance with the DSA approved drawings and provide all documentation to the Architect and/or Engineer of record.
3. Any changes or "substitutions" that impact or relate to DSA requirements for structural, ADA or fire and life safety MUST be approved by DSA prior to proceeding with the work.
4. The Contractor shall also be responsible for all costs to the DSA, Architect or Architect consultants for review, co-ordination, and approval by the DSA.
    a. All costs for submittal to DSA and Architect/ design team expenses shall be back charged to the Contractor.

PART 3 - EXECUTION

3.1 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Product List Form.
   2. Substitution Request Form.
   3. Similar Installation List Form.

END OF SECTION 01 60 00

PRODUCT LIST FORM

☐ Preliminary Product List.
☐ Complete Product List.
Include a written explanation for omissions of data and for variations from Contract requirements.

Project: ______________________ From: ______________________

To: ______________________ Date: ______________________

Spec Section		**Early approval?** ☐ **Yes** ☐ **No**	**Product**	**Model No.**	**Manufacturer**	**Supplier**	**Installer**	**Delivery Date**
No.	**Title**							

End of Product List Form

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SIMILAR INSTALLATION LIST FORM

Provide minimum 5 similar installations within last 3 years.

Project: _____ From: _____

To: _____ Date: _____

	Date of Installation	Project Name	Owner Info	GC Info	Architect info
1					
2					
3					
4					
5					
6					
7					
8					

End of Previous Project List Form

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SUBSTITUTION REQUEST FORM

Substitutions are only allowed within number of days specified. Use this for m for requesting "or equal" products and materials.

Project:	Substitution Request Number:
	From:
To:	Date:
	Project Number:

Specification Section Title:		
Section Number:	Page:	Article/Paragraph:
Specified Item:		

Proposed Substitution:	
Manufacturer:	Address:
Contact Name:	Phone Number:
☐ Comparison between proposed substitution and specified product is attached. Note all differences.	

Reason for not using specified item:
- ☐ Specified product is no longer available.
- ☐ Substitution will improve lead time by _____ days
- ☐ Substitution will save Owner $ _____
- ☐ Other:

☐ List 3 similar installations including project name, address, owner, and date installed is attached.
Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explanation attached.

Supporting Data Attached:
- ☐ Product Data (indicate any options to be included)
- ☐ Drawings ☐ Test Reports ☐ Samples ☐ Color Chart ☐ Other:

Undersigned certifies:
- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable is available.
- Proposed substitution will not affect or delay Construction Progress Schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.

- Payment will be made for changes to building design, including architectural or engineering design, detailing, and construction costs caused by the requested substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- Substitutions for products or systems involving structural, fire/life safety and access compliance will require AHJ approval. This will add time required to review those substitutions requiring AHJ approval. Contractor is solely responsible for all documentation, cost, and time required to obtain AHJ approval.

Submitted by:	Firm:
Signature:	Date:
Comments:	

A/E Review:
☐ Approve Substitution.
☐ Approve Substitution as Noted.
☐ Reject Substitution. Use specified product.
☐ Reject Substitution. Use specified product. Substitution request received too late.

Signed by:	Date:
Comments:	

Owner's Review and Action (Approval of substitution is not valid without Owner's signature)
☐ Substitution approved.
☐ Substitution approved as Noted.
☐ Substitution rejected. Use specified product.

Signed by:	Date:

Comments:

End of Substitution Request Form

SECTION 01 70 00 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. General installation of products.
   2. Progress cleaning.
   3. Starting and adjusting.
   4. Protection of installed construction.
   5. Correction of the Work.

B. Related Sections include the following:
   1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
   2. Division 1 Section "Submittal Procedures" for submitting surveys.
   3. Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate

and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

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

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

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

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Provide protection against weather, rain, wind, storms, frost and heat so as to maintain all work and materials free from injury or damage.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 70 00

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SECTION 01 72 19 - CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:
   1. Disposing of nonhazardous construction waste.

B. Related Sections include the following:
   1. Division 1 Section "Temporary Facilities and Controls" for environmental-protection measures during construction.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

1.4 PERFORMANCE GOALS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.
   1. Not a requirement, but a goal for sustainable design. No extra cost should incur to Owner.

1.5 SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:
   1. Material category.
   2. Generation point of waste.
   3. Total quantity of waste in tons.
   4. Quantity of waste salvaged, both estimated and actual in tons.

5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 RECYCLING CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.2 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

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

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 72 19

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SECTION 01 73 20 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Demolition and removal of selected portions of building or structure.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

A. Qualification Data: For demolition firm.

B. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.

2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
7. Means of protection for items to remain and items in path of waste removal from building.

C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
1. Comply with submittal requirements in Division 1 Section "Construction Waste Management."

1.6 QUALITY ASSURANCE

A. Reference Standards:
1. Part 1 2016 California Building Standards Administrative Code, Title 24 C.C.R.
2. Part 2 2016 California Building Code, Title 24 C.C.R.
3. (2015 International Building Code of the International Code Council, with California Amendments)
4. Part 3 2016 California Electrical Code, Title 24 C.C.R.
5. (2014 National Electrical Code of the National Fire Protection Association, NFPA)
6. Part 4 2016 California Mechanical Code, Title 24 C.C.R.
7. (2015 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
8. Part 5 2016 California Plumbing Code, Title 24 C.C.R.
9. (2015 Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
10. Part 6 2016 California Energy Code, Title 24 C.C.R.
11. Part 7 currently vacant
12. Part 8 2016 California Historical Building Code, Title 24 C.C.R.
13. Part 9 2016 California Fire Code, Title 24 C.C.R.
14. (2015 International Fire Code of the International Code Council)
15. Part 10 2016 California Existing Building Code, Title 24 C.C.R.
16. (2015 International Existing Building Code of the International Code Council, with amendments)
17. Part 11 2016 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
18. Part 12 2016 California Referenced Standards Code, Title 24 C.C.R.

B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

E. Standards: Comply with ANSI A10.6 and NFPA 241.

F. Predemolition Conference: Conduct conference at Project site. Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

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

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

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

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

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Division 1 Section "Construction Waste Management."

B. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 01 73 20

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
   1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building.
   2. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's or Construction Manager's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Reference Standards:
1. Part 1 2016 California Building Standards Administrative Code, Title 24 C.C.R.
2. Part 2 2016 California Building Code, Title 24 C.C.R.
3. (2015 International Building Code of the International Code Council, with California Amendments)
4. Part 3 2016 California Electrical Code, Title 24 C.C.R.
5. (2014 National Electrical Code of the National Fire Protection Association, NFPA)
6. Part 4 2016 California Mechanical Code, Title 24 C.C.R.
7. (2015 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
8. Part 5 2016 California Plumbing Code, Title 24 C.C.R.
9. (2015 Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
10. Part 6 2016 California Energy Code, Title 24 C.C.R.
11. Part 7 currently vacant
12. Part 8 2016 California Historical Building Code, Title 24 C.C.R.
13. Part 9 2016 California Fire Code, Title 24 C.C.R.
14. (2015 International Fire Code of the International Code Council)
15. Part 10 2016 California Existing Building Code, Title 24 C.C.R.
16. (2015 International Existing Building Code of the International Code Council, with amendments)
17. Part 11 2016 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
18. Part 12 2016 California Referenced Standards Code, Title 24 C.C.R Cutting, boring, sawcutting or drilling through the new or existing structural elements to be done only when so detailed in the drawings or accepted by the Architect and Structural Engineer with the approval of DSA Representative.

B. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

C. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

D. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

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

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

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SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. IOR's Inspection procedures.
   2. Warranties.
   3. Extra Materials.
   4. Final cleaning.
   5. DSA project closeout and Final Certification of Construction.
   6. Title 24 Certificate of Acceptance requirements.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
   2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
   3. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   4. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   5. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.
   6. Division 23 sections for mechanical Title 24 Certificate of Acceptance requirements.
   7. Division 25 sections for electrical Title 24 Certificate of Acceptance requirements.

1.3 DEFINITIONS

A. IOR: Inspector of Record.

B. Inspection: IOR will inspect, not the Architect.

1.4 SUBMITTALS

A. Submit a copy of Title 24 Certificate of Acceptance forms submitted to enforcement agency.

1.5 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting IOR's inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
   8. Complete startup testing of systems.
   9. Submit test/adjust/balance records.
   10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   11. Advise Owner of changeover in heat and other utilities.
   12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   13. Complete final cleaning requirements, including touchup painting.
   14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. IOR's Inspection: Submit a written request for IOR's inspection for Substantial Completion. On receipt of request, Architect will either proceed with IOR's inspection process or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after IOR's inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.6 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final IOR's inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

2. Submit certified copy of Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. IOR's Inspection: Submit a written request for final IOR's inspection process for acceptance. On receipt of request, Architect will either proceed with IOR's inspection process or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after IOR's inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use form attached.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

1.8 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date specified in General Conditions.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Include Table of Contents.
3. Identify content with specification section number and title.

4. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
5. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

1.9 EXTRA MATERIALS

A. Deliver to Owner's facility manager extra materials specified in each section.

B. Organize submitted materials in orderly sequence based on the table of contents of the Project Manual.
1. Itemize each material and quantity in 8-1/2 by 11-inch paper.

C. Label each items for easy identification.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting IOR's inspection for certification of Substantial Completion for entire Project or for a portion of Project:
a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

3.2 DSA PROJECT CLOSEOUT AND FINAL CERTIFICATION OF CONSTRUCTIONS

A. Verified Reports: Per Title 24 Part 1, Section 4-336.

B. Final Certificate of Construction: Per Title 24 Part 1, Section 4-339

C. Duties of Contractor: Per Title 24 Part 1, Section 4-343

3.3 TITLE 24 CERTIFICATE OF ACCEPTANCE REQUIREMENTS

A. Comply with the requirements of Division 22, 23, and 25.

3.4 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Punch-List Form.

END OF SECTION 01 77 00

PUNCH-LIST FORM

☐ Preliminary Punch-List.
☐ Final Punch-List.

Project:	From:
To:	Date:

Item No.	Room No.	Area	Description	Completion Date	A/E Verification

End of Punch-List Form

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SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.

B. Related Sections include the following:
   1. Division 1 Section "Closeout Procedures" for general closeout procedures.
   2. Division 1 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Divisions 2 through 33 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit 1 set of marked-up Record Prints.

B. Record Specifications: Submit 1 copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit 1 copy of each Product Data submittal.
   1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
   5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
   4. Assembly in single binder with table of contents.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and

in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

3.2 FORMS

A. Electronic versions of attached forms will be provided upon request.
   1. Record Product Data Form.

END OF SECTION 01 78 39

SECTION 02 3000 - SUBSURFACE INVESTIGATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes:
This section describes the subsurface conditions observed during the Geotechnical Investigation for this project. The Geotechnical Report is available for review upon written request from the Architect for the cost of printing.

B. Related Work:
1. Section 312000 Earthwork
2. Geohazards Report for Sunkist Elementary School Proposed Modular Classroom Building prepared by Earth Systems, dated September 19, 2018
3. Response to Engineering Geology and Seismology Review prepared by Earth Systems, dated February 12, 2019

1.2 QUALITY ASSURANCE

A. Prior to bidding, bidders may request their own subsurface investigations to satisfy themselves as to site and subsurface conditions

1.3 OBSERVED SUBSURFACE CONDITIONS

A. Subsurface Conditions:
1. Geohazards Report for Sunkist Elementary School Proposed Modular Classroom Building prepared by Earth Systems, dated September 19, 2018

Actual Conditions:
1. The subsurface information provided is based on soil borings and observations made during the Geotechnical Investigation and are not a guarantee of actual subsurface conditions. If any variations or undesirable conditions are encountered during construction, the contractor shall notify the Geotechnical Engineer and the Architect.

2. Existing utilities and facilities shown are based on record drawings and surface observations. The contractor shall verify locations of existing utilities to protect, identify for relocation, or remove, as necessary for the performance of work to complete this project.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

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SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   2. Miscellaneous steel trim.

B. Related Sections include the following:
   1. Division 9 Section "Painting" for field painting.

1.3 DEFINITIONS

A. Exterior: Defined as the following:
   1. Areas, locations, and surfaces that are unprotected, or exposed to environmental elements.
   2. Areas, locations and surfaces within uncontrolled environments.
   3. Areas, locations and surfaces of unconditioned spaces, including belowgrade/underground, partially-exposed, or "covered" parking areas.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

A. Product Data: For items specified.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.

C. Samples for Verification: For each type and finish of extruded nosing.

1.6 QUALITY ASSURANCE

A. Reference Standards:
1. Part 1 2016 California Building Standards Administrative Code, Title 24 C.C.R.
   Part 2 2016 California Building Code, Title 24 C.C.R.(2015 International Building Code of the International Code Council, with California Amendments)
2. Part 3 2016 California Electrical Code, Title 24 C.C.R. (2014 National Electrical Code of the National Fire Protection Association, NFPA)
3. Part 4 2016 California Mechanical Code, Title 24 C.C.R.
   (2015 Uniform Mechanical Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
4. Part 5 2016 California Plumbing Code, Title 24 C.C.R.
   (2015 Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials, IAPMO)
5. Part 6 2016 California Energy Code, Title 24 C.C.R.
6. Part 7 currently vacant
7. Part 8 2016 California Historical Building Code, Title 24 C.C.R.
8. Part 9 2016 California Fire Code, Title 24 C.C.R.
   (2015 International Fire Code of the International Code Council)
9. Part 10 2016 California Existing Building Code, Title 24 C.C.R.
   (2015 International Existing Building Code of the International Code Council, with amendments)
10. Part 11 2016 California Green Building Standards Code (CALGreen Code), Title 24 C.C.R.
11. Part 12 2016 California Referenced Standards Code, Title 24 C.C.R.

B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal fabrications that fails in materials or workmanship within specified warranty period.
   1. Warranty Period: 1 year.

B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Anchor Bolts: ASTM F 1554, Grade 36.
   1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
   1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Surface Preparation: SSPC-SP2 Hand Tool Clean and /or SSPC-SP3 Power Tool Clean.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

2.7 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.8 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

C. Galvanize exterior miscellaneous steel trim and interior miscellaneous steel trim, where indicated.

2.9 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.
   1. Fill pipe with concrete and finish with dome top.
   2. Pipe diameter: As indicated on Drawings.

B. Fabricate sleeves for bollard anchorage from steel pipe or tubing with 1/4-inch- thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches deep and 3/4 inch larger than OD of bollard.

2.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
   1. ASTM A 123, for galvanizing steel and iron products.
   2. ASTM A 153, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

D. Field Finish: Comply with Division 9 Section "Painting" for field painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLING METAL BOLLARDS

A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

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SECTION 05 52 13

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe.

1.2 RELATED SECTIONS

A. Section 05 50 00, Metal Fabrications

1.3 PERFORMANCE REQUIREMENTS

A. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of pipe and tube railings that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Period: 2 years.

B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. -Steel Pipe and Tube Railings:

   a. Blum, Julius & Co., Inc.
   b. CR Laurence.
   c. Livers Bronze.
   d. Wagner, R & B, Inc.; a division of the Wagner Companies.
   e. Or equal

B. Nonshrink, Nonmetallic Grout:
   1. 1107 Advantage Grout by Dayton Superior Chemical & Cement Products.
   2. Conset Grout by ChemMasters Specialty Construction Products.
   3. General-Purpose Grout by Symons.
   4. Or equal.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.3 STEEL AND IRON

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for all exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS

A. General: Provide the following:

1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:

1. By bending or by inserting prefabricated elbow fittings.

K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

D. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

3.2 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Use of "Bondo" for finishes where applicable and for continuity of finishes is allowed.

3.4 PROTECTION

A. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
1. Materials and equipment shall be furnished and installed in support of electrical work described in these plans and specifications including but not limited to, raceways, boxes, enclosures, feeders, branch circuiting, supports, terminal cabinets, sleeves, gutters, panels, transformers, switchgear, lighting fixtures, controls, relays, contactors, in order to complete and make fully functional the systems described.
2. Complete fire alarm and annunciation system as shown and/or required by the authority having jurisdiction (AHJ) and Division of the State Architect (DSA), including monitoring equipment and wiring for central station connection as approved by the DSA.
3. Duct banks and raceways for all power and communications systems as shown and/or required. Duct banks shall include all trenching, racking, conduit, concrete, backfill, boxes, pads, substructures required for a fully developed and useable pathway for cables, conductors, as shown on site, etc.
4. HVAC and plumbing electrical: Conduit, conductors and terminations for all line voltage power, line voltage controls and fusible and/or non-fusible safety disconnect switches for HVAC equipment, including but not limited to air conditioners, furnaces, fans, heat pumps, cooling towers, system pumps, condensing units. Provide protective equipment unless otherwise noted, etc. including protective devices.
5. Plumbing Electrical: Conduit, conductors and terminations for plumbing equipment with power requirements including necessary fusible and/or non-fusible safety disconnect devices. Provide motor starters where required unless provided by mechanical specification.
6. Power and Lighting Distribution: Furnish and install power and lighting distribution systems including but not limited to panels, feeders, transformers, branch circuits, devices, fixtures, disconnect switches, contactors, controls, etc. for a complete working system.

7. Data systems infrastructure including all boxes, raceways, cable tray, wire basket tray, dedicated branch circuits, sleeves and penetrations, etc. as described and as shown in plans, risers, specifications, EIA/TIA standards and/or required for a complete and operating system.
8. Master clock system including master Global Positioning System (GPS), antenna, retransmitter, controller, clocks, backboxes, conduits/conductors, connectors, terminations, cabinets, etc. as required for a complete and operating system.
9. Voice amplification system in multi-purpose rooms, auditoria and gymnasiums, including amplifiers, racks, mixers, microphones, outlets, cable/connections, equipment racks, etc. as specified on the drawings and in written specifications.
10. Allocation of time to adequately train the Owner on the use and operation of all systems installed within the facility or on the property. Minimum two week advance notice shall be coordinated with the Owner and his representatives. Training shall be as outlined in individual system specifications identified to follow.

B. Related Sections Under Other Divisions:
1. Mechanical Wiring: Control circuit wiring, energy management controls and interlocks for mechanical equipment shall be installed by Mechanical Contractor.
2. Painting of electrical equipment where exposed and required by the Architect to be painted as described elsewhere in the specification.
3. HVAC Control Raceway: Raceways, boxes, and control wiring for thermostats, temperature sensors and control components specified within the mechanical specifications, shall be furnished and installed as required by Division 25 and installed in accordance with the minimum wiring methods allowed for branch circuit wiring in Division 26 (the DDC systems/EMS systems and components are installed in accordance with Division 25).
4. Smoke Fire Dampers: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).
5. Duct mounted smoke detectors: Coordination with Mechanical plans for exact locations and points of connection for power and fire alarm system connections (power and fire alarm connection shall be by Electrical Contractor).

1.3 SYSTEM DESCRIPTION

A. The electrical plans indicate the general layout and arrangement; the architectural drawings and field conditions shall determine exact locations. Field verify all conditions and modify as required to satisfy design requirements as well as code minimums. Maintain all required working clearances as described in CEC Article 110 as well as other applicable articles.

B. Discrepancies shall be brought immediately to the attention of the Architect for clarification. The Architect shall approve any changes. Prior to rough-in, refer to architectural plans that shall take precedence over electrical plans with respect to locations.

1.4 SUBMITTALS AND SHOP DRAWINGS

A. Before construction, submit in accordance with the General Conditions of this Specification: A complete list of all materials proposed to be furnished and installed under this section.

B. Manufacturers' specifications, catalog cuts and shop drawings as required to demonstrate compliance with the specifications. Identify specific intended use for each component where submittal may be ambiguous. Submit entire bound submittal at one time; partial submittals will not be accepted. At a minimum, submittals will be required for the following:
   1. Distribution equipment including main switchboards, distribution switchgear, transformers, distribution panels and breakers, motor controls, distribution and branch circuit panels, grounding, transient voltage surge suppressors, etc.
   2. Electrical equipment including disconnects, fuses, raceways, straps and racks, fittings, conductors, boxes, gutters, devices, plates, etc.
   3. Complete system component submittals and shop drawings for:
      a. Voice Public Address System
      b. Intercom
      c. Master Clock System
      d. Fire Alarm System
      e. Communication Systems including but not limited to; cable, fiber, terminations, cable management, cable tray, patch panels, equipment racks, specified active electronics (where called for), cabinets, jacks, plates, cable labeling, testing procedure.
   4. Conduit including all fittings, etc.
   5. Wiring and cable, terminations, etc.
   6. Fire rating penetration materials, details, etc.

C. The intent of these specifications is to establish a standard of quality for materials and equipment. Therefore, some items are identified by manufacturer or trade name designation. Substitutions shall be subject to the Architect's approval. Samples of the proposed and substitute materials may be required for inspection prior to approval. Costs, if any, for evaluation of substitutions shall be the Contractor's responsibility. The decision of the Architect shall be final. Where the substitution will affect other trades, coordinate all changes with those trades concerned and pay any additional costs incurred by them as a result of this substitution. Approval of substitutions shall not relieve the Contractor from providing an operational system in accordance with all applicable codes and ordinances.

D. SUPPORTING DEVICES (DSA/OSHPD)
1. Provide all details of suspension and support for ceiling hung equipment.
2. Where walls, floor, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the submittals must include spacing, static loads and seismic loads at all attachment and support points.
3. Provide seismic details of seismic restraints and anchors; including number, size and locations for each piece of equipment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage of equipment for the job is the responsibility of the Electrical Contractor and shall be scheduled for delivery to the site, as the equipment is required. Damage to the equipment delivered to the site or in transport to the job shall be the responsibility of the Electrical Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be new and bear the label of or be listed by a nationally recognized testing laboratory. The quality and suitability of all materials shall conform to the standards and practices of this trade.

B. Supplied materials shall be of a current manufactured product line. Discontinued products are not acceptable. Where products are identified on the contract documents by part number, supply the current product model or series which meets the specification and intended use of the specified component.

2.2 SUPPORTING DEVICES

A. Pipe Straps: Two-hole galvanized or malleable iron.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Professionalism and appearance of installations shall be in accordance with accepted practices of this trade. Installation methods shall conform to manufacturers' specifications and recommendations. The Contractor shall man the job with qualified

journeymen and helpers in this trade for the duration of the job. It is the Contractor's responsibility to communicate with and keep the job superintendent appraised of changes or clarifications, etc.

B. Employment of any person on any job in the capacity of an electrician is not permitted unless such person has qualified for and holds a valid Journeyman Electrician Pocket Card or General Journeyman Electrician Certificate issued by the State of California Division of Apprenticeship Standards except, Contractor may employ electrical helpers or apprentices on any job of electrical construction, new or existing, when the work of such helpers or apprentices is performed under the direct and constant personal supervision of a journeyman electrician holding a valid Pocket Card accepted by the State of California Division of Apprenticeship Standards.
   1. Each Pocket Card carrying journeyman electrician will be permitted to be responsible for the quality of workmanship for a maximum of one helper or apprentice during any same time period, provided the nature of work is such that good supervision can be maintained and the quality of workmanship is the best, as expected by Owner and implied by the latest edition of the National Electrical Code.
   2. Before each journeyman electrician commences work, deliver to Owner at the project site, a photocopy of the journeyman's valid Pocket Card.

C. Materials shall be installed in accordance with the manufacturers' specification and recommendations. They must conform to the approval AHJ adopted codes and standards, but not less than the 2016 CEC and all applicable codes and standards, including but not necessarily limited to California Code of Regulations Title 24, NFPA, National Electrical Manufacturers Association, ANSI, CBC, and any other adopted ordinances of applicable agencies having jurisdiction. Refer to general conditions of specifications.

D. Electrical Contractor shall lay work out in advance in order to avoid unnecessary cutting, chasing, and drilling of floors, walls, ceilings and other surfaces. Work of this nature shall be carefully done so as not to damage work already performed by other trades. Any damage which results must be properly repaired at no extra cost to the Owner. Such alterations shall not depreciate the integrity of the structure. Approval for cuts or penetrations in structural members shall be by the Architect.

E. Supporting Devices:
   1. Install vertical support members for equipment, straight and parallel to building walls. Provide independent supports to structural member for electrical materials or equipment installed in or on ceiling, walls or in void spaces or over furred or suspended ceilings.
   2. Do not use other trade's fastening devices as supporting means for electrical equipment or materials. Do not use supports or fastening devices to support other than one particular item.

3. Support conduits within 18" of outlets, boxes, panels, cabinets and deflections. Maximum distance between supports not to exceed 8' spacing.
4. Securely suspend all junction boxes, pull boxes or other conduit terminating housings located above suspended ceiling from the floor above or roof structure to prevent sagging and swaying.
5. Provide seismic bracing per UBC requirements for this building location.
6. Supporting Devices: Safety factor of 4 required for every fastening device or support for electrical equipment installed. Support to withstand four times weight of equipment it supports. Bracing to comply with seismic design category "SDC" per Structural Engineer or as required for the project site.

F. Coordinate work with other trades as required to eliminate any delays during construction. Coordinate changes with other prime contractors to avoid construction conflicts.

G. Engineer's Field Observation: Site visits during construction for field observations and reports will be conducted by electrical engineer when directed by the Architect. A list of items that need to be addressed will be submitted to the Architect for forwarding to the Contractor. A written response to all items shall be submitted for Owner's review once complete. When Electrical Engineering representative performs a field observation, the Electrical Contractor shall be present and available to remove equipment covers as needed.

H. Drawings of Record: Provide a full and accurate set of field record drawings marked up in a neat and understandable manner submitted to the Owner Representative, Construction Manager, or Architect upon completion of the work and prior to issuance of a certificate of completion. The drawings shall dimension all electrical facilities including but not limited to underground conduit, vaults, boxes as well as conduit routing scaled to within 12" of actual field conditions and shall be kept up to date on a daily basis reflecting changes or deviations. Electrical facilities shall be accurately drawn on the plan to scale. Refer to the general conditions of these specifications for additional requirements. Record drawings shall be required to identify both horizontal and vertical dimensions to visible and fixed points such as concrete, asphalt, buildings, sidewalks, etc.

I. Identification: Provide engraved laminated plastic nameplates for all switchboards, panelboards, fire alarm terminal cabinets, telephone and cable television backboards, main devices, control panels, time clocks, contactors and safety disconnect switches accurately identifying each device. Labels shall be attached to the equipment by means of screws or rivets. Self-adhering labels will not be acceptable. Refer to Section 26 0553, IDENTIFICATION OF ELECTRICAL SYSTEMS.

J. Safety: The Electrical Contractor is responsible to maintain equipment in a safe and responsible manner. Keep dead front equipment in place while equipment is energized. Conduct construction operations in a safe manner for employees as well as

other work persons or anyone visiting the job site. Provide barriers, trench plates, flags, tape, etc. The Contractor shall hold all parties harmless of negligent safety practices that may cause injury to others on or near the job site.

K. Guarantees: Equipment and labor shall be guaranteed and warranted free of defects, unless otherwise stated to be more restrictive, for a period of one year from the date of final acceptance by the Owner. A written warranty shall be presented to the Architect at the time of completion prior to final acceptance. Equipment deemed to be damaged, broken or failed should be repaired or replaced at no additional cost to the Owner. Materials or system requiring longer than a one-year warranty as described herein shall be separately warranted in separate letters of guarantee stating the duration of warranty.

L. Operating and Installation Manuals: Provide two copies each of manuals, operating and installation instructions for equipment indicated in submittal packages. Instruct the Owner's representative as to the operation and location of equipment necessary to allow them to operate the facility upon final acceptance. This instruction period shall be prearranged with the Owner's representative prior to occupancy of the facility and the weeks prior to training scheduled.

END OF SECTION 26 0500

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SECTION 26 05 01
SELECTIVE ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Electrical demolition.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work shall be as specified in individual sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor to walk job to observe existing conditions and account for variance as needed.

B. Verify field measurements and circuiting arrangements as shown on drawings.

C. Verify that abandoned wiring and equipment serve only abandoned facilities.

D. Demolition Drawings are based on limited field observation and existing record documents. Report discrepancies to Owner/Architect before disturbing existing installation.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, observe provisions of NFPA 70E and CALOSHA, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area as required.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Coordinate outages with Owner and local fire service. Notify Owner/Owner's representative at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Notify Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of this section.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Allow the owner first right to retain ownership of salvaged materials, otherwise the Electrical Contractor is responsible for its removal from the site and proper disposal or recycling.

D. Remove abandoned wiring to source of supply.

E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.

G. Disconnect and remove abandoned panelboards and distribution equipment.

H. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

I. Discarded electrical components and lamps containing hazardous waste (i.e., mercury in fluorescent lamps) shall be disposed of as required by the State Laws and Local Ordinances regarding hazardous materials.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

L. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

C. Luminaires: Cleaning light fixtures. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace ballasts and broken electrical parts as required for any inoperative fixtures. Provide new lamps for all fixtures that are to remain.

3.5 INSTALLATION

A. Install relocated materials and equipment as shown and/or as required.

END OF SECTION 26 05 01

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SECTION 26 05 19
LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Wires and cables.
2. Connectors.
3. Lugs and pads.

1.3 SYSTEM DESCRIPTION

A. Provide wires, cables, connectors, lugs, strain reliefs, racking insulators for a complete and operational electrical system.

1.4 SUBMITTALS

A. Provide product data for the following equipment:
1. Wires.
2. Cables.
3. Connectors.
4. Lugs.
5. Splice Kits.
6. Strain Relief Fittings.
7. Cable Racking and Insulators.

B. Provide the insulation cable testing report in the project closeout documentation, refer to Closeout Requirements in the General Conditions portion of this specification.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of the CEC, latest adopted version with amendments by local Authority Having Jurisdiction (AHJ).

B. Furnish products listed by UL or other testing firm acceptable to AHJ.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Wires and Cables: General Cable, Okonite, Southwire, or approved equal.

B. Connectors: Burndy, Ilsco, Thomas & Betts, or approved equal.

C. Wire connectors shall be minimum 75 degree centigrade rated and properly sized for the number of conductors being connected, terminated, spliced etc. All above grade connectors shall be solderless lug or plastic wire nut type, screw on, pressure cable type (wire nut or spring nut type), 600 volt, 105 degree C, with skirt to cover all portions of stripped wires. Connector shall be U.L. rated for number and size of conductors being joined together as a splice.

D. Splices:
1. Branch Circuit Splices: Ideal, Scotch-Lock, 3M, or approved.
2. Feeder Splices: Compression barrel splice with two layers Scotch 23 and four layers of Scotch 33+ as vapor barrier.
3. Screw Terminal Lugs.
4. Kearney Split Bolt.

E. MC and HFC Cable: Alflex, AFC, or approved and shall meet all CEC Article 334 provisions.

2.2 WIRES AND CABLES FOR LINE VOLTAGE SYSTEM AND CONTROLS. WIRE AND CABLE SHALL BE:

A. Copper, 600 volt rated throughout. Conductors 14AWG to 10AWG, solid or stranded. Conductors 8AWG and larger, stranded.

B. Phase color to be consistent at all feeder terminations; A-B-C, top to bottom, left to right, front to back. Phasing tape shall be permitted on sizes #6 and larger.

C. Color Code Conductors as Follows:

PHASE	208 VOLT	240 VOLT DELTA	480 VOLT
A	Black	Black	Brown
B	Red	Orange (High Leg)	Orange
C	Blue	Blue	Yellow
Neutral	White	White	Gray
Ground	Green	Green	Green
Isolated Grnd	Green w/yellow trace	Green w/yellow trace	N/A

D. All conductors shall be copper unless otherwise noted. Minimum size for individual conductors shall be #12 AWG unless otherwise noted. Sizes #8 AWG and larger shall be stranded conductor. Individual conductors shall be insulated with type, XHHW, THW, THHN/THWN 600-volt insulation unless otherwise noted. Control, signal,

communication conductors shall be as dictated by the vendor of that equipment or as specified here-in. Proper insulation type shall be used for the proper environmental application (i.e., waterproof, wet location, plenum, temperature rated). If a condition exists where the application is uncertain, contact the Engineer for direction. Contractor is responsible to follow specific cabling requirements described in other sections of this specification relative to various communications and controls systems as well as the respective riser diagrams shown on plans. If a discrepancy occurs, communicate such discrepancy to the Architect and Engineer immediately for resolution.

E. Insulation types THWN, THHN or XHHW. Minimum insulation rating of 90C for branch circuits.

F. Refer to signal and communications specification sections for cable requirements.

2.3 CONNECTORS

A. Copper Pads: Drilled and tapped for multiple conductor terminals.

B. Lugs: Indent/compression type for use with stranded branch circuit or control conductors.

C. Solid Conductor Branch Circuits: Spring connectors, wire nuts, for conductors 18 through 8AWG.

2.4 LUGS AND PADS

A. Ampacity: Cross-sectional area of pad for multiple conductor terminations to match ampere rating of panelboard bus or equipment line terminals.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation: Conductors shall not be installed until after conduit systems are permanently in place. Use an approved non hardening type wire pulling lubricant if lubricant is to be used. Maintain all conduits and wire pulls free from foreign material. If due to field conditions, more than a total of 300 degrees of bend are required; a pull box shall be furnished and installed for ease of installation. Said pull boxes must be sized and rated for the appropriate application and must remain easily accessible upon completion of the project (approval of the location shall be obtained from the Architect prior to installation). Show these pullboxes on the field record drawings. Conductors installed in underground raceways on site shall be duct sealed and taped where they exit the raceway to prevent the entrance of foreign material and moisture after the conductors are installed. Proper drainage shall be provided for underground pull and splice boxes.

B. Insulation: Use proper insulation types where temperature and environment are a factor.

C. Splices at or below grade level shall be made with wet location rated and approved mechanical connectors and shall be encapsulated in epoxy or plastic molded poured kits. The connections must be assured to be watertight. Splices at or below grade shall always be avoided and minimized. Prior approval is required for feeder splices below grade. Submit proposed materials and exhibit showing location of intended splices for Engineer's review and approval prior to commencing with the work.

D. Labeling: All conductors in panels, switchboards, terminal cabinets, vaults, pull boxes, and junction boxes shall be labeled with tape number markers indicating circuit number and identifying system. All labeling shall be permanent. In manholes and vaults, provide embossed brass tags identifying system serviced and function. See Section 26 0553 IDENTIFICATION OF ELECTRICAL SYSTEMS.

E. All conductors, wiring, cable where installed below floor, slab or underground shall be considered wet locations, and shall be rated accordingly. Non waterproof cabling is not allowed in any below grade or wet application.

F. Cables routed together in cable tray shall be stacked, organized and tie wrapped together in a neat and workman like manner. Random cable routing is not acceptable.

G. Cable and conductors routed through pull boxes and vaults shall be properly supported on porcelain or equal insulators mounted on steel rack inserts. Bend radius of cable or conductor shall not be less than six times the overall cable diameter.

H. Wires and Cables:
   1. Conductor Installation:
      a. Install conductors in raceways having adequate, code size cross-sectional area for wires indicated.
      b. Install conductors with care to avoid damage to insulation.
      c. Do not apply greater tension on conductors than recommended by manufacturer during installation.
      d. Use of pulling compounds is permitted. Clean residue from exposed conductors and raceway entrances after conductor installation.
   2. Conductor Size and Quantity:
      a. Install no conductors smaller than 12AWG unless otherwise shown.
      b. Provide all required conductors for a fully operable system.
   3. Provide dedicated neutrals (one neutral conductor for each phase conductor) in the following single phase circuits:
      a. Dimmer controlled circuits.
      b. Isolated ground circuits.
      c. Ground fault and arc fault protected circuits where a GFI and arc fault breakers are used in panelboards.
      d. Other electronic equipment which produces a high level of harmonic distortion including but not limited to computers, printers, plotters, copy machines, fax machines, where indicated.
   4. Conductors in Cabinets:

a. Cable and train all wires in panels and cabinets for power and control neatly and uniformly. Use plastic ties in panels and cabinets.
b. Tie and bundle feeder conductors in wireways of panelboards.
c. Hold conductors away from sharp metal edges.
d. Connectors: Retighten mechanical type lugs and connectors for conductors to equipment prior to Notice of Completion.

3.2 FIELD QUALITY CONTROL

A. Tests:
1. Test conductor insulation on feeders of 400 amp and greater for conformity with 1000 volt megohmmeter. Use Insulated Cable Engineers Association testing procedures. Minimum insulation resistance acceptable is 1 megohm for systems 600 volts and below.

2. Test Report: Prepare a typed tabular report indicating the testing instrument, the feeder tested, amperage rating of the feeder, insulation type, voltage, the approximate length of the feeder, conduit type, and the measured resistance of the megohmmeter test. Submit report with operating and maintenance manual.

END OF SECTION 26 05 19

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Grounding and bonding requirements of electrical installations for personnel safety and to provide a low impedance path for possible ground fault currents as described in CEC Article 250.
   2. "Grounding electrode system" refers to all electrodes required by CEC, as well as including made, supplementary, lightning protection system and telecommunications system grounding electrodes.
   3. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.

B. Related Work:
   1. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.
   2. Section 26 0519, LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be permitted to be identified per CEC.

B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes No. 10 AWG and smaller shall be ASTM B1 solid bare copper wire.

C. Conductor sizes shall not be less than what is shown on the drawings and not less than required by the CEC, whichever is greater.

2.2 GROUND RODS

A. Copperclad steel, 3/4" diameter by 10' long, conforming to UL 467 unless otherwise noted on drawings and details.

B. Quantity of rods shall be as required to obtain the specified ground resistance or additional rods shall be driven to obtain specified resistance or less.

2.3 SPLICES AND TERMINATION COMPONENTS

A. Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

PART 3 - EXECUTION

3.1 GENERAL

A. Ground in accordance with the CEC, as shown on drawings, and as hereinafter specified.

B. System Grounding:
1. Secondary service neutrals: Ground at the supply side of the secondary disconnecting means and at the related transformers.
2. Separately derived systems (transformers downstream from the service entrance): Ground the secondary neutral.

C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, fire sprinklers, plumbing piping, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

3.2 INACCESSIBLE GROUNDING CONNECTIONS

A. Make grounding connections which are buried or otherwise normally inaccessible (except connections for which periodic testing access is required) by exothermic weld.

3.3 SECONDARY EQUIPMENT AND CIRCUITS

A. Main Bonding Jumper: Bond the secondary service neutral to the ground bus in the service equipment.

B. Metallic Piping, Building Steel, and Supplemental Electrode(s):
1. Provide a grounding electrode conductor sized per CEC between the service equipment ground bus and all metallic water and gas pipe systems, building

steel, and supplemental or made electrodes. Jumper insulating joints in the metallic piping. All connections to electrodes shall be made with fittings that conform to UL 467.

2. Provide a supplemental ground electrode and bond to the grounding electrode system.

C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors.

D. Switchgear, Switchboards, Unit Substations, and Motor Control Centers:
1. Connect the various feeder equipment grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
2. For service entrance equipment, connect the grounding electrode conductor to the ground bus.
3. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and grounding conductor to the equipment ground bus.

E. Transformers:
1. Exterior: Exterior transformers supplying interior service equipment shall have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to nearest component of the grounding electrode system and the ground bar at the service equipment.

F. Conduit Systems:
1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor sized per CEC.
2. Non metallic conduit systems shall contain an equipment grounding conductor, except that non-metallic feeder conduits which carry a grounded conductor from exterior transformers to interior or building-mounted service entrance equipment need not contain an equipment grounding conductor.
3. Metal conduit containing only a grounding conductor, and which is provided for mechanical protection of the conductor, shall be bonded to that conductor at the entrance and exit from the conduit.

G. Feeders and Branch Circuits: Install equipment grounding conductors with all feeders, power and lighting branch circuits.

H. Boxes, Cabinets, Enclosures, and Panelboards:
1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
2. Provide lugs in each box and enclosure for equipment grounding conductor termination.

3. Provide ground bars in panelboards, bolted to the housing, with sufficient lugs to terminate the equipment grounding conductors.

I. Motors and Starters: Provide lugs in motor terminal box and starter housing or motor control center compartment to terminate equipment grounding conductors.

J. Receptacles shall not be grounded through their mounting screws. Ground with a jumper from the receptacle green ground terminal to the device box ground screw and the branch circuit equipment grounding conductor.

K. Ground lighting fixtures to the equipment grounding conductor of the wiring system when the green ground is provided; otherwise, ground the fixtures through the conduit systems. Fixtures connected with flexible conduit shall have a green ground wire included with the power wires from the fixture through the flexible conduit to the first outlet box.

L. Fixed electrical appliances and equipment shall be provided with a ground lug for termination of the equipment grounding conductor.

M. Raised Floors: Provide bonding of all raised floor components.

N. Panelboard Bonding: The equipment grounding terminal buses of the normal and emergency branch circuit panelboards shall be bonded together with an insulated continuous copper conductor not less than No. 8 AWG where panels are in same room together or within 25' of each other. These conductors shall be installed in rigid metal conduit.

3.4 CONDUCTIVE PIPING

A. Bond all conductive piping systems, interior and exterior, to the building to the grounding electrode system. Bonding connections shall be made as close as practical to the equipment ground bus.

3.5 TELECOMMUNICATIONS SYSTEM

A. Bond telecommunications system grounding equipment to the electrical grounding electrode system. Refer to Section 27 1300, INTERCOMMUNICATIONS SYSTEMS.

3.6 GROUND RESISTANCE

A. Grounding system resistance to ground shall not exceed 25 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Owner. Final tests shall assure that this requirement is met.

B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE Standard 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

C. Services at Southern California Edison Company interface point shall comply with their ground resistance requirements.

D. Below-grade connections shall be visually inspected by the IOR prior to backfilling. The Contractor shall notify the IOR 24 hours before the connections are ready for inspection.

E. Furnish a copy of tests to Owner at completion of project.

3.7 GROUND ROD INSTALLATION

A. Drive each rod vertically in the earth, not less than 9 1/2' in depth.

B. Where permanently concealed ground connections are required, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with mechanical pressure type ground connectors.

C. Where rock prevents the driving of vertical ground rods, install angled ground rods or grounding electrodes in horizontal trenches to achieve the specified resistance.

3.8 GROUNDING FOR RF/EMI CONTROL

A. Install bonding jumpers to bond all conduit, cable trays, sleeves and equipment for low voltage signaling and data communications circuits. Bonding jumpers shall consist of 4" wide copper strip or two No. 10 copper conductors spaced minimum 4" apart. Use No. 6 copper where exposed and subject to damage.

B. Comply with the following when shielded cable is used for communication circuits.
   1. Shields shall be continuous throughout each circuit.
   2. Connect shield drain wires together at each circuit connection point and insulate from ground. Do not ground the shield.
   3. Do not connect shields from different circuits together.
   4. Shield shall be connected at one end only. Connect shield to signal reference at the origin of the circuit. Consult with equipment manufacturer to determine signal reference.

END OF SECTION 26 05 26

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Conduit and fittings.
2. Outlet boxes.
3. Weatherproof outlet boxes.
4. Junction and pull boxes.
5. Floor boxes and poke-through.
6. Cabinets, termination cabinets.
7. Gutters.
8. Concrete boxes and vaults.
9. Fiberglass or composite boxes and vaults.
10. Hazardous Location: Sealing Fitting

B. Related Work:
1. Installation of all wire, cable, conductor, boxes/gutters, pull ropes, fiber optic cable raceway, conduit, innerduct, cable sleeve and duct as described on the plans and/or as specified here-in. This scope shall include pathways to be installed underground onsite and offsite, underslab, above grade, both concealed and exposed, overhead concealed and exposed as appropriately applied. Raceways/boxes shall be installed in accordance with their intended and allowed uses and as specified here-in whichever is more restrictive. Size and capacity of all raceway/boxes shall be as specified here-in or as depicted on the drawings, but shall not be less than that required by code. Larger raceway sizes may be specified than code would permit. The specifications shall govern.
2. Listed products for termination, coupling, extending, benching supports of raceways shall be used.
3. Raceways/boxes described by this section shall include, but not be limited to, power for site utilities and lighting, site and building communications, controls, fire alarm, security, access control, sound systems, data system, energy management systems, power distribution, lighting, lighting controls, video, CATV, voice communications, intercom, nurse call, HVAC and other building low voltage/communications systems controls as may be required. Raceways, boxes and duct paths required for utility companies shall be installed per plans unless

utility company requirements are more restrictive at which time those requirements shall take precedence.

4. Protection of and cleanliness of pathways and raceways must be assured during the construction process in order to eliminate the possibility of debris entering the conduit, duct, pathway resulting in decreased wire capacity and potential damage to installed conductors and cables.
5. Pathways are shown in a diagrammatic way and are generally accurate as to routing, however, it is the Contractor's responsibility as a means and methods process to coordinate with all other trades that require space within a building. The Contractor shall obtain approval for installation of raceways routing through structural footings, retaining walls, columns, beams, perlins, grade beams, etc.
6. It is the Contractor's responsibility to insure that all raceway and boxes systems penetrate fire assemblies and sound rated assemblies in an approved manner using the appropriate and listed products for the purpose.
7. Trenching and backfilling for all underground conduit systems installed by the Electrical Contractor shall be the responsibility of the Contractor. Conduits shall have minimum cover requirement of 36" below finish grade with the exception of site lighting conduits which may be 24" below finish grade minimum. More stringent depth requirements may be imposed by the local agency and utility company and shall be adhered to, and / or this specification or as detailed on the plans. Joint trenching may be utilized where practicable and where permitted by this specification. Concrete, native material and sand shall be used as backfill material and shall be compacted in accordance with and coordinated with the grading and site preparation requirements. Conduits shall rest in a minimum of 4" bed of sand prior to backfill and compaction. Locations of existing underground (UG) utility systems shall be determined by calling Underground Service Alert (USA) at least 48 hours prior to any excavation.
8. Minimum conduit size shall be 1/2" except if plan shows or code requires larger size. Exception: Use minimum 3/4" for underslab and below grade applications outside of building exterior walls.
9. All electrical, control, communications systems shall be installed in metallic conduit system. This shall include but not be limited to all systems described in Section B.3 above, except for voice and data systems which shall be installed as described on these plans and as specified here-in but shall not be less than the recommendations of EIA/TIA standards.
10. All line voltage wiring within the building shall be installed in metallic conduit.
11. All conduit, concrete pads, underground concrete or fiberglass substructures shall be furnished and installed with the approved materials and type for the application. Provide proper traffic control during construction as well as barriers and protection of all excavations and trenching.
12. Empty or future conduits shall be properly plugged with plastic caps or inserts with a 3/8" polyethylene pull rope. Plastic or "duct" tape will not be acceptable.
13. Exterior installations: After conductors are installed, seal conduit ends to prevent entrance of foreign material using pliable duct seal, caps or waterproof expanding foam.
14. All low voltage systems including intercom, fire alarm, public address, etc. shall be in dedicated conduit systems. Voice / Data and Direct Digital Control (DDC) systems for HVAC cabling shall be routed as specified in Section 27 1300, INTERCOMMUNICATIONS SYSTEMS and as recommended by EIA/TIA

standards. It shall be the contractor's responsibility to provide raceway down walls to outlet boxes and to provide sleeves across inaccessible ceiling spaces.

15. Underground conduits entering building shall have the open end of conduit within building above the elevation of the conduit outside the building such that water cannot enter building through conduit. If such a condition exists, a pull box outside of building footprint shall be installed in conduit route before conduit enters building whereby top of pull box is below finish floor of building and moisture may exit box before entering building.
16. No single conduit run of any type shall exceed 360 degrees of radius bend from termination box to termination box.
17. Separate Raceway System: Provide a separate dedicated raceway system for each system installed, do not combine different systems into a raceway or cable tray system, unless otherwise noted or allowed.
18. Spare, Future Conduits: Conduits labeled conduit only, spare, or for future use, shall be provided with a pullrope, capped at each end, labeled as spare with destination marked, and turned over to the Owner in an unused state. Contractor shall not utilize these conduits for the installation of cabling or conductors as part of this scope of work. Contractor to verify and install at no additional cost to the Owner, additional conduits as required for the installation of the systems being installed.
19. Outlet System: Provide electrical boxes and fittings as required for a complete installation. Including but not limited to outlet boxes, junction boxes, pull boxes, bushings, locknuts, covers and all other necessary components.
20. Code Compliance: Comply with CEC as applicable to construction and installation of electrical boxes and fittings and size boxes according to CEC 312, 314 and 366 except as noted otherwise.
21. Outlets to be flush mounted: Maintain integrity of insulation and vapor barrier. Unless otherwise noted, flush mount all outlet boxes.
22. Provide putty pads of proper type around outlet boxes and/or as detailed on plan to meet sound transmission restrictions and fire ratings of walls.

1.3 SUBMITTALS

A. Provide Shop Drawings and Product Data for the Following Equipment:
1. Conduit and fittings.
2. Outlet boxes.
3. Weatherproof outlet boxes.
4. Junction and pull boxes.
5. Floor boxes and poke-through.
6. Cabinets, termination cabinets.
7. Gutters.
8. Concrete boxes and vaults.
9. Fiberglass or composite boxes and vaults.
10. Putty pads.
11. Raceways
12. Hazardous Location: Sealing Fitting

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of the CEC, latest adopted version with amendments by local AHJs.

B. Furnish products listed by UL or other independent and nationally recognized testing firm.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Heavy wall Rigid Non-Metallic Conduit, shall be PVC schedule 40 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.

B. Extra heavy wall non-metallic conduit, shall be PVC schedule 80 manufactured in accordance with NEMA Standard TC-2, UL-651 and WC 1094A specifications.

C. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.

D. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.

E. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes.

F. Flexible Metal Conduit (FMC) shall be continuous wound reduced wall galvanized steel produced to UL standards.

G. Liquid tight flexible metal conduit shall have a thermoplastic cover over a galvanized steel core containing an integral copper ground in sizes to 1 1/4" and shall be in compliance with UL standards and CEC Article 350.

H. Surface mount raceway shall only be used where shown on the plans. The raceway and cover shall be "Ivory" colored by Wiremold but be capable of being over-painted in the field if required. The raceway and fittings shall meet all requirements of CEC Article 386 and be U.L. listed. Raceway shall be mechanically connected to structure with backing and anchor bolts.

I. Wire basket tray shall be 12" wide with 4" side rails unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. and be cut and installed using listed equipment. Material shall be zinc electroplated steel.

J. Cable runway tray shall be 12" wide with 4" side rails unless otherwise noted. It shall be U.L. listed and use listed connectors, elbows, tees, etc. Material shall be hollow steel with gray painted finish.

K. Manufacturers:
1. Outlet Boxes: Bowers, Raco, Steel City or equal.
2. Weatherproof Outlet Boxes: Bell, Red Dot, [Carlon] or equal.
3. Floor Boxes: Wiremold/Walker, Hubbell, Steel City, or equal.
4. Junction and Pull Boxes: Circle AW, Hoffman, Wireguard or equal.
5. Box Extension Adapter: Bell, Red Dot, [Carlon] or equal.
6. Conduit Fittings: O-Z Gedney, Thomas & Betts, or equal.
7. Vaults: Christy, Brooks, Utility Vault or equal.
8. Putty pads: 3M, Hilti, or equal.
9. Heavy wall rigid non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
10. Extra heavy wall non-metallic conduit, Carlon, Certainteed, R&G Sloane or equal.
11. Galvanized Rigid Steel (GRS) conduit shall be hot dipped galvanized, zinc coated and shall comply with Underwriters Laboratories UL-6, ANSI Specification C-80.1 and Federal Specification WW-C-581E.
12. Electrical Metallic Tubing (EMT) shall be zinc coated, with a protective coating applied to the inside surface and shall comply with Underwriter Laboratories UL-797 ANSI Specification C-80.3 and Federal Specification WW-C-563A.
13. Electrical Non-Metallic Tubing (ENT), shall be listed to requirements of U.L. 1653, in accordance with CEC Article 362, and meet requirements of BI National Standard CAN/CSA-C22.2 No. 227.1-U.L. 1653. ENT shall be rated for 90 degrees C conductors and shall be recognized for use in 2-hour fire resistance non-load bearing and load bearing wall assemblies. ENT shall be recognized for through-penetration firestop systems as classified to meet U.L. and ICC building codes.
14. Flexible Metal Conduit (FMC), Alflex, American Flexible Conduit or equal.
15. Liquid tight flexible metal conduit, Anacanda (type UA), Electri-flex Liquatite or equal.
16. Surface mount raceway, Wiremold, Three Compartment Series 5500 or equal
17. Wire basket tray, B-line, GS Metals, Cablofil or equal.
18. Cable runway tray, B-line, CPI, Homaco or equal.
19. Floor Boxes, Single Gang, Walker/Wiremold 880 CS Series or approved equal.
20. Floor Boxes, Multiple Gang, Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers.
21. Masonry Boxes, outlets in concrete, Raco Series 690 or equal.
22. Floor Boxes, Poke-Thru, Hubbell PT7 Series, Walker/Wiremold RC4 Series, or approved equal unless otherwise noted.
23. Floor Boxes, Poke-Thru, Furniture Feed, Walker/Wiremold RC9 Series or approved equal.
24. Exterior In-Grade Boxes for Non-Utility Company, Precast concrete or polymer concrete, Utility Vault and Christy.
25. Hazardous Location: Sealing Fitting – Killark, Crouse-Hinds or Appleton.

2.2 OUTLET BOXES

A. NEMA 1 gutter, junction and pull boxes shall be fabricated from code gage steel finished in grey enamel with screw cover fronts and concentric knockouts in all sides.

B. NEMA 3R gutter, junction and pull boxes shall be fabricated from code gage galvanized steel with screw cover fronts and concentric knockouts in the bottom only. Any penetrations to the side, top or back shall be weatherproofed in an approved manner such as "MYERS" gasketed type hub or equal.

C. Steel outlet boxes and plaster rings shall be galvanized rigid assemblies, either one piece pressed or factory welded construction containing the size and number of knockouts required. Steel outlet boxes shall be manufactured, sized and installed in accordance with CEC Article 314. Device Outlet: Installation of one or two devices at common location, minimum 4" square, minimum 1 1/2" deep. Single or 2 gang flush device plaster ring. Raco Series 681 and 686 or equal.

D. Luminaire Outlet: minimum 4" square with correct plaster ring depth, minimum 1 1/2" deep with 3/8" luminaire stud if required. Provide proper depth plaster ring on bracket outlets and on ceiling outlets.

E. Multiple Devices: Three or more devices at common location. Install 1 piece gang boxes with 1 piece device plastering. Install one device per gang unless otherwise allowed.

F. Construction: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices. Boxes shall be properly secured to the structure such that they are flush with the finish surface. Boxes shall be made structurally secure by means of the proper fastening devices.

G. Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, plaster rings, luminaire studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.

2.3 WEATHERPROOF OUTLET BOXES

A. Construction: Provide corrosion-resistant cast iron, with zinc finish, weatherproof outlet wiring boxes, of the type, shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring-hinged waterproof cap suitably configured for each application, including face plate gasket, blank plugs and corrosion proof fasteners. Weatherproof boxes to be constructed to have smooth sides, zinc, galvanized finish.

B. Surface mounted die cast aluminum device boxes shall be provided with screw holes to accommodate cast device covers.

C. Cover plates on outlet boxes mounted flush in the wall shall be gasketed to the wall in a watertight manner. Weatherproof boxes in wet locations as described in CEC 406.8 (B) shall be provided with a "while-in-use" cover; red dot 'CK' Series of aluminum die-cast construction, NEMA 3R, with lacquer finish.

2.4 JUNCTION AND PULL BOXES

A. Construction: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with steel nuts, bolts, screws and washers.

B. Location:
1. Install junction boxes above accessible ceilings for drops into walls for receptacle outlets from overhead.
2. Install junction boxes and pull boxes as required to facilitate the installation of conductors and limiting the accumulated angular sum of bends between boxes, cabinets and appliances to 300 degrees.
3. Locations: Junction boxes shall be located only where necessary and only in equipment rooms, closets, and accessible attic and underfloor spaces. A horizontal distance of 24" shall separate outlet boxes on opposite sides of occupancy separation walls, fire-rated walls or partitions.
4. Labeling: Junction box covers shall be marked with indelible ink indicated the circuit numbers passing through the box.

2.5 BOX EXTENSION ADAPTER

A. Construction: Cast iron with gasket.

B. Location: Install over flush wall outlet boxes to permit flexible raceway extension from flush outlet to fixed or movable equipment.

2.6 CONDUIT FITTINGS

A. Requirements: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and plastic conduit bushings of the type and size to suit each respective use and installation.

B. Steel boxes may allow for field knock-out modifications, but shall in all other ways conform to code requirements.

2.7 FLOOR BOXES - SINGLE GANG

A. Construction: Deep cast iron fully adjustable before and after concrete pour with all required components for complete activation. Verify required components for application of service fittings, covers, monuments, and the like, attached to floor boxes.

B. Activations:
   1. Flush: Provide brass duplex or single signal cover, hinged with set screw lock. Carpet or tile finish ring.
   2. Monuments: Provide stainless steel monuments with power receptacle or data grommet as noted.
   3. Coordinate specific application of systems as noted on Drawings.

C. Plastic floor boxes which glue together will not be considered. Plastic mechanically assembled floor boxes may be considered with prior approval.

D. Location: Concrete floor. Use poke-thru of same construction in non-concrete structure. Verify exact locations. Ensure flush with finish surface.

E. Steel floor box construction will be allowed only at upper levels of buildings not at slab on grade level.

2.8 FLOOR BOXES - MULTIPLE GANG

A. Construction: Deep cast iron, fully adjustable before and after pour. Equal to Walker/Wiremold RFB Series or Walker Omnibox multi-service floor box with carpet plates, and/or water resistant device covers. Verify color. Partition for different power or signal applications. Provide required power receptacle devices and signal grommets or receptacles as noted. Flange type shall be compatible with floor covering for either carpet or vinyl as required and shall be brass type not polycarbonate.

B. Floor mounted boxes shall be water tight and cast iron when installed in grade level concrete slab floor, fully adjustable with interior and exterior leveling screws. Receptacle flange shall be brass with a duplex lift lid. Flange type shall be compatible with floor type. Before installation, coordinate exact location with Architect.

2.9 FLOOR BOXES - POKE-THRU

A. Fire rated for 4 hour, dual service, flush brass cover and service fitting prewired specification grade receptacle, voice/data jacks, as specified.

B. Furniture Feed: Fire rated per floor assembly rating, finish flange and service head assembly.

2.10 EXTERIOR IN-GRADE BOXES FOR NON-UTILITY COMPANY USE SHALL BE:

A. Precast concrete or polymer concrete type with full bottoms and draining into gravel drywell. Open bottom splice/pull boxes 24" x 36" and smaller shall be open bottom, with minimum 12" of gravel below for drainage.

B. Flushmount in hardscape and 1" above grade in softscape.

C. Provided with correct traffic type lid, i.e., full vehicular, intermediate incidental vehicular or pedestrian-rated as applicable stamped with "ELECTRIC", "LIGHTING", COMMUNICATIONS", etc. cover identification as shown on the drawings or as applicable. All boxes or vaults located in streets, driveways, sidewalks wider than 8', and turf areas where mowing takes place shall be traffic rated.

D. Provided with brass hold-down bolts in cover.

E. Provided with necessary box extensions to gain proper depth.

F. Seal all conduit in underground boxes with duct seal after conductors have been installed.

2.11 HAZARDOUS LOCATION SEALING FITTING

A. Copper free aluminum gas seal fitting to prevent passage of gases and vapor through electrical conduit.

B. Provide proper sealing fitting listed for the hazard classification and orientation of installation.

C. Include a drain canal and drain plug in installations which have a probability that liquid or vapor condensation may be trapped in raceway.

D. Splices are not allowed in sealing fitting.

E. Install packing fiber and sealing compound per manufacturers recommendations.

2.12 IN-GRADE UTILITY COMPANY BOXES AND VAULTS

A. In-grade boxes and pads for utility company, shall be as specified by the respective utility company with all of the company's requirements and construction methods met.

2.13 PUTTY PADS

A. Intumescent moldable firestop putty designed to protect electrical outlet boxes.

B. Designed to install around outside of outlet boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Conduit systems listed below are for use in installations where they are permitted to be used by CEC and/or other occupancy restrictions. The below installation methods do

not intend to suggest that these materials be installed in conflict with any applicable code. Special attention to applications shall be made in building types such as Educational, Health Care, wet location, hazardous locations, assembly occupancy and multi-story, but not limited to these. Requirements which are more restrictive than the CEC may be called for by the drawings and / or these specifications. These requirements must be adhered to. The Electrical Contractor shall be responsible to use the proper conduit system for the application. Exposed conduit is not allowed below ceilings or above slab of floor, without the permission and approval of the Architect. All conduits shall be concealed except in electrical and telecommunication rooms or where shown to be surface mounted. Exposed conduit (where allowed) shall be run square and plumb with building lines in an approved manner. Support roof-mount conduits, where allowed, with minimum 12" wide redwood blocks set in mastic unless otherwise detailed in roof requirements or as specified in roofing specification, by the Architect. Strap conduits to blocks with proper sized conduit straps. Spacing of support shall be a minimum as provided for in the CEC. All exposed conduit mounted below 8' above finished grade shall be strapped at a minimum of 5' spacing.

B. Non-Metallic Rigid Conduit shall be used in concrete slabs, below concrete slabs on grade, or underground outside of a building slab or foundation. Maintain minimum depth requirements and cover with appropriate fill material. Minimum 4" of bedding and cover of backfill material 1/4" size grain and smaller maximum. Conduit shall be heavy wall Schedule 40 or 80, rigid PVC only. Rigid utility P&C duct shall not be used in any application. Properly sized grounding conductors shall be installed per CEC article 250, in all non-metallic conduit branch circuit and feeder runs. PVC conduit shall be formed or field bent only with the use of properly approved bending tools such as to not decrease the internal bore of the conduit. All conduits shall be cut square and reamed of burrs. Approved and compatible glue shall be used on all PVC fittings to attain watertight joints. All non-metallic conduit runs over 150' in length and over 1 1/4" trade size conduit shall utilize galvanized rigid steel elbows.

C. Galvanized Rigid Steel (GRS) conduit shall be used where exposed less than 8'–0" above finished grade to 18" below finished grade and where subject to physical damage. Conduits shall be cut square and reamed to remove burrs and sharp edges. Strap conduit below 8' above grade at 5' intervals. Unless otherwise noted, threadless setscrew and threadless weathertight fittings may be used in lieu of threaded fittings. All threaded ends entering a junction box of any type shall require one locknut on the inside and one on the outside of the enclosure and be provided with a plastic bushing or grounding bushing where necessary for proper grounding. Where exposed to moisture, a watertight hub or other approved method shall be required. All conduits shall be stubbed up straight and uniform into junction boxes, panels, cabinets, etc., and shall be (GRS) properly supported and strapped. All GRS conduit located below grade, shall be tape wrapped.

D. Electrical Metallic Tubing (EMT) shall be used as allowed by code and as permitted by this specification. It shall not be in contact with soil or the concrete slab on the ground floor of any structure. Connectors and couplings shall be steel insulated set screw type where installed in indoor dry locations not subject to moisture. Where the potential for moisture is present, compression type weathertight fittings are required. One hole conduit straps are permitted from 1/2" to 1" and two hole conduit straps are required for

size 1 1/4" and larger. EMT shall not be allowed in areas subject to severe physical damage. Install copper ground wire sized per CEC 250-122 in all EMT conduits.

E. Flexible conduit may be used where concealed in building construction or above dropped ceilings, but shall meet the following criteria: No individual circuit path from distribution panel to last device shall exceed a cumulative length of 30' of flexible conduit from start to end. Flexible conduit shall not exceed a total directional change of 270 bending degrees in any one run between conduit terminations. Squeeze type or Jake type steel flex fittings of a grounding type are required. Flexible conduit must be supported in accordance with CEC. Where exposed to the weather, moisture, or spray down flexible conduit shall be of the liquidtight type. Fittings shall be manufactured for use with liquidtight flexible conduit. All motor connections shall be made with liquidtight flex. Flexible conduit may not be used where exposed except for last 2' of equipment connection and unless otherwise noted or approved. A copper ground wire sized per CEC 250-122 shall be installed in all flexible conduit runs. Flexible conduit may not be used exposed. Weatherproof liquid tight conduit shall not be used at roof level for equipment connections with lengths exceeding 24" nor shall it be used to circumvent a rigid conduit system in a horizontal direction. Connect recessed lighting fixtures to conduit runs with a maximum of 6' of flexible metal conduit extending from junction box to fixture. "Master" "Slave" fixtures are permitted to use manufactured flexible cable of longer dimension up to 12' between "Master" and "Slave" only and only as a U.L. listed system component.

F. Underground conduits and transition to above grade/slab shall be as follows:
1. PVC elbows allowed if top of elbow is minimum 18" BFG or below top of slab, otherwise GRS elbows are required.
2. GRS elbows are required if conduit run is 150' or greater.
3. GRS risers are required from elbow below grade to equipment (device, outlet, panel, cabinet, etc.) above grade.
4. GRS elbows/risers to be PVC coated or 10 MIL taped wrapped (1/2" lapped) to 3" above finish grade or top of slab.

G. Conduit Supports: Conduit runs may be supported by one-hole and two-hole straps or supports as manufactured by Unistrut, Minerallac, Caddy or equals. Supports may be fastened by means of anchors, shields, beam clamps, toggle bolts, or other approved methods appropriate for the application and size of conduit. Pipe nailers (J-hooks) may only be used for 1" conduit and smaller and only in wood frame construction. Conduit support methods are subject to review by the engineer and authority having jurisdiction for adequacy. Installations deemed inadequate shall be corrected by the contractor at no cost to the Owner.

H. Bends and offsets shall be made with approved tools for the type of conduit being utilized. Bends shall be made without kinking or destroying the smooth bore of the conduit. Parallel conduits shall be run straight and true with bends uniform and symmetrical. Minimum radii shall be per CEC 344-24.

I. Conduit Stub-outs below grade shall be capped with plastic cap, and identified by placing a pull box marked with correctly identified utility such as "Elec", "Tel", etc.

Dimension for exact location on field record drawings. Provide lids for proper field application (i.e. traffic, incidental, pedestrian).

J. Conduit Seals: Where below grade conduits enter structure through slab or retaining wall of building or basement, seal the inside of each conduit as follows:
1. Provide damming material around conductors 3" into conduit.
2. Fill 3" of conduit with 3M #2123 sealing compound.
3. Wrap conductors where they exit the conduit with 3M #2229 "Scotch Seal" mastic tape. Lap tape to approximate diameter of the raceway and wrap outside of conduit opening with (minimum) one turn.
4. Use conduit sealing bushings type CSB (O-Z/Gedney) or equal.
5. Empty conduits shall be sealed with standard non-hardening duct seal compound and then capped to prevent entrance of moisture and gases and to meet fire resistance requirements.
6. Provide cable drip loop minimum 12" high.

K. Marker tape: Place plastic yellow marker tape at 12" below finish grade along and above buried conduits. Label tape "CAUTION: ELECTRICAL LINES BELOW" or similar wording.

L. Conduits for high voltage (12kv) systems shall be separated from all other conduits by a minimum of 12". All power system conduits shall be separated from low voltage systems by a minimum of 12" when running parallel to each other and no less than 6" when running perpendicular to each other at conduit crossings.

M. Medium voltage system conduits including 4,000 volt and above, shall be installed in conduit systems or duct banks that are concrete encased by a minimum of 3" of concrete. Depth of conduits shall remain as specified elsewhere in this specification or as required by the CEC.

N. Electrical and communications systems raceways routed underground shall not occupy the same trench as plumbing utilities such as sewer, water, storm drain, gas or other wet or dry gaseous utility system. A minimum of 12" of undisturbed earth is required. Where utilities must cross in closer proximity to each other due to physical constraints, 6" minimum crossing distances are allowed, however 18" on all sides of a utility crossing must be concrete encased.

O. Duct bank defined here-in shall be four or more conduits in a common trench, conduit spacers and saddles shall be required in all trenches where more than two conduits over 2" in diameter travel in the same trench. Proper spacing between systems as outlined above shall be required and spacers shall be located each 5' (maximum) along trench route from point to point.

P. Conduits, routed below footings, slabs, grade beams, columns, and other structural elements shall be installed in strict compliance with structural details and criteria shown on structural plans. Clearances below structural elements and sleeves through structural elements must be carefully planned to avoid conflict and must be approved by the structural engineer if conflict arises.

Q. All conduit or raceways passing through fire rated walls, floors, or ceilings shall be installed with a listed penetration method which protects the opening to the same rating as the assembly and is non hardening.

R. Expansion Joints
1. Conduits 3" and larger, that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install the couplings in accordance with the manufacturer's recommendations.
2. Provide conduits smaller than 3" with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 5" vertical drop midway between the end. All conduit shall have a copper green grounding bonding conductor installed.

S. Seismic Joints
1. At seismic joints, provide conduits rigidly secured to the building structure on opposite sides of a building expansion joint with junction boxes or approved fittings, on both sides of the joint. Connect conduits to junction boxes with sufficient slack flexible conduit such that these slack conduits are 1 1/2 times the distance between conduit ends. Flexible conduit shall have a copper green ground bonding jumper installed.

T. Ladder tray shall be used in equipment rooms where shown on the plans. Ladder tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation.

U. Wire basket tray shall be used in all concealed spaces (above ceiling spaces, under buildings in access tunnels, below raised floors, etc.) unless otherwise noted. Wire basket tray installations shall conform to the requirements of CEC Article 318. The contractor shall provide all mounting hardware, connectors and bracing as required and as recommended by the manufacturer for a complete system installation. All cutting of wire basket tray shall be per the manufacturer's recommendation using tools designed for that purpose. Cable loading shall not exceed the listing of the system and its support.

V. Location: Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.

W. Anchoring: Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry.

X. Special Application: Provide weatherproof outlets for locations exposed to weather or moisture.

Y. Knockout Closures: Provide knockout closures to cap unused knockout holes where blanks have been removed.

Z. Mount outlet boxes, unless otherwise required by ADA, or noted on drawings, the following distances above the finished floor:

1. Receptacles, Telephone, TV & Data outlets. (measured to bottom of outlet box): +15".
2. Outlet above counter (measured to top of outlet box): +46".
3. Control (light) Switches. (measured to top of outlet box): +48".
4. Fire Alarm Manual Pull Stations, T-stats. (measured to top of outlet box): +48".
5. Fire Alarm Visuals: the lower of +80" to bottom of lens, or 6" below ceiling.
6. Other Outlets: As indicated in other sections of specifications or as detailed on drawings.

AA. Coordinate all electrical device locations with the architectural floor plan and interior and exterior elevations to prevent mounting devices within elements that they may conflict such as cabinetry, mirrors, planters, etc.

BB. Size outlet and junction boxes to minimum wire fill space requirements. Upsize box as required to allow ease of wire installation and device installation.

CC. Outlet and junction boxes in fire rated walls shall be gauged and spaced so as not to exceed the maximum penetration allowed by the assembly without compromising the fire rating. If a conflict arises relative to a specific condition, the contractor shall follow the requirements of the fire authority and ask for guidance from the design team. At no time should a larger box be installed prior to resolution of conflict.

END OF SECTION 26 05 33

SECTION 26 05 34
CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Cabinets where shown on the contract drawings and specified herein.

B. Related Work:
   1. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.
   2. Section 26 0553, IDENTIFICATION OF ELECTRICAL SYSTEMS.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Type: Cabinets shall be flush or surface mounted type as indicated on the contract drawing, as per Code and U.L. Standard 50.

B. Cabinet Construction: Sizes as indicated, constructed of code gauge sheet steel with hinged lockable doors, common keyed with panelboards. Equip cabinets with 3/4" fire retardant treated plywood backboards and/or barriers as applicable, terminal blocks for connection; index card holders and cards mounted behind heavy plastic on inside of cabinet doors.

C. Finish: Cabinets shall be chemically cleaned and the fronts shall be finished in same way as panelboards and switchboards.

D. Controls: As indicated on the contract drawings.

E. Identification: Provide on exterior of cabinet doors engraved plastic nameplate identifying the cabinet as designated on the Contract Drawing. Lettering shall be white on black finish and shall be minimum 3/16" high. Affix nameplates to cabinet doors with a minimum of two escutcheon pins or screws.

PART 3 - EXECUTION

3.1 GENERAL

A. Required: To be located where indicated on the Contract Drawing and installed as per manufacturer's instruction. Securely fasten to structural members or Unistrut support in vertical and plumb position and at heights indicated.

B. Nameplates: Conform to provisions noted in 2.1E above or as designated on the plans.

END OF SECTION 26 05 34

SECTION 26 05 43
UNDERGROUND DUCTS AND RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Manholes, handholes and ducts to form a complete underground raceway system.
   2. "Duct" and "conduit", and "raceway" are used interchangeably in this specification and have the same meaning. Refer to Section 26 0533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS for approved raceway and materials as well as execution.
   3. Scope of Work: Furnishing, installation and connection of manholes, handholes and ducts to form a complete underground raceway system for distribution of electrical and signal systems. Provide trenching, conduit, backfill, boxes and equipment pads as applicable.

B. Related Work:
   1. SITEWORK.
   2. FLATWORK.
   3. LANDSCAPING.
   4. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.
   5. Section 26 0533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings and boxes for raceway systems.
   6. Section 26 0526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

1.3 SUBMITTALS

A. Submit in accordance with Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.

B. Shop Drawings:
   1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
   2. Include manholes, handholes, duct materials, and hardware. Proposed deviations from details on the drawings shall be clearly marked on the submittals.

3. If necessary to locate manholes or handholes at locations other than shown on the drawings, show the proposed locations accurately on scaled site drawings.
4. Precast manholes and handholes: Submit detail drawings and design calculations for approval prior to installation.

1.4 APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. Underwriters Laboratories, Inc. (UL):
1. UL 467 Grounding and Bonding Equipment
2. UL 651 Schedule 40 and 80 Rigid PVC Conduit
3. UL 6 Electrical Rigid Metal Conduit-Steel

C. National Fire Protection Association (NFPA):
1. 70 California Electrical Code (CEC)

D. National Electrical Manufacturers Association (NEMA):
1. RN 1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
2. TC 2 Electrical Polyvinyl Chloride (PVC) Tubing And Conduit
3. TC 3 PVC Fittings For Use With Rigid PVC Conduit And Tubing

E. American Concrete Institute (ACI):
1. 318 Building Code Requirements For Structural Concrete

F. American Society for Testing and Materials (ASTM):
1. C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
2. C478M Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
3. F512-95 Standard Specification for Smooth-Wall Polyvinyl Chloride (PVC) Conduit and Fittings for Underground Installation

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete: ACI 318, 3000 psi minimum 28 day compressive strength.

B. Reinforcing Steel: Number 4 minimum.

C. Manhole Hardware:
1. Frames and covers (traffic type).

2. Sump frames and gratings.
3. Pulling Irons: 7/8" diameter hot dipped galvanized steel bar with exposed triangular shaped opening.
4. Cable supports:
   a. Cable stanchions, hot rolled, heavy duty, hot dipped galvanized "T" section steel 2 1/4" by 1/4" in size and punched with 14 holes on 1 1/2" centers for attaching cable arms.
   b. Cable arms, 3/16" gage, hot rolled, hot dipped galvanized sheet steel pressed to channel shape. Arms shall be approximately 2 1/2" wide and 14" long.
   c. Insulators for cable supports, high glazed, wet process porcelain.
   d. Spares: Equip each cable stanchion with two spare cable arms and six spare insulators for future use.
   e. Miscellaneous hardware, hot dipped galvanized steel.

D. Handhole Hardware:
   1. Frames and covers configuration as shown on the drawings.
   2. Pulling irons, 7/8" diameter galvanized steel bar with exposed triangular shaped opening.

E. Cable supports are not required.

F. Ground Rod Sleeve: Provide a 3" PVC sleeve in manhole floors so that a driven ground rod may be installed.

G. Manholes and Handholes shall be precast units and be constructed as described below. Units shall comply with ASTM C478, C478M.
   1. Size: Plan area and clear height shall be not less than that shown on the drawings.
   2. Accessories, hardware, and facilities shall be the same as required for poured in place type.
   3. Assume ground water level 3' below ground surface unless a higher water table is shown in the boring logs and adjust design accordingly.

H. Ducts:
   1. Size shall be as shown on drawings.
   2. Ducts (concrete encased):
      a. Plastic Conduit:
         1) NEMA TC6 & 8 and TC9 plastic utilities conduit UL 651 and 651A Schedule 40 PVC.
         2) Duct shall be suitable for use with 90 degree C rated conductors.
   3. Ducts (direct burial):
      a. Plastic duct:
         1) NEMA TC2 and TC3, EPC-40, Type II.
         2) UL 651 and 651A, Schedule 40 Schedule 80 PVC.
         3) Duct shall be suitable for use with 75 degree C rated conductors.

b. Rigid metal conduit, PVC-coated: UL6 and NEMA RN1 galvanized rigid steel, threaded type, coated with PVC sheath bonded to the galvanized exterior surface, nominal 0.040" thick.

I. Ground Rods: Per Section 26 0526, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

J. Ground Wire: Stranded bare copper No. 6 AWG minimum.

K. Conduit Spacers: Prefabricated plastic.

L. Warning Tape: Standard 4 mil polyethylene 3" wide tape, detectable type, red with black letters, imprinted with "CAUTION BURIED ELECTRIC CABLE BELOW".

M. Pull Rope: Plastic with 200 pound minimum tensile strength.

PART 3 - EXECUTION

3.1 TRENCHING

A. Refer to EARTHWORK section of specification for trenching back-filling, and compaction requirements.

B. Work with extreme care near existing ducts, conduits, cables, and other utilities to avoid damaging them.

C. Conduits to be installed under existing paved areas, roads, and railroad tracks which are not to be disturbed shall be protected into place. Conduits shall be minimum 36" cover.

D. Trench Preparation: A 4" sand bedding is required if trench bottom is not rock free. A 4" sand covering over the cable is required if the native backfill is not rock free. Backfill and compaction should meet City, County, and State requirements. All backfill requirements shall also meet or exceed those set forth in the earthwork or civil section of this specification.

E. Excavation: Provide 6" gravel in bottom of excavated holes for all concrete boxes. Spare gravel shall be available for final adjustment. The Contractor is responsible for final grade level of enclosures and boxes. Non-conformance will be corrected by electrical contractor at his expense.

F. Conduit Routing: Sharp turns, bends, or other irregularities in the conduit must be avoided. Every effort should be made to obtain a straight water tight conduit line. The end of all spare conduits must be capped.

G. Joint Trenching: Maintain all required depths, clearance and separations as required by code, ordinance or utility company policies. Coordinate with other utilities to confirm requirements.

3.2 OTHER PADMOUNTED EQUIPMENT

A. Provide adequately sized and reinforced concrete pads with openings for conduit(s) as necessary by the equipment manufacturer.

B. A grounding system shall be installed at each padmounted piece of equipment including, but not limited to, a ground rod, grounding conductor, ufer, and ground grid (if called for).

C. Padmounted equipment shall be bolted to concrete pad with minimum 5/8" x 7 1/2" anchor bolts, one in each of 4 corners of each section of padmounted equipment.

END OF SECTION 26 05 43

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SECTION 26 05 53
IDENTIFICATION OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of this Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section Includes:
   1. Nameplates and warning signs where specified herein and as shown on contract documents including the following:
      a. Nameplates and warning signs permanently installed on all electrical equipment and devices including, but not limited to, the following items:
         1) Enclosures for transformers, switchboards, motor control, panels, pullboxes, cabinets, motors, generators, transfer switches.
         2) Enclosures for all separately enclosed devices including, but not limited to, disconnect switches, circuit breakers, contactors, time switches, control stations and relays, fire alarm panels and lighting control panel.
         3) Wall switches not within sight of outlet controlled.
         4) Special systems such as, but not limited to, telephone, fire alarm, warning and signal systems. Identification shall be at each equipment rack, terminal cabinet, control panel, annunciator and pullbox.
         5) Devices mounted within and part of equipment including circuit breakers, switches, control devices, control transformers, relays, indication devices and instruments.

B. Related Work:
   1. Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL.
   2. Section 26 0534, CABINETS.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABEL DESIGNATIONS

A. Equipment labels indicating equipment designations both emergency and normal. Designation data per drawings or to be supplied with shop drawings approval.

B. Panelboard labels showing panel designation, voltage, phase and source.

C. In accordance with CEC 110.16, provide arc flash protection warning labels on all switchboards, panelboards, distribution panels, transformers, safety switches, transfer equipment, etc. Labels shall be per ANSI Z535.4 guidelines.

2.2 MATERIALS

A. For Labels: Three layer laminated plastic or micarta with engraved white letters over black background.

B. For Emergency Equipment: Use engraved white letters over red background.

C. For Warning Signs: Minimum 18 gauge steel with red lettering on white porcelain enamel finish.

D. Arc flash labels shall be provided as required by CEC Article 70E.

PART 3 - EXECUTION

3.1 MOUNTING

A. Equipment labels shall be mounted by self-tapping, threaded screws and bolts, or by rivets. Adhesive types are not acceptable unless specifically noted in this section.

3.2 HEIGHTS ON LABELS

A. Panelboards, Switchboards and Motor Control Centers and Special Systems Enclosures: 1/4" identify equipment designation; 1/8" identify voltage rating and source.

B. Individual Circuit Breakers, Switches, and Motor Starters in Panelboards, Switchboards, and Motor Control Centers: 3/16" identify circuit and load served, including location of equipment.

C. Enclosed Circuit Breakers, Enclosed Switches, and Motor Starters: 3/16" identify load served.

D. Transformers: 3/16" identify equipment designation; 1/8" identify primary and secondary voltages, primary source and secondary load. Include location of primary source or secondary load if remote from transformer.

3.3 WARNING SIGNS

A. Warning signs shall be permanently mounted with cadmium plated steel screws or nickel-plated brass bolts.

B. Warning signs to read "DANGER - HIGH VOLTAGE", with letters 1 1/2" high, 3/16" stroke minimum.

C. Provide warning sign on all doors or immediately next to door for equipment rooms, enclosures or closets containing equipment energized above 150 volts to ground as per CEC, and/or as directed by the Architect. For interior finish spaces and interior doors, signage shall be coordinated and approved with the Architect in advance of installation.

END OF SECTION 26 05 53

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SECTION 27 13 00
INTERCOMMUNICATION SYSTEMS

1. GENERAL

1.1 SCOPE

A. This document describes the products and execution requirements relating to furnishing and installing Telecommunications Cabling at the new or remodeled buildings for the project. Backbone and horizontal cabling comprised of copper and fiber cabling, and support systems are covered under this document.

B. The Horizontal (workstation) Cabling System shall consist of a minimum of two (2) 4-pair Unshielded Twisted Pair (UTP) Copper Cables to each work area outlet unless otherwise noted for specific locations. The cables shall be installed from the Work Area Outlet to the Telecommunications Room (TR) located on the same floor and routed to the appropriate rack serving that area and terminated as specified in this document.

C. All cables and related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Telecommunications contractor as detailed in this document.

D. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document. If the bid documents are in conflict, this specification shall take precedence. The successful vendor shall meet or exceed all requirements for the cable system described in this document. Verify/Coordinate all cable, device, equipment specifications with District/Campus standards.

1.2 REGULATORY REFERENCES

A. All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the local Electrical Code and present manufacturing standards.

B. All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

C. All modular jacks, patch cords, consolidation point, and patch cords performance shall be verified (not just tested) by a third party to be category 6 component and channel compliant.

D. The cabling system described in this is derived from the recommendations made in recognized telecommunications industry standards. The following documents are incorporated by reference:

1. ANSI/TIA/EIA - 568-C.0, Generic Telecommunications Cabling for Customer Premises
2. ANSI/TIA/EIA - 568-C.1, Commercial Building Telecommunications Cabling Standard.
3. ANSI/TIA/EIA - 568-C.2, Balanced Twisted Pair Cabling Components, Addendum 1 –
4. ANSI/TIA/EIA - 568-C.3, Optical Fiber Cabling Components
5. ANSI/TIA/EIA – 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces, February, 1998.
6. ANSI/TIA/EIA – 606-A, Administration Standard for Telecommunications Infrastructure of Commercial Buildings, February, 2002.
7. ANSI/TIA/EIA – 607-A, Commercial Building Grounding and Bonding Requirements for Telecommunications, August, 1994.
8. ANSI/ TIA/EIA – 758, Customer-Owned Outside Plant Telecommunications Cabling Standard, April 1999.
9. BICSI - TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM) – 10th Edition, 2003.
10. National Fire Protection Agency (NFPA – 70), National Electrical Code (NEC) –2002.

E. If this document and any of the documents listed above are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

F. This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project.

1.3 APPROVED CONTRACTOR

A. The Telecommunications Contractor must be a Certified Installer for the products and/or system being supplied. A copy of certification documents must be submitted with the quote in order for such quote to be valid. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with said certification. At least (1) for every (3) members of the copper installation and termination crew must be certified to a Technician Level of training by the product manufacturer or BICSI. At least (1) for every (5) members of the optical fiber installation and termination crew must be certified by the product manufacturer or other approved organizations in Optical Fiber installation and termination practices.

1.4 WORK INCLUDED

A. The work included under this specification consists of furnishing all labor, equipment, materials, and supplies and performing all operations necessary to complete the installation of this structured cabling system in compliance with the specifications and drawings. The Telecommunications contractor will provide and install all of the required material to form a complete system.

B. The work shall include, but not be limited to the following:

1. Furnish and install a complete telecommunications wiring infrastructure as described on the plans and in these specifications.
2. Furnish, install, and terminate all UTP and Optical Fiber cable.
3. Furnish and install all wall plates, jacks, patch panels, and patch cords.
4. Furnish and install all required cabinets and/or racks as required and as indicated.
5. Furnish any other material required to form a complete system.
6. Perform link testing (100% of horizontal and/or backbone links) and certification of all components.
7. Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.

8. Adhere and comply with all requirements of the product certification programs.

9. Provide owner training and documentation. (Testing documentation and As-built drawings).

1.5 SUBMITTALS

A. Under the provisions of this request for proposal, prior to the start of work the telecommunications contractor shall:

1. Submit copies of the certification of the company and names of staff that will be performing the installation and termination of the installation to provide proof of compliance of this spec.

2. Submit proof from manufacturer of contractor's good standing in manufacturer's program.

3. Submit appropriate cut sheets and samples for all products, hardware and cabling.

B. Work shall not proceed without the Owner's approval of the submitted items.

C. The telecommunications contractor shall receive approval from the Owners on all substitutions of material. No substituted materials shall be installed except by written approval from the Owner.

1.6 QUALITY ASSURANCE

A. The telecommunications contractor shall staff the project with qualified personnel. All products shall be new and in good condition.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery and receipt of products shall be at the site described in the Scope Section.

B. Cable shall be stored according to manufacturer's recommendations as a minimum. In addition, cable must be stored in a location protected from vandalism and weather. If cable is stored outside, it must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F. minimum) location. If necessary, cable shall be stored off site at the contractor's expense.

C. If the telecommunications contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the Owner.

1.8 DRAWINGS

A. It shall be understood that the electrical details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the telecommunications contractor in bidding the job. The telecommunications contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

B. The telecommunications contractor shall verify all dimensions at the site and be responsible for their accuracy.

C. Prior to submitting the bid, the telecommunications contractor shall call the attention of the Engineer to any materials or apparatus the telecommunications contractor believes to be inadequate and to any necessary items of work omitted.

2. PRODUCTS

2.1 EQUIVALENT PRODUCTS

A. The Owner and engineer have selected specific products that achieve the desired level of performance and preference. The project has been designed around said products. Proposed substitutions must demonstrate equivalent performance in all areas to the satisfaction of the Owner and must be submitted for review at least 10 days prior to bid. The Owner shall not be required to entertain substitutions submitted after bid.

2.2 WORK AREA OUTLETS

A. Work area cables shall each be terminated at their designated work area location in the connector types described in the subsections below. Included are modular telecommunication jacks. These connector assemblies shall snap into a faceplate.

B. The Telecommunications Outlet Assembly shall accommodate:

1. A minimum of two (2) modular jacks unless otherwise noted on plans with number adjacent to device.

2. Additional accommodations for specific locations as noted in the plans for optical fiber and/or additional copper cables as necessary.

3. A blank filler will be installed when extra ports are not used.

4. All modular jacks shall have their circuit number on the faceplate identifier strip.

5. Multiple jacks that are identified in close proximity on the drawings (but not separated by a physical barrier) may be combined in a single assembly. The telecommunications contractor shall be responsible for determining the optimum compliant configuration based on the products proposed.

6. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation. Prior to installation, the telecommunications contractor shall submit the proposed configuration for each outlet assembly for review by the Owner.

7. The modular jack shall incorporate printed label strip on the dust cap module for identifying the outlet. Printed labels shall be permanent and compliant with ANSI/TIA/EIA–606-A standard specifications. Labels shall be printed using a printer such as a Brady hand held printer. Hand printed labels shall not be accepted.

C. Faceplates: The faceplates shall:

1. Be as appropriate to fit the modular jack used.

2. Be UL listed and CSA certified.

3. Be constructed of high impact, ABS plastic UL 94V-0 construction (except where noted otherwise).

4. Shall match the faceplate color used for other utilities in the building or match the color of the raceway if installed in surface raceway.

5. Be compliant with the above requirements along with the following when incorporating optical fiber:

   a. Be a low profile assembly,

   b. Incorporate a mechanism for storage of cable and fiber slack needed for termination,

c. Position the fiber optic couplings to face downward or at a downward angle to prevent contamination and,

d. Incorporate a shroud that protects the optical couplings from impact damage.

6. Be available as single-gang or dual-gang.

7. Provide easy access for adds, moves, and changes by front removal of jack modules.

8. Possess recessed designation windows to facilitate labeling and identification.

9. Include a clear plastic cover to protect labels in the designation window.

10. Have mounting screws located under recessed designation windows.

11. Comply with ANSI/TIA/EIA-606-A work area labeling standard.

12. Allow for the UTP modules to be inverted in place for termination purposes.

13. Be manufactured by an ISO 9001 registered company.

D. Voice / Data Jacks

1. Voice/Data jacks shall be 8-position modular jacks and shall be Category 6 performance as defined by the references in this document including ANSI/TIA/EIA-568-C.2. All pair combinations must be considered, with the worst-case measurement being the basis for compliance. Modular jack performance shall be third-party verified by a nationally recognized independent testing laboratory.

2. The modular jack shall use dual reactance modular contact array.

3. The modular jack shall be both component, link and channel compliant to category specifications in ANSI/TIA/EIA-568-C.

4. The modular jack's performance shall be third-party verified to ANSI/TIA/EIA-568-C Category 6 specifications.

5. The modular jack shall have low emission IDC contacts.

6. The modular jack shall use standard termination practice using 110 impact tool.

7. The modular jack shall be backwards compatible to Category 3, 5, and 5e.

8. The modular jack shall be center tuned to category 6 test specifications.

9. Dust covers shall be used on each termination.

2.3 110 COPPER TERMINATION BLOCK

A. The voice cross connect shall be a passive connection between the horizontal termination blocks and the backbone termination blocks. The wall mount frames shall be field terminated kits including all blocks, connecting blocks, and designation strips. Management rings shall be mounted between vertical columns of blocks to provide management of cross-connect wire. Backbone and horizontal blocks shall use 4-pair connecting blocks. Blocks shall be oriented so that backbone terminations are located on the left and horizontal frames are located on the right of the termination field when facing the frame assembly.

B. 110 Block Kits shall:

1. Include both the wiring block in a 50, 100 and 300 pair (as applicable) footprint and the connecting block.

2. Be manufactured using fire retardant molded plastic.

3. Support termination of 22-24 AWG solid conductor.

4. Contain back openings for the feed through of cable.

5. Meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory.

6. Have color-coded tips on the wiring block and color-coding on the connector blocks for installation identification.

7. Use standard termination practice requiring a single conductor 110 impact tool.

8. Termination hardware shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.

9. Be backwards compatible to category 3, 5 and 5e.

10. Be labeled in compliance with ANSI/TIA/EIA-606-A labeling specifications using permanent labels and LabelMo software (or other labeling software/printer).

11. Be manufactured by an ISO 9001 registered company.

C. 110 Cross-Connect System Backboard Channels shall:

1. Be available in 300 and 900 pair sizes.

2. Allow the mounting of 110 100-pair blocks without legs.

3. Include bottom trough and grounding bar.

4. Be wall mountable.

5. Be of cold roll steel construction.

6. Be manufactured by an ISO 9001 registered company.

D. 110 Wall Mount Vertical Trough shall:

1. Be available in single channel or dual channel configurations.

2. In dual channel configuration shall be used to provide separation for different wiring media.

3. Be available in 300 pair and 900 pair sizes.

4. Be wall mountable.

5. Be used with wall mountable backboard channels. Acceptable configurations include a 300 pair and a 900 pair.

6. Be of cold roll steel construction.

7. Be manufactured by an ISO 9001 registered company.

2.4 MODULAR PATCH PANELS

A. The Modular Patch Panels shall:

1. Meet category 6 component compliance and be verified by a third-party nationally recognized independent testing laboratory.

2. Use low emission IDC contacts.

3. Use dual reactance technology to enhance the signal-to-noise ratio.
4. Require standard termination practices using a 110 impact tool.
5. Use a single piece IDC housing designed to accept larger Category 6 conductors.
6. Support both T568B and T568A wiring.
7. Include easy to follow wiring labels.
8. Include label fields.
9. Allow for the use of icons.
10. Include full length metal rear cable management.
11. Be available in standard or high density.
12. Be backward compatible to category 3, 5 and 5e.
13. Be center tuned to category 6 test specifications.

2.5 RACKS

A. All racks and wire management shall be of one manufacturer or designed specifically to work together. The equipment rack shall provide vertical cable management and support for the patch cords at the front of the rack and wire management, support, and protection for the horizontal cables inside the legs of the rack. Waterfall cable management shall be provided at the top of the rack for patch cords and for horizontal cables entering the rack channels for protection and to maintain proper bend radius and cable support. Wire management shall also be mounted above each patch panel and/or piece of equipment on the rack. The rack shall include mounting brackets for cable tray ladder rack to mount to the top of the rack. Velcro cable ties shall be provided inside the rack channels to support the horizontal cable. Rack shall be black in color to match the patch panels and cable management.

B. Free-Standing Rack

1. Free-standing rack shall:

a. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-C.

1) Rear channels to securely route distribution cables.

2) Vertical management "cage" to protect patch cords while allowing easy access for moves, adds and change with individual 1-rack unit fingers and double hinged door.

3) Include speednuts to reduce assembly time.

b. Have top cable trough with waterfall and built in patch/horizontal cable distribution separator.

c. Have EIA hole pattern on front and rear.

d. Have rack units stamped on the front, on both sides allowing numbering from top-to-bottom or bottom-to-top.

e. Be available with a 10.5" or 16.25" channel depth.

f. Be available with hook and loop straps for securing bulk cables inside the vertical U-channels.

g. Assemble as 19" (483 mm) or 23" (584 mm) with no additional hardware.

h. Be available with three styles of vertical patch cord management: interbay with latches, cable management rings, or fingerduct with covers.

i. Provide floor and ceiling access for cable management and distribution.

j. Provide pre-drilled base for floor attachment of rack.

k. Be available in a 7 foot version (45 rack units) or an 8 foot version (51 rack units).

l. Be available in standard color of black.

m. Be manufactured by an ISO 9001 registered company.

C. Wall Mounted Rack

1. Wall mount rack shall:

a. Provide the necessary strain relief, bend radius and cable routing for proper installation of high performance cross connect products, meeting all specifications of ANSI/TIA/EIA-568-C.

b. Have top cable trough to route patch and distribution cables between racks.

c. Have EIA hole pattern on front and rear.

d. Rack height shall be specified as 7 ft / 2.13 m (44 rack units) or 4.0 ft/1.22 m (22 rack units).

e. Be available with a 6.5" (165 mm) or 14" (356 mm) channel depth.

f. Be available with hook and loop straps for securing cables inside the vertical U-channels.

g. Be available with vertical cable management rings for cord routing organization and strain relief.

h. Be available with vertical U-channels to protect and conceal distribution cables.

i. Provide floor and ceiling access for cable management and distribution.

j. Have wall mount braces with locator posts for easy wall mounting.

k. Have side access points that allow for access to manage/install distribution cables in the vertical channels.

l. Be available in standard color of black.

m. Be manufactured by an ISO 9001 registered company.

2.6 HORIZONTAL DISTRIBUTION CABLE

A. All horizontal data station cable and voice cable shall terminate on modular patch panels (copper or fiber), 110 cross-connecting blocks (copper), or patch/splice cabinets (fiber) in their respective Telecommunications Room or Equipment Room as specified on the drawings.

B. 100 OHM Category 6 UNSHIELDED TWISTED PAIR CABLE (UTP)

1. Physical Characteristics:

a. Shall be plenum rated and meet applicable requirements of ANSI/ICEA S-80-576. All 4 pairs must be insulated with F.E.P. No 2 x 2 or 3 x 1 constructions will be allowed.

b. The diameter of the insulated conductor shall be .023 in. maximum.

c. Shall consist of (4) twisted pairs.

d. Shall be suitable for the environment in which they are to be installed.

e. The color coding of pairs shall be:

Pair 1	Pair 2	Pair 3	Pair 4
W-BL; BL	W-O; O	W-G; G	W-BR; BR

f. The overall diameter of the cable shall be 0.2150"nominal.

g. The ultimate breaking strength measured in accordance with ASTM D 4565 shall be 400 N minimum.

h. Cable shall withstand a bend radius of 1" at -20 degrees Celsius without jacket or insulation cracking.

i. Cable shall be third party verified to meet ANSI/TIA/EIA-568-C.2.

2. Transmission Characteristics:

a. DC resistance of any conductor shall not exceed 9.38 Ohms per 100m max. at 20°C. Measured in accordance with ASTM D 4566.

b. The mutual capacitance of any pair at 1 kHz for 100m of cable shall not exceed 4.4 Nf.

c. DC resistance unbalance between any two conductors of any pair shall not exceed 3% when measured at or corrected to 20°C in accordance with ASTM D 4566.

d. The capacitance unbalance to ground at 1 kHz of any pair shall not exceed 330 pF per 100m.

3. Cable shall be Berk-Tek LANmark-1000 UTP (Plenum) or approved equal.

4. Cable installed underground/below slab in conduit shall be Berk-Tek LANmark-6 OSP (wet location) or approved equal.

2.7 FIBER OPTIC CABLE

A. Outdoor 48-fiber Singlemode Armored Stranded Loose Tube Gel-free.

B. CommScope D-048-LA-8W-F1NS or approved equal.

C. Verify/coordinate requirements with District/Campus Standards.

2.8 FIBER OPTIC CONNECTORS

A. LC Fiber Optic Single Mode Connectors.

B. CommScope SFC-LCR-09-BL or approved equal.

C. Verify/coordinate requirements with District/Campus Standards.

2.9 COPPER CABLE PROTECTION UNITS

A. All copper circuits shall be provided with protection between each building with an entrance cable protector panel. All building-to-building circuits shall be routed through this protector. The protector shall be connected with a #6 AWG copper bonding conductor between the protector ground lug and the TC ground point. Approved manufacturer of protection units is Porta Systems.

2.10 PATCH CORDS

A. The contractor shall provide factory terminated and tested UTP and optical fiber patch cords and equipment cords for the complete cabling system. The UTP patch cables shall meet the requirements of ANSI/TIA/EIA-568-B for patch cord testing.

B. Copper (UTP) patch cords shall:

1. Use 8-position connector with impedance matched contacts and designed using dual reactance.

2. Be constructed of 100 ohm, 4 pair stranded conductor, unshielded twisted pair copper per the requirements of the ANSI/TIA/EIA-568-B.2 and ANSI/TIA/EIA-568-B.2–1 standard.

3. Meet TIA category 6 component specifications in ANSI/TIA/EIA-568-B.2-1

4. 100% factory tested to meet category 6 performance and

5. ETL or any other nationally recognized 3rd party verification

6. Be center tuned to category 6 performance specifications by using paired bi-level contact array.
7. Be capable of universal T568A or T568B wiring schemes.
8. Modular connector shall maintain the paired construction of the cable to facilitate minimum untwisting of the wires.
9. Have a performance marking indelibly labeled on the jacket (by the manufacturer).
10. Have the ability to accept color-coded labels and icons to comply with ANSI/TIA/EIA-606-A labeling specifications.
11. Have "snagless" protection for the locking tab to prevent snagging and to protect locking tab in tight locations and provide bend relief.
12. Be available in three standard colors.
13. Be available in 3 foot, 5 foot, 7 foot, 9 foot, and 15 foot standard lengths.
14. Be backwards compatible to Category 3, 5 and 5e.
15. Be manufactured by an ISO 9001 registered company.

C. Optical Fiber patch cords shall:

1. Contain two (2) multi-mode optical fibers.
2. Use multi-mode, graded-index fibers with a 62.5 micron core.
3. Be capable of transmission at both 850 nm and 1300 nm wavelengths.
4. Include listing of actual loss of patchcord when packaged.
5. Be manufactured in standard lengths of 1 m (3.27 ft), 2 m (6.56 ft), 3 m (9.84 ft), 4 m (13.11 ft), 7 m (22.95 ft), and 10 m (32.79 ft), and special ordered in any other lengths.
6. Be manufactured by an ISO 9001 registered company.

2.11 GROUNDING AND BONDING

A. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA/EIA-607 Telecommunications Bonding and Grounding Standard.

B. The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each telecommunications room shall be provided with a telecommunications ground bus bar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.

C. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, ungrounded conduits, etc. entering or residing in the TR or ER shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.

D. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.

2.12 FIRESTOP

A. A firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.

B. All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall be properly firestopped.

C. Firestop systems shall be UL Classified to ASTM E814 (UL 1479) and shall be approved by a qualified Professional Engineer (PE), licensed (actual or reciprocal) in the state where the work is to be performed. A drawing showing the proposed firestop system, stamped/embossed by the PE shall be provided to the Owner's Technical Representative prior to installing the firestop system(s).

3. EXECUTION

3.1 WORK AREA OUTLETS

A. Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 12" of fiber slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is not enough space present in the outlet box to store slack cable.

B. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.0 document, manufacturer's recommendations and best industry practices.

C. Pair untwist at the termination shall not exceed 12 mm (one-half inch).

D. Bend radius of the horizontal cable shall not be less than 4 times the outside diameter of the UTP cable.

E. The cable jacket shall be maintained to within 25mm (one inch) of the termination point.

F. Data jacks, unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the right-most position(s).

G. Voice jacks shall occupy the top position(s) on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the left-most position(s).

3.2 HORIZONTAL DISTRIBUTION CABLE INSTALLATION

A. Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.

B. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

C. Cable raceways shall not be filled greater than the ANSI/TIA/EIA-569-A maximum fill for the particular raceway type or 40%.

D. Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.

E. Where transition points, or consolidation points are allowed, they shall be located in accessible locations and housed in an enclosure intended and suitable for the purpose.

F. The cable's minimum bend radius and maximum pulling tension shall not be exceeded.

G. If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of 48 to 60 inch (1.2 to 1.5 meter) intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.

H. Horizontal distribution cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.

I. Cable shall be installed above fire-sprinkler systems and shall not be attached to the system or any ancillary equipment or hardware. The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.

J. Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the contractor shall install appropriate carriers to support the cabling.

K. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

L. Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification and ANSI/TIA/EIA-606-A. The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.

M. Unshielded twisted pair cable shall be installed so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.

N. Pulling tension on 4-pair UTP cables shall not exceed 25-lbf for a four-pair UTP cable.

O. Cables installed underground or below slab shall be suitable for use in wet locations and outdoors in duct or conduit. If wet location cable is exposed in the building after exiting the wet area, it must transition to an appropriate category dry cable within 50 feet (15M) of exiting conduit.

3.3 HORIZONTAL COPPER TERMINATION AND INSTALLATION

A. Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-C standard, manufacturer's recommendations and best industry practices.

B. Pair untwist at the termination shall not exceed 13 mm (0.5 inch).

C. Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

D. Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

E. The cable jacket shall be maintained as close as possible (within 25mm – 1 inch) to the termination point.

F. Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

3.4 OPTICAL FIBER TERMINATION HARDWARE

A. Fiber slack shall be neatly coiled within the fiber splice tray or enclosure. No slack loops shall be allowed external to the fiber panel.

B. Each cable shall be individually attached to the respective splice enclosure by mechanical means. The cables strength member shall be securely attached the cable strain relief bracket in the enclosure.

C. Each fiber bundle shall be stripped upon entering the splice tray and the individual fibers routed in the splice tray.

D. Each cable shall be clearly labeled at the entrance to the splice enclosure. Cables labeled within the bundle shall not be acceptable.

E. A maximum of 12 strands of fiber shall be spliced in each tray.

F. All spare strands shall be installed into spare splice trays.

3.5 BACKBONE CABLE INSTALLATION

A. Backbone cables shall be installed separately from horizontal distribution cables

B. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

C. Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits

D. Where backbone cables are installed in an air return plenum, riser rated cable shall be installed in metallic conduit.

E. Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

F. All backbone cables shall be securely fastened to the sidewall of the TR on each floor.

G. Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.

H. Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.

I. Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

3.6 RACKS

A. Racks shall be securely attached to the concrete floor using a minimum 3/8" hardware or as required by local codes.

B. Racks shall be placed with a minimum of 36-inch clearance from the walls on all sides of the rack. When mounted in a row, maintain a minimum of 36 inches from the wall behind and in front of the row of racks and from the wall at each end of the row.

C. All racks shall be grounded to the telecommunications ground bus bar in accordance with Section 9.0 of this document.

D. Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

E. Wall mounted termination block fields shall be mounted on 4' x 8' x .75" void free plywood. The plywood shall be mounted vertically 12" above the finished floor. The plywood shall be painted with two coats of white fire retardant paint.

F. Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.

3.7 FIRESTOP SYSTEM

A. All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cable system acceptance.

3.8 GROUNDING SYSTEM

A. The TBB shall be designed and/or approved by a qualified PE, licensed in the state that the work is to be performed. The TBB shall adhere to the recommendations of the ANSI/TIA/EIA-607 standard, and shall be installed in accordance with best industry practice.

B. Installation and termination of the main bonding conductor to the building service entrance ground shall be performed by a licensed electrical contractor.

3.9 IDENTIFICATION AND LABELING

A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.

B. Outside Plant cables passing through a pull box or vault shall have a cable label that is water and mud proof.

C. All label printing will be machine generated by Ortronics LabelMo, or similar software, using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

3.10 TESTING AND ACCEPTANCE

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Certification Program Information Manual provided by the product manufacturer and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Link Testing

1. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance.

2. Horizontal cabling shall be tested using a Level III test unit for category 6 performance compliance.

3. The basic tests required are:

   a. Wire Map

   b. Length

   c. Attenuation

   d. NEXT (Near end crosstalk)

   e. Return Loss

   f. ELFEXT Loss

   g. Propagation Delay

   h. Delay skew

   i. PSNEXT (Power sum near-end crosstalk loss)

   j. PSELFEXT (Power sum equal level far-end crosstalk loss)

4. Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.

5. Length - Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

6. Category 6 Performance Shall meet the link requirements outlined below for a 90-meter, 4-connector permanent link.

Frequency (MHz)	Maximum Insertion Loss (dB)	Minimum NEXT (dB)	Minimum PSNEXT (dB)	Minimum ELFEXT (dB)	Minimum PSELFEXT (dB)	Minimum Return Loss (dB)
1.0	2.1	69.0	64.0	65.3	62.3	21.0
4.0	4.0	67.0	62.5	53.2	50.2	21.0
10.0	6.3	60.6	46.0	45.3	42.3	21.0
20.0	9.0	55.6	51.0	39.2	36.2	21.0
31.25	11.3	52.4	47.7	35.4	32.4	19.1
62.5	16.4	47.4	42.6	29.3	26.3	16.1
100.0	21.2	43.9	39.1	25.3	22.3	14.0
155.0	26.6	40.7	35.8	21.4	18.4	12.1
200.0	31.5	38.8	33.9	19.2	16.2	11.0
250.0	36.0	37.1	32.4	17.3	14.3	10.0

C. Fiber Testing

1. All fiber testing shall be performed on all fibers in the completed end-to-end system. Testing shall consist of an end-to-end power meter test performed per EIA/TIA-455-53A. The system loss measurements shall be provided at 850 and/or 1300 nanometers for multimode fibers and 1310 and/or 1550 nanometers for single mode fibers. These tests also include continuity checking of each fiber.

2. Backbone multimode fiber cabling shall be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.

3. Test set-up and performance shall be conducted in accordance with ANSI/EIA/TIA-526-14 Standard, Method B.

4. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. ONLY LINK TEST IS REQUIRED. The contractor can optionally install patch cords to complete the circuit and then test the entire channel. The test method shall be the same used for the test described above. The values for calculating loss shall be those defined in the ANSI/TIA/EIA Standard.

5. Attenuation testing shall be performed with an approved hand held tester from an industry recognized test equipment manufacturer.

3.11 SYSTEM DOCUMENTATION

A. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.

C. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

3.12 TEST RESULTS

A. Test documentation shall be provided on disk within three weeks after the completion of the project. The disk shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

B. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-C including applicable TSB's and amendments. The appropriate Level III tester shall be used to verify Category 6 cabling systems.

C. Printouts generated for each cable by the wire (or fiber) test instrument shall be submitted as part of the documentation package. The telecommunications contractor must furnish this information in electronic form CD-ROM). If needed, provide manufacturers software require to read the test results.

D. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.

4. WARRANTY AND SERVICES

4.1 WARRANTY

A. The manufacturer shall provide the warranty directly to the end-user.

B. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system for a minimum of 20 years from the date of registration. The Extended Product Warranty shall warrant the installed horizontal and/or backbone copper, and both the horizontal and the backbone optical fiber portions of the cabling system.

C. The Application Assurance Warranty shall cover the failure of the wiring system to support the applications that are designed for the link/channel specifications of ANSI/TIA/EIA–568-C.0. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, 155Mb/sATM, and 1Gb/s ATM.

D. The contractor shall provide a warranty on the physical installation.

4.2 FINAL ACCEPTANCE AND SYSTEM CERTIFICATION

A. Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two-week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a numbered certificate, from the product manufacturer, registering the installation.

END OF SECTION 27 13 00

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SECTION 28 31 00
FIRE ALARM AND DETECTION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Emergency evacuation fire alarm system.

1.2 REFERENCES

A. Electrical Industries Association (EIA):
   1. RS-232-D – Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
   2. RS-485 – standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems

B. National Fire Protection Association (NFPA):
   1. NFPA 70 – *National Electrical Code (NEC).*
   2. *NFPA 72 – National Fire Alarm Code.*
   3. *NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.*
   4. *NFPA 101 – Life* Safety Code.
   5. *NFPA 5000 – Building Construction and Safety Code.*

C. Underwriters Laboratories (UL):
   1. UL 268 – Standard for Smoke Detectors for Fire Alarm Signaling Systems.
   2. UL 1971 – Standard for Signaling Devices for the Hearing Impaired.

1.3 SYSTEM DESCRIPTION

A. A new intelligent reporting, microprocessor-controlled fire detection and notification system shall be installed in accordance with the specifications and as indicated on the Drawings.

B. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.

C. Control Panel shall be expandable from 2 to 128 SLC loops as necessary to accommodate future expansion

D. Basic Performance:
   1. Signaling Line Circuits (SLC) Serving Addressable Devices: Wired Class B.

2. Initiation Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class B.
3. Notification Appliance Circuits (NAC) Serving Strobes and Horns: Wired Class B.
4. On Class B Configurations: Single ground fault or open circuit on Signaling Line Circuit shall initiate a trouble signal at the fire alarm control panel. Operational capability is maintained during the application of a single ground fault.
5. Alarm Signals Arriving at Control Panel: Not lost following primary power failure until alarm signal is processed and recorded.
7. Network Node Communications:
   a. System shall have the capability of networking with other Control Panels on single pair of copper wires or fiber optic cables.
8. Signaling Line Circuits (SLC):
   a. Reside in remote panels with associated audio zones.
   b. SLC modules shall operate in peer-to-peer fashion with all SLC modules in the Control Panel.
   c. On loss of an SLC module, each remaining panel shall continue to communicate with remainder of system, including all SLC and control functions
9. NAC Circuits: Arranged such that there is a minimum of 1 audible device per fire alarm zone.
10. Notification Appliance Circuits (NAC), and Control Equipment: Arranged such that loss of any 1 NAC circuit will not cause loss of any other NAC circuit in system.
11. NAC Circuits:
    a. Electrically supervised for open and short circuit conditions.
    b. If short circuit exists on NAC circuit, it shall not be possible to activate that circuit.

E. Basic System Functional Operation: When fire alarm condition is detected and reported by 1 of the system alarm initiating devices, the following functions shall immediately occur:
   1. System Alarm LEDs: Flash.
   2. Local Piezo-Electric Signal in Control Panel: Sound at a pulse rate.
   3. 80-Character LCD Display: Indicate all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
   4. Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence.
   5. System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
   6. Strobes flash synchronized continuously.
   7. Audible devices sound continuous Temporal pattern until system is reset.

F. Fire Alarm System Functionality:
   1. Provide complete, electrically supervised distributed, Class B networked analog/addressable fire alarm and control system, with analog initiating devices.
   2. Fire Alarm System:

a. Incorporate E3 Series multiprocessor-based control panel one or more Intelligent Loop Interface (ILI-MB-E3 or ILI95-MB-E3), and 80 character LCD annunciator.
b. Intelligent Network Transponders (INX), communicating over peer-to-peer token ring network with standard capacity of 64 nodes expandable to 122.

3. Each ILI-MB-E3 or ILI95-MB-E3 SLC module: Incorporate 2 Signaling Line Circuits (SLC), with capacity to support up to 159 analog addressable detectors and 159 addressable modules per SLC or support in Apollo mode up to 126 detectors and modules per ILI95-MB-E3 SLC.
4. Control Panel shall incorporate Boolean control-by-event programming, including as a minimum AND, OR, NOT, and Timer functions.
5. Control Panel shall have the capability to accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips.
6. Control Panel shall have the capability of having an integral DACT (digital alarm communicator transmitter) that can report to single central station monitoring account.
7. Control Panel shall have the capability of storing its entire program, and allow installer to activate only devices that are installed during construction, without further downloading of system.
8. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.
9. Network:
   a. Based on peer-to-peer token ring technology operating at 625 K baud, using Class A configuration.
   b. Capability of using twisted-pair wiring, pair of fiber optic Multi-mode cable strands up to 200 microns or Single-mode optimized for 9/125 microns, or any combination, to maximize flexibility in system configuration.
10. Each Network Node:
    a. Capability of being programmed off-line using Windows-based software supplied by fire alarm system manufacturer. Capability of being downloaded by connecting laptop computer into any other node in system. Systems that require system software to be downloaded to each transponder at each transponder location shall not be acceptable.
    b. Capability of being grouped with any number of additional nodes to produce a "Region", allowing that group of nodes to act as 1, while retaining peer-to-peer functionality. Systems utilizing "Master/Slave" configurations shall not be acceptable.
    c. Capability of annunciating all events within its "Region" or annunciating all events from entire network, on front panel LCD without additional equipment.
11. Each SLC Network Node: Capability of having integral DACT (digital alarm communicator transmitter) that can report events in either its region, or entire network to single central station monitoring account.
12. Each Control Panel: Capability of storing its entire program, and allow installer to activate only devices that are installed during construction, without further downloading of system.
13. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.

1.4 SUBMITTALS

A. Comply with applicable provisions of Section 26 0533, RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS.

B. The submittal shall include certification from the manufacturer verifying that the distributor is an authorized agent, who is qualified and trained by the manufacturer in the proper installation, operation and service of the system. Include sufficient information, clearly presented, to determine compliance with the specifications and the Drawings.

C. Shop Drawings:

1. A complete list of all supplied equipment including model numbers with catalog data sheets on each component and CSFM number.

2. Provide schematic layout, floor plan, drawings indicating location of all components and equipment, required size and location of conduit and outlets and type and quantity of system conductors. Include voltage drop calculations and battery calculations based on actual number of devices to be installed.

3. Include wiring diagrams for overall system and components including control panels, annunciators, power supplies, initiating circuits, notification appliances, control devices and FATC. Address numbers shall be noted on all appliances.

4. Include physical and electrical characteristics of equipment to indicate conformance with the Specifications.

5. Describe system characteristics and function as well as device wiring diagrams.

6. Voltage drop and battery calculations for each control panel and power supply and initiating circuits.

7. System operational matrix.

D. Data Sheets: Show California State Fire Marshal Listing, U.L. listing, equipment ratings, dimensions and finishes.

E. Certification: Submit with equipment submittals and shop drawings, letter of certification from major equipment manufacturer, indicating proposed engineered system distributor is an authorized representative of major equipment manufacturer.

F. Project Record Drawings:
1. Submit complete project record drawings within 14 calendar days after acceptance test.
2. Project record drawings shall be similar to shop drawings, but revised to reflect changes made during construction.

G. Operation and Maintenance Manuals:

1. Manual shall include the following tailored to this specific project:

a. Operational description.
b. Coded cabling plan.
c. Two wire circuit diagrams.
d. Wiring destination schedule.
e. Schematic component diagrams and PC board layouts.
f. Maintenance and alignment procedures.
g. Voltage drop and battery calculations.

1.5 QUALITY ASSURANCE

A. Codes and Standards:
1. NFPA: System shall comply with the following NFPA codes and standards:

a. NFPA 12.
b. NFPA 13.
c. NFPA 15.
d. NFPA 16.
e. NFPA 16A.
f. NFPA 70.
g. NFPA 72.
h. NFPA 90A.
i. NFPA 90B When smoke control is required by code.
j. NFPA 101.
k. NFPA 750.
l. NFPA 5000.

2. ADA: System shall conform to American with Disabilities Act (ADA).

B. To ensure reliability and complete compatibility, all items of fire alarm system, including control panels, power supplies, initiating devices, and notification appliances, shall be listed by Underwriters Laboratories Inc. (UL) and shall bear "UL" label.

C. Fire Alarm Control Panel Equipment: UL-listed under UL 864 Ninth Edition.

D. Equipment, Programming, and Installation Supervision:
1. Provide services of approved Engineered systems distributor of Gamewell-FCI for equipment, programming, and installation supervision.
2. Provide proof of factory training within 14 calendar days of award of the Contract.

E. Software Modifications:
1. Provide services of Gamewell-FCI factory-trained and authorized technician to perform system software modifications, upgrades, or changes.
2. Provide use of all hardware, software, programming tools, and documentation necessary to modify fire alarm system software on-site.

3. Modification includes addition and deletion of devices, circuits, zones, and changes to system operation and custom label changes for devices or zones.
4. System structure and software shall place no limit on type or extent of software modifications on-site.
5. Modification of software shall not require power-down of system or loss of system fire protection while modifications are being made.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

C. Handling: Protect materials from damage during handling and installation.

1.7 COORDINATION

A. Refer to the electrical and mechanical drawings and specifications to determine quantities and location of devices and required scope of work and coordinate work with mechanical and electrical installers. Provide function described under mechanical section Sequence of Control, for fire and/or emergency conditions. Submit conduit and pathing requirements to electrical installer.

1.8 WARRANTY

A. Warranty Period for System Equipment: 1 year from date of final acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Gamewell-FCI, Honeywell Fire Systems, 12 Clintonville Road, Northford, Connecticut 06472. Phone (203) 484-7161. Fax (203) 484-7118. Website: www.gamewell-fci.com.

B. References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality. Equivalent equipment from Gamewell may be substituted for the specified equipment, as long as minimum standards are met. No other manufacturers, other than Gamewell-FCI, FCI, and Gamewell will be considered for use on this project.

C. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System, provide proof that such

substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System.

2.3 CONTROL PANEL HARDWARE

A. Intelligent Control Panel: Supply user interface, including LCD or touch-screen 1/4 VGA display Intelligent Loop Interface Modules (ILI-MB-E3), manual switching, Control Panel shall consist of the following units and components:
   1. System Cabinet (B-, C-, or D-Size Cabinet) with associated inner door.
   2. Power Supply Module (PM-9) with batteries.
   3. 80-Character LCD Display (LCD-E3).
   4. Intelligent Loop Main Board Interface (ILI-MB-E3).
   5. Optional Intelligent Loop Supplemental Interface (ILI-S-E3).
   6. Intelligent Loop Main Board Interface (ILI95-MB-E3).
   7. Optional Intelligent Loop Supplemental Interface (ILI95-S-E3).
   8. Optional DACT (DACT-E3).
   9. Optional 1/4 VGA touch-screen display (NGA).
   10. Optional LED Driver Module (ANU-48)
   11. Optional Auxiliary Switch Module (ASM-16).
   12. Optional ARCNET Repeater (RPT-E3) with fiber optic modules (FSL-E3 or FML-E3).
   13. Optional Addressable Node Expander (ANX-SR, ANX-MR-FO, ANX-MR-UTP).

B. System Cabinet:
   1. Surface or semi-flush mounted with texture finish.
   2. Consist of back box, inner door, and door.
   3. Available in at least 3 sizes to best fit project configuration.
   4. Houses 1 or more PM-9 Power Supply Modules, 1 or more ILI-MB-E3 orILI95-MB-E3, ILI-S-E3 or ILI95-S-E3 assemblies, and other optional modules as specified.
   5. Construction: Dead-front steel construction with inner door to conceal internal circuitry and wiring.
   6. Wiring: Terminated on removable terminal blocks to allow field servicing of modules without disrupting system wiring.

C. Power Supply Module (PM-9): Use latest technologies to provide power to the Control Panel and incorporate the following features:
   1. Power-saving switching technology using no step-down transformers.
   2. 9-amp continuous-rated output to supply up to all power necessary under normal and emergency conditions.
   3. Integral battery charger with capacity to charge up to 55 amp-hour batteries while under full load.

D. Batteries:
   1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.

E. LCD Display Module (LCD-E3):
   1. LCD Display: 80-character RS-485 based textual annunciator with capability of being mounted locally or remotely. Provides audible and visual annunciation of all alarms and trouble signals. Provide dedicated LEDs for:
      a. AC Power On: Green.
      b. Alarm: Red.
      c. Supervisory: Yellow.
      d. System Trouble: Yellow.
      e. Power Fault: Yellow.
      f. Ground Fault: Yellow.
      g. System Silenced: Yellow.
   2. 80-Character Alphanumeric Display: Provide status of all analog/addressable sensors, monitor and control modules. Display shall be liquid crystal type (LCD), clearly visible in dark and under all light conditions.
   3. Panel shall contain 4 functional keys:
      a. Alarm Acknowledge.
      b. Trouble Acknowledge.
      c. Signal Silence.
      d. System Reset/Lamp Test.
   4. Panel shall contain 3 configuration buttons:
      a. Menu/Back.
      b. Back Space/Edit.
      c. OK/Enter.
   5. Panel shall have 12-key telephone-style keypad to permit selection of functions.

F. Intelligent Loop Interface (ILI-MB-E3/ILI95-MB-E3): System shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. Intelligent Loop Interface shall be capable of mounting in stand-alone enclosure as specified.
   1. Field Programmable: System shall be capable of being programmed by Field Configuration Program (FCP), allowing programming to be downloaded via portable computer from any node on network.
   2. RS-232C Serial Output: Supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept downloaded program from portable computer, or provide 80-column readout of all alarms, troubles, location

descriptions, time, and date. Communication shall be standard ASCII code operating from 1,200 to 115,200 baud rate.

3. RS-485 Serial Output: Each ILI-MB-E3/ILI95-MB-E3 shall incorporate RS-485 bus via ribbon harness for connection of modules inside same cabinet, and via 4-wire quick connector for connection of modules up to 3,000 feet from cabinet. Each ILI-MB-E3's RS-485 bus shall support up to 16 ASM-16 auxiliary switch modules, 6 LCD-E3 main annunciators, and 5 LCD-7100 annunciators.
4. Peer-to-Peer Panel Configuration: All Loop Interface Modules shall incorporate own programming, log functions, Central Processor Unit, and control-by-event (CBE) programming. If any loop driver becomes disabled, each remaining loop driver shall continue to communicate with remainder of network and maintain normal operation.
5. Control-by-Event (CBE) Program: ILI-MB-E3 shall be capable of programming using Boolean logic including AND, OR, NOT, TIMING and COUNT, SCHEDULE functions to provide complete programming flexibility.
6. Alarm Verification: Smoke detector alarm verification shall be standard option while allowing other devices such as manual stations and sprinkler flow to create immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
7. Alarm Signals: All alarm signals shall be automatically latched or "locked in" at control panel until operated device is returned to normal and control panel is manually reset. When used for sprinkler flow, "SIGNAL SILENCE" switch may be bypassed, if required by AHJ.
8. Electrically Supervised:
   a. Each SLC and NAC circuit shall be electrically supervised for opens, shorts, and ground faults. Occurrence of fault shall activate system trouble circuitry, but shall not interfere with proper operation of other circuits.
   b. Yellow "SYSTEM TROUBLE" LEDs shall light and system audible sounder shall steadily sound when trouble is detected in system. Failure of power, open or short circuits on SLC or NAC circuits, disarrangement in system wiring, failure of microprocessor or any identification module, or system ground faults shall activate this trouble circuit. Trouble signal shall be acknowledged by operating "TROUBLE ACKNOWLEDGE" switch. This shall silence sounder. If subsequent trouble conditions occur, trouble circuitry shall resound. During alarm, all trouble signals shall be suppressed with exception of lighting yellow "SYSTEM TROUBLE" LEDs.
9. Drift Compensation – Analog Smoke Sensors: System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to effects of component aging or environment, including dust. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring factors which generally contribute to nuisance alarms. System trouble circuitry shall activate, display units that requires maintenance.
10. Analog Smoke Sensor Test: System software shall automatically test each analog smoke sensor a minimum of 3 times daily. Test shall be recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of sensor shall

activate system trouble circuitry, display "Test Failed" indication, and identify individual device that failed.

11. Off-Premises Connection:
    a. Fire Alarm System: Connect via Digital Alarm Communicator Transmitter (DACT) and telephone lines to central station or remote station. Panel shall contain disconnect switch to allow testing of system without notifying fire department.
12. Central Station Option: Fire alarm control panel shall provide Digital Alarm Communicator Transmitter (DACT) for signaling to central station. DACT shall contain "Dialer-Runaway" feature preventing unnecessary transmissions as result of intermittent faults in system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. Fire department shall be consulted as to authorized central station companies serving municipality. Fire alarm system shall transmit both alarm and trouble signals, with alarm having priority over trouble signal. Contractor shall be responsible for all installation charges and Owner will be responsible for line lease charges.
13. Network Annunciator Option: Each ILI-MB-E3 or ILI95-MB-E3 and associated display shall provide option of being configured as network annunciator. Options for annunciation shall default as regional annunciator with capability of selecting global annunciation to provide system-wide protection and Acknowledge, Silence, and Reset capabilities.
14. Redundant History Log: Each ILI-MB-E3 or ILI95-MB-E3 shall contain full 4100 event history log supporting local and network functions. If a main processor or network node is lost the entire log shall be accessible at any other Loop Interface board. This shall be demonstrated by removing power followed by extraction of history log from any loop driver location
15. LEDs Indicator and Outputs: Each ILI-MB-E3 or ILI95-ME3 Loop Interface shall incorporate as a minimum the following diagnostic LED indicators:
    a. Power: Green.
    b. Alarm: Red.
    c. Supervisory: Yellow.
    d. General Trouble: Yellow.
    e. Ground Fault: Yellow.
    f. Transmit: Green.
    g. Receive: Green.
16. Auxiliary Power Outputs: Each ILI-MB-E3/ILI95-MB-E3 Loop Interface shall provide the following supply outputs:
    a. 24 VDC non-resettable, 1 amp. maximum, power limited.
    b. 24 VDC resettable, 1 amp. maximum, power limited.
17. Microprocessor: Loop interface shall incorporate 32-bit RISC processor. Isolated "watchdog" circuit shall monitor microprocessor and upon failure shall activate system trouble circuits on display. Microprocessor shall access system program for all control-by-event (CBE) functions. System program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.
18. Auto Programming: System shall provide for all SLC devices on any SLC loop to be pre-programmed into system. Upon activation of auto programming, only

devices that are present shall activate. This allows for system to be commissioned in phases without need of additional downloads.

19. Environmental Drift Compensation: System shall provide for setting Environmental Drift Compensation by device. When detector accumulates dust in chamber and reaches unacceptable level but yet still below allowed limit, control panel shall indicate maintenance alert warning. When detector accumulates dust in chamber above allowed limit, control panel shall indicate maintenance urgent warning.
20. NON-FIRE Alarm Module Reporting: Non-reporting type ID 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 message at panel LDC. Activation of NON-FIRE point shall activate control by event logic, but shall not cause indication on control panel.
21. 1-Man Walk Test:
    a. System shall provide both basic and advanced walk test for testing entire fire alarm system. Basic walk test shall allow single operator to run audible tests on panel. All logic equation automation shall be suspended during test and while annunciators can be enabled for test, all shall default to disabled state. During advanced walk test, field-supplied output point programming shall react to input stimuli, such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch input. Advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device, and wiring operation/verification.
    b. Shall Automatically generate professionally formatted NFPA 72, NFPA 10, or Joint Commission Reports such as (GW-eVance Inspection Manager) A second technician will not be required at the fire panel during testing.
    c. Test feature is intended to provide for certain random spot testing of system and is not intended to comply with requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all functions and verify items such as annunciation with only 1 person.
22. Signaling Line Circuits: Each ILI-MB-E3 module shall provide communication with analog/addressable (initiation/control) devices via 2 signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. Circuits shall be capable of operating in NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of 159 analog sensors and 159 addressable monitor/control devices. Unique 40-character identifier shall be available for each device. Devices shall be of the Velocity series with capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLCs are fully loaded.
23. Notification Appliance Circuits: 2 independent NAC circuits shall be provided on ILI-MB, polarized and rated at 2 amperes DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y or Class A, Style Z.
24. Alarm Dry Contacts: Provide alarm dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system alarm occurs.

25. Supervisory Dry Contacts: Provide supervisory dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system supervisory condition occurs.
26. Trouble Dry Contacts: Provide trouble dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system trouble occurs.

G. Auxiliary Switch Module (ASM-16):
1. Each ASM-16 has 16 programmable push-button switches.
2. Each push-button switch has 3 associated status LEDs (red, yellow, and green), configurable to indicate any combination of functions.
3. Flexible switch configurations to allow auxiliary functions.
4. An insertable label to identify function of each switch and LEDs combination.
5. Provide capability to communicate with up to 16 ASM-16 modules locally, or up to 3,000 feet from the Control Panel.

H. Graphic Annunciator (NGA): Optional 1/4 VGA, touch-screen annunciator with the following characteristics:
1. Custom Graphics: Panel shall permit uploading of custom bit-mapped graphic to display screen. Graphic shall display when all systems are normal.
2. Intuitive Functions: In alarm or trouble condition, annunciator shall display only information pertaining to event, including control switches.
   a. Trouble Condition: Display shall indicate cause of trouble. Only controls available to operator shall be Acknowledge and Reset functions.
   b. Alarm Condition: Display shall indicate cause of alarm. Only controls available to operator shall be Acknowledge, Silence, and Reset functions.

I. Addressable Node Expander (ANX):
1. Addressable Node Expander shall provide interconnection between the Fire Alarm Control Panel networks.
2. ANX-MR-FO (Addressable Node Expander Multi-Ring with Fiber Optic connectors) and ANX-MR-UTP (Addressable Node Expander Multi-Ring with Fiber Optic and Twisted Pair connectors) shall expand the E3 Series network from 64 nodes to 122 nodes. ANX-SR (Addressable Node Expander Single Ring) will function in single 64 node systems.
3. ANX shall provide a Ethernet Port for use in Systems Integration and for use with Emergency Communication System (ECS) functions. The Ethernet port may also be used to communicate with a graphic interface software.

J. Network Repeater Module (RPT-E3):
1. Intelligent Network Interface shall provide interconnection and protection of remote INCC Command Centers and Transponders. Repeater shall regenerate and condition token passing, 625 K baud signal between units. Repeater shall be available in wire, or wire/fiber configurations as determined by field conditions.
2. Interface shall have jumper to allow selection of ground detection of wiring when used in wire mode. Interface shall have integral LEDs to display current status of board.
3. Fiber configurations shall use:

a. Multi-Mode ST-type connectors with a maximum attenuation of 8db with 62.5/125 micron cable.
b. Single-Mode LC-style connector with a maximum attenuation of 30db with 9/125 micron cable.

2.4 PRINTERS

A. Printers: Automatic type, printing code, time, date, location, category, and condition.
1. Provide hard-copy printout of all changes in status of system and time-stamp such printouts with current time-of-day and date.
2. Standard carriage with 80 characters per line.
3. Use standard pin-feed paper.
4. Enclose in separate enclosure suitable for placement on desktop or table.
5. Communicate with control using interface complying with EIA-232-D.
6. Power: 120 VAC at 60 Hz.

2.5 SUPPLEMENTAL NOTIFICATION APPLIANCE CIRCUIT (HPF24)

A. Not used.

2.6 SYSTEM PERIPHERALS - SYSTEM SENSOR Velociti

A. Addressable Devices – General:
1. Provide address-setting means using rotary-decimal switches.
2. Use simple to install and maintain decade-type (numbered 0 to 15) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
4. Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
6. Using software in ILI-MB-E3, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter7.
8. Following bases and auxiliary functions shall be available:
a. Standard base with remote LED output.

b. Sounder base rated at 85 dBA minimum.
c. Intelligent Addressable Sounder base rated at 75 dBA minimum.
d. Form-C relay base rated 30 VDC, 2.0 A.
e. Isolator base.

9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).

B. Addressable Manual Stations (MS-7AF):
1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.

C. Intelligent Thermal Detectors (ATD-RL2F): Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.

D. Intelligent Photoelectric Smoke Detectors (ASD-PL2F): Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.

E. Intelligent Ionization Smoke Detectors (ASD-IL2F): Use dual-chamber ionization principal to measure products of combustion and shall, on command from control panel, send data to panel representing analog level of products of combustion.

F. Intelligent Multi-Criteria Acclimating Detectors (MCS-ACCLIMATE2F):
1. Addressable device designed to monitor a minimum of photoelectric and thermal technologies in single-sensing device. Include ability to adapt to its environment by utilizing built-in microprocessor to determine its environment and choose appropriate sensing settings. Allow wide sensitivity window, with no less than 1 to 4 percent per foot obscuration. Utilize advanced electronics that react to slow smoldering fires and thermal properties within single sensing device.
2. Microprocessor: Capable of selecting appropriate sensitivity levels based on environment type it is in, such as office, manufacturing, or kitchen, and then have

ability to automatically change setting as environment changes, as when walls are moved or as occupancy changes.

3. Intelligent multi-criteria detection device shall include ability to combine signal of thermal sensor with signal of photoelectric signal to react hastily in event of fire situation. Include inherent ability to distinguish between fire condition and false alarm condition by examining characteristics of thermal and smoke sensing chambers and comparing them to database of actual fire and deceptive phenomena.

G. Intelligent Laser Detectors (ASD-LS): Sensor device designed to use laser diode similar to way photoelectric sensor uses LEDs inside of sensing chamber. Detector design shall allow wide sensitivity window, with no less than 0.2 to 4 percent per foot obscuration. Detector shall be used as indicated in special application clean-room-type environments only.

H. Intelligent 4 Element Multi-Criteria Detectors (MCS-4-WARN):
1. 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 environment changes.
3. 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.
4. 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.

I. Intelligent Fire/Carbon Monoxide Detectors (MCS-COF):
1. 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.
2. 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.

3. 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.
4. 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
5. The MCS-COF Photo/CO Detector shall be used with the B200S Intelligent Sounder Base.

J. Intelligent Sounder Base (B200S):
1. The B200S sounder base "listens in" to the SLC communication between the attached sensor head and the fire alarm control panel (FACP) to adopt the same address as the detector, but as a unique device type on the loop. The FACP can then be programmed to use that address to command an individual sounder or a group of sounders to activate. The command set from the panel can be programmed to the specific event, allowing selection of volume, tone, and group. In addition, the FACPs will enable custom tone patterns.
2. The sounder can be programmed to be silenced whenever a live page or active message is being played over the system.

K. Intelligent Aspiration Smoke Detector (AAD-8100):
1. The AAD-8100 shall offer Very Early Warning Smoke Detection, Early Warning Smoke Detection and Standard Smoke Detection settings.
2. It shall be tested and approved for coverage up to 8,000 sq. ft.
3. The ASD 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.
4. The ASD shall operate in air flows from 0-4000 ft/min (0-1,219 m/min).
5. PipeIQ software shall provide pipe design, FAAST system configuration, and FAAST system monitoring in a single software program.
6. The ASD shall allow 5 programmable alarm levels with time delays, including Alert, Action 1, Action 2, Fire 1, and Fire 2.

L. Intelligent Duct Smoke Detector Base (DNR, DNRW):
1. In-Duct Smoke Detector Housing: Use ASD-PL2F intelligent photoelectric detector, ASD-PL2FR intelligent remote test photoelectric detector or ASD-IL2F intelligent ionization detector, which provides continuous analog monitoring and alarm verification from panel.
2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.

3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide an (RTS151KEY) Remote test station accessory, designed to test a remotely located Intelligent Duct Smoke detector with remote alarm indicator.
4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.
5. DST Sampling Tube
   a. No tools needed for installation or removal
   b. Installs/removes from front or back of detector
   c. Available in 1 ft, 1.5ft, 3 ft, 5 ft, and 10 ft lengths

M. Addressable Dry Contact Monitor Modules (AMM-2F):
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2. Mount in standard deep electrical box.
3. IDC Zone: Suitable for Style B operation.

N. Addressable Dry Contact Monitor Modules (AMM-4F):
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3. IDC Zone: Suitable for Style D or Style B operation.
4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

O. Addressable Dry Contact Monitor Modules (AMM-2IF):
1. Provide to connect 2 supervised IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3. IDC Zones: Suitable for Style B operation.
4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

P. Addressable Two Input and Two Output Modules (AMM-2RIF):
1. Provide two isolated sets of Form-C contacts, which operate as a single pole double throw switch. The module shall allow the control panel to switch these contacts on command. The module shall not provide supervision for the notification appliance circuit (NAC). Module shall have both normally open and normally closed connections available for field wiring. Two input modules shall connect two supervised initiating device circuit (IDC) or zone of conventional alarm initiating devices (any normally open dry contact device) to the fire alarm control panel signaling line circuit (SLC) Loop.
2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3. IDC Zones: Suitable for Style B operation.
4. LEDs: Four LEDs that are controlled by the panel to indicate status of each input and output. Coded signals, transmitted from the panel, can cause the LED to blink,

latch on, or latch off. Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

Q. Addressable Dry Contact Monitor Modules (MMI-10F):
   1. Provide to connect 10 supervised Style B IDC zones or 5 supervised Style D IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
   2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
   3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

R. 2-Wire Detector Monitor Modules (AMM-4SF):
   1. Provided to connect 1 supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
   2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to optional surface-mounted back box.
   3. IDC Zone: Wired for Class A or B (Style D or Style B) operation.
   4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

S. 2-Wire Detector Monitor Modules (MMI-6SF):
   1. Provided to connect 6 supervised Class B IDC zones of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
   2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
   3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

T. Addressable Control Modules (AOM-2SF):
   1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
   2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
   3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
   4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

U. Addressable Control Modules (MMO-6SF):
   1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
   2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.

3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.
4. Control module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
5. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

V. Addressable Relay Modules (AOM-2RF):
1. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

W. Addressable Relay Modules (MMO-6RF):
1. Available for HVAC control and other building functions. Relay shall be Form C and rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

X. Isolator Modules (M500X):
1. Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 25 devices shall be connected to 1 isolator module.
2. If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.
3. Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.
4. Mount in standard 4-inch (101.6-mm) deep electrical box or in surface-mounted back box.
5. Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.

Y. Conventional Heat Detectors:
1. Combination rate-of-rise and fixed temperature rated at 135 degrees F (57.2 degrees C) for areas where ambient temperatures does not exceed 100 degrees F (37.7 degrees C), and 200 degrees F (93.3 degrees C) for areas where temperature does not exceed 150 degrees F (65.5 degrees C).
2. Low profile, ceiling-mount type with positive indication of activation.
3. Rate-of-Rise Element: Air chamber, flexible metal diaphragm, and factory-calibrated, moisture-proof, trouble-free vent, and operate when rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.
4. Fixed-Temperature Element: Fusible-alloy retainer and actuator shaft.
5. Smooth Ceiling Rating: 2,500 square feet (762 m^2).

Z. Conventional Photoelectric Area Smoke Detectors:
1. 24-VDC, 2-wire, ceiling-mounted, light-scattering type using LEDs light source.
2. Each Detector: Remote LEDs output and built-in test switch.
3. Provide on twist-lock base.
4. Perform calibrated sensitivity and performance test on detector without need for generation of smoke. Test method shall test all detector circuits.
5. Visual Indication of Alarm: Provide by dual-latching LEDs on detector, seen from ground level over 360 degrees. LEDs shall flash every 10 seconds, indicating power is applied to detector.
6. Detector shall not go into alarm or trouble when exposed to air velocities of up to 3,000 feet (914.4 m) per minute.
7. Detector Screen and Cover Assembly: Easily removable for field cleaning of detector chamber.
8. Field-Wire Connections: Made to base through use of clamping plate and screw.

AA. Conventional Ionization-Type Smoke Detectors:
1. 2-wire, 24-VDC type using dual uni-polar chamber.
2. Each Detector: Remote LEDs output and built-in test switch.
3. Provide on twist-lock base.
4. Perform calibration sensitivity and performance test on detector without need for generation of smoke.
5. Visual Indication of Alarm: Provide by dual-latching LEDs over 360 degrees, on detector, seen from ground level. LEDs shall flash every 10 seconds, indicating power is applied to detector.
6. Detector shall not alarm or trouble when exposed to air velocities of up to 1,200 feet (365.76 m) per minute.
7. Detector Screen and Cover Assembly: Easily removable for field cleaning of detector chamber.
8. Field-Wire Connections: Made to base through use of clamping plate and screw.

BB. Addressable Projected Beam Detectors (ABD-2F,ABD-RT2F):
1. Single-ended, reflective design.
2. Six user-selectable sensitivity levels.
3. Operates in a range from 16 feet to 328 feet.
4. Temperature Range of Device: Minus 22 degrees F to 131 degrees F.

5. Beam Detector: Automatic gain control to compensate for gradual signal deterioration from dirt accumulation on lenses.
6. UL Listed.
7. Ability to be tested using calibrated test filters or magnet-activated remote test station.

2.7 SYSTEM PERIPHERALS – Apollo XP95

A. Not used.

2.8 SYSTEM PERIPHERALS – E3 SERIES

A. Graphic Annunciator (Uses ANU-48 Serial Driver Board):
   1. Communicate to fire alarm control panel via EIA-485 (multi-drop) 2-wire communications loop. Up to 16 annunciator drivers, each configured up to 48 points, shall be connected per SLP panel locally, or up to 3,000 feet from the Control Panel.
   2. ANU-48: Provide interface to approved UL-listed graphic-style LED annunciator and provide each of the features specified.

B. Auxiliary Switch Module (ASM-16):
   1. Each ASM-16 has 16 programmable push-button switches.
   2. Each push-button switch has 3 associated status LEDs (red, yellow, and green), configurable to indicate any combination of functions.
   3. Flexible switch configurations to allow auxiliary functions.
   4. An insertable label to identify function of each switch and LEDs combination.
   5. Provide capability to communicate with up to 16 ASM-16 modules locally, or up to 3,000 feet from the Control Panel.

C. LCD Display Annunciator:
   1. Furnish and install as indicated on the Drawings a remote serial annunciator, Model LCD-7100. Annunciator shall provide 80-character display, which shall duplicate all information on basic system display, including any network nodes its host panel is annunciating, with exception of menus. Contain the following function keys:
      a. Alarm Acknowledge.
      b. Trouble Acknowledge.
      c. Signal Silence.
      d. System Reset/Lamp Test.
      e. System Drill Test.
   2. Key Lock: Enable switches only when placed in "ON" position, with exception of Trouble Acknowledge, which is used to silence local trouble audible sounder. Annunciator shall contain the following LEDs:
      a. Alarm.
      b. Supervisory.
      c. System Trouble.

d. Power Fault.
e. System Silenced.

3. Mount on standard 3-gang surface or flush electrical box.
4. Each ILI-MB-E3/ILI95-MB-E3: Accommodate up to 5 remote LCD-7100 annunciators which shall be located up to 3,000 feet from control panel.

D. NGA Network Graphic Annunciator

1 Main Menu

a. Configure allows Auto-configuration of ILI-MB-S/ and ILI95-MB-E3/ILI95-S-E3 and NGA or ANX.
b. Walk/Drill enables Walk Test and Fire Drill function.
c. I/O Allows enable/disable input and output devices.
d. Clock system real-time clock.
e. View system configuration information
f. NGA log displays, stores, prints and clears the 4100 event history log.
g. Service provides Network Query functions.
h. (More spec items – Text messaging, custom logo, custom screensaver, max amount of text on screen at one time)

E. Horns:

1. Operate on 24 VDC or with field-selectable outputs.
2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
3. Have at least 2 audibility options

F. Strobes:

1. Compliance: ADA and UL 1971.
2. Maximum Pulse Duration: 0.2 second.
3. Strobe Intensity: UL 1971.
4. Flash Rate: UL 1971.
5. Strobe Candela Rating: Determine by positioning selector switch on back of device.

G. Horn/Strobes:

1. Operate on 24 VDC
2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
3. Have at least 2 audibility options
4. Maximum Pulse Duration: 0.2 second.
5. Strobe Intensity: UL 1971.
6. Flash Rate: UL 1971.
7. Strobe Candela Rating: Determine by positioning selector switch on back of device.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and surfaces to receive fire alarm system.
   1. Notify Architect of conditions that would adversely affect installation or subsequent use.
   2. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install fire alarm system in accordance with NFPA 72, NFPA 70, state and local codes, manufacturer's instructions, and as indicated on the Drawings.

B. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas.

C. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.

D. Flush-mount fire detection and alarm system devices, control panels, and remote annunciators in finished areas. Flush-mount or surface-mount fire detection and alarm system devices, control panels, and remote annunciators in unfinished areas.

E. Ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on the Drawings. Install not less than 42 inches, not more than 48 inches, above finished floor measured to operating handle.

F. Comply with all applicable paragraphs in Section 26 0500, COMMON WORK RESULTS FOR ELECTRICAL, apply as though repeated herein.

G. Install system(s) in accordance with manufacturer's instructions.

H. Include services of certified technicians to supervise installation, provide adjustments, provide final connections, system testing and system training to Owner Representative.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide service of competent, factory-trained technician authorized by manufacturer to technically supervise and participate during pre-testing and acceptance testing of system.

B. Testing:
   1. Conduct complete visual inspection of control panel connections and test wiring for short circuits, ground faults, continuity, and insulation before energizing cables and wires.
   2. Close each sprinkler system control valve and verify proper supervisory alarm at Control Panel.
   3. Verify activation of flow switches.
   4. Open initiating device circuits and verify that trouble signal actuates.
   5. Open signaling line circuits and verify that trouble signal actuates.
   6. Open and short notification appliance circuits and verify that trouble signal actuates.
   7. Ground initiating device circuits and verify response of trouble signals.
   8. Ground signaling line circuits and verify response of trouble signals.
   9. Ground notification appliance circuits and verify response of trouble signals.
   10. Check installation, supervision, and operation of intelligent smoke detectors.
   11. Introduce on system each of the alarm conditions that system is required to detect. Verify proper receipt and proper processing of signal at Control Panel and correct activation of control points.
   13. Consult manufacturer's manual to determine proper testing procedures when system is equipped with optional features. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and similar.

C. Acceptance Testing:
   1. Before installation shall be considered completed and acceptable by AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by representative approved by Engineer. Monitoring company and/or fire department shall be notified before final test in accordance with local requirements.
   2. Contractor's job foreman, in presence of representative of manufacturer, representative of Owner, and fire department shall operate every installed device to verify proper operation and correct annunciation at control panel.
   3. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
   4. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of manufacturer and Owner, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to Owner and fire department.
   5. Leave fire alarm system in proper working order and, without additional expense to Owner, replace defective materials and equipment provided within 1 year (365 days) from date of final acceptance by the owner.

3.4 DEMONSTRATION

A. Provide instruction as required for operating fire alarm system.

B. Provide hands-on demonstrations of operation of fire alarm system components and functions.

3.5 INSPECTION

A. Systems to meet all the requirements of the CSFM and IOR and AHJ and shall be approved thereby before installation and prior to final acceptance.

3.6 REPORT

A. Prepare written report of final test results, signed by witnessing parties. Submit to the Engineer in triplicate for final approval.

END OF SECTION 28 31 00

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SECTION 31 1000 - SITE CLEARING

PART 1 - GENERAL

1.1 Description

A. Work included: Clear and grub the site.
B. Related Work:
   1. Section 312000 Earth Moving.
   2. Geotechnical Investigation Report for the project.

1.2 Quality Assurance

A. A Geotechnical Engineer will be retained by the Owner to observe performance of work in connection with Site Clearing, Grading, Excavation and Fill, Utility Trenching, Subgrade and Roadbed preparation, and perform compaction tests.
B. Re-adjust work performed that does not meet technical or design requirements, but make no deviation from the contract documents.
C. Use adequate numbers of skilled workers who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

PART 2 - PRODUCTS

2.1 Materials

A. Provide materials not specifically described but required for proper completion of the work of this Section, as selected by the Contractor subject to the approval of the Architect.
B. Herbicide – Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this work by governmental agencies having jurisdiction.

PART 3 - EXECUTION

3.1 Protection

A. Protect existing utilities and use utility locators to identify below grade utilities.
B. Protect trees and shrubs, where indicated to remain, by providing a fence around the tree or shrub a sufficient distance away and of sufficient height so trees and shrubs will not be damaged in any way as part of this work.
C. Protection of persons and property:
   1. Barricade open depressions and holes occurring as part of this work, and post warning lights on property adjacent to or within public access.
   2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
   3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this Section.
D. Use means necessary to prevent dust from becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.
E. Maintain access to the site at all times.

3.2 Clearing

A. Clearing and Grubbing
   1. Remove all surface rocks, debris, trash, tree stumps, roots, and other vegetation within the extent of construction. Do not remove vegetation in other areas.
   2. Fell trees, dispose of the trees and other vegetation designated for removal, together with the downed timber, snags, brush, wood, rocks, weeds grass and rubbish. Limbs, branches and roots damaged during construction, together with those required to be trimmed, shall be neatly cut next to the hole of the tree or main branch or root. Cuts more than 1" diameter thus made and any injury to the tree trunk or main branches shall be immediately painted with tree wound paint.
   3. Grub soils to a depth adequate to remove all deleterious material from the working area of the site.
   4. Do not leave any root greater than one inch in diameter and larger in the ground to a depth of at least 12" below the existing ground surface or subgrade or the new graded surface, whichever is lower.
B. Removal of Debris: Remove debris from the site in a legal manner and leave the site in a neat and orderly condition subject to the approval of the Owner. Do not store or permit debris to accumulate on the job site.

3.4 Disposal

A. General:
   1. Remove brush, grass, roots, trash, and other material from clearing operations.
   2. Dispose of away from the site in a legal manner.

3. Do not store or permit debris to accumulate on the job site.

B. Do not burn debris at the site.

3.5 Dust Control

A. Use chemical palliative or spread water as required to maintain strict control of dust generated by operation of work under this Section.

3.6 Clean-Up

A. Maintain cleanliness on roadways and other public area used by equipment. Contractor will be held responsible for immediate removal of spillage. Remove from the Project Site rubbish, rubble, and debris and materials and debris resulting from demolition, leaving site in a safe and clean condition.

END OF SECTION

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SECTION 31 2000 - EARTH MOVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section includes, but is not necessarily limited to, work necessary or incidental to excavating, grading, filling, and backfilling

B. Geotechnical Investigation Report:
   1. A Geotechnical Investigation Report for the site of this work has been prepared
   2. The Geotechnical Investigation Report may be inspected at the office of the Owner, and copies may be obtained at the cost of reproduction and handling upon request.
   3. The recommendations of the Geotechnical Investigation Report are considered a part of the construction documents.

C. Use of Data:
   1. Reports are available for bidders' information, but are not a warranty of subsurface conditions.
   2. For grading recommendations, refer to geotechnical reports listed on drawing sheet G-001.

D. Related Work:
   1. Section 312010 Grading.
   2. Section 311000 Site Clearing.
   3. The Geotechnical Investigation Report prepared for this project.

1.2 PROJECT / SITE CONDITIONS

A. General
   1. Control dust on or near the site resulting from the performance of the work. Moisten surfaces to prevent dust being a nuisance to the public, adjacent uses, and concurrent work on site.
   2. Verify existing grades and dimensions before starting any grading operations.
   3. Protect existing features, products, or items designated to remain. In the event of damage, repair or replace immediately to the approval of and at no additional cost to the Owner.
   4. All existing benchmarks shall be protected and maintained throughout the course of the work. Monuments or stakes disturbed or destroyed during the course of the work shall be re-established without expense to the Owner.
   5. Work shall be conducted as to avoid injury to persons and damage to adjacent property. This includes, but is not necessarily limited to:
      a) Provide appropriate shoring, bracing, and barriers
      b) Barricade open depressions and holes occurring as part of this work, and post warning lights on property adjacent to or within public access.
      c) Operate warning lights during hours from dusk to dawn each day and as otherwise required.

d) Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining washout and other hazards created by operations under this Section.

6. An effort has been made to define the location of underground facilities within the job site. However, existing utilities and other underground structures may not be shown on the drawings and their location where shown is approximate. Contractor shall assume sole and complete responsibility for locating all underground utilities and related facilities and for protection of same during the course of the construction. Contact Underground Service Alert U.S.A. of Southern California (800) 642-2444 two working days prior to the start of construction for assistance from the respective utilities. All utilities not a member of U.S.A. must also be notified.
7. Hauling permits required by the local jurisdiction must be obtained and paid for under this contract. Off-site, all local codes and ordinances must be followed.
8. Maintain access to the site at all times.
9. Erosion control: If the permanent erosion control has not been established before the onset of the rainy season (October 15th) or if the construction occurs during the period between October 15th and April 15th, then erosion control devices shall be provided and available on-site. The contractor is responsible for the placement of such devices, at no cost to the Owner.
10. The contractor is responsible for the cost and acquisition of any necessary storm water permits through the Regional Water Quality Control Board and installation and compliance with the permit.

1.3 QUALITY ASSURANCE

A. Testing:
1. The Owner will retain and pay a qualified Geotechnical Engineer to observe performance of work in connection with Site Clearing, Excavation and Fill, Utility Trenching, Subgrade and Roadbed preparation and to perform compaction tests. The Geotechnical Engineer shall take all field samples and do all laboratory testing necessary to insure compliance of the work to these Specifications or as required by Architect or other regulatory agencies. The Geotechnical engineer shall submit results of all testing done during the course of the work to the Owner, Engineer, and Contractor.
2. Notify testing lab a minimum of 48 hours in advance of testing required to satisfy requirements of this section.
3. Should testing specified above show work which does not satisfy these Specifications, the Contractor shall pay, through the Owner, for all additional tests required to determine the extent of work that is not satisfactory and for all additional tests necessary to demonstrate compliance with these specifications.

D. Certification Upon Completion of the Work: Contractor shall certify in writing to the Owner and the Engineer that all earthwork was performed in accordance with this specification and as shown on drawings.

1.5 REFERENCES

A. General
1. In addition to complying with all current, applicable codes and regulations, including Chapter 33 of the 2013 California Building Code, Title 24, Part 2, comply with applicable sections of:
a. The geotechnical recommendation of the Geotechnical Investigation Report for this project.
2. All of the above specifications shall be consulted. The most restrictive specification shall apply.

PART 2 - PRODUCTS

2.1 FILL MATERIAL FOR SUB-GRADE PREPARATION

A. Materials suitable for recompaction free of deleterious and organic material
B. Site soils may be used if suitable

PART 3 - EXECUTION

3.1 SITE CLEARING

A. Refer to Section 311000 Site Clearing.

END OF SECTION

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SECTION 312010 - GRADING

PART 1 GENERAL

1.1 DESCRIPTION

A. Related Work:
1. Section 312000 Earth Moving
2. Geotechnical Investigation Report and Geotechnical Engineer

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.
C. In addition to complying with requirements of governmental agencies having jurisdiction, comply with the directions of the soils engineer
D. The standard tests used to determine maximum dry density and field density shall be ASTM D1557-07 and ASTM D6938-07b respectively.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Where and if shown on the Drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoils, roots, heavy or stiff clay, stones larger than 1 inch in greatest dimension, noxious weeds, sticks, brush, litter, and other deleterious matter.
B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines. If damaged, repair or replace at no additional cost to the Owner.
2. If service is interrupted as a result of Work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
3. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, notify the Architect.

B. Dewatering:
1. Remove all water, including rain water, encountered during trench and substructure work to an approved location by pumps, drains, and other methods.
2. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.3 COMPACTING

A. Control soil compaction during construction to provide the minimum percentage of maximum dry density and field density specified for each area as determined according to ASTM D1557-07 and ASTM D6938-07b respectively.

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by the soils engineer.
1. Structures:
   a. All compact soils beneath the proposed new building section shall be compacted to a minimum 95% of maximum density.
2. Lawn and Unpaved Areas:
   a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 90% of maximum density;
3. Walks:
   a. Compact the top 8" of subgrade and each layer of fill material or backfill material at 95% of maximum density.
4. Pavements:
   a. Compact the top 12" of subgrade and each layer of fill material or backfill material at 95% of maximum density for cohesive soil material.

C. Moisture Conditioning and Control:
1. "Moisture conditioning" refers to the moistening or drying of soils to at least optimum moisture content, prior to application of compactive effort.
2. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
4. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory

value as determined by moisture-density relation tests approved by the Geotechnical Engineer.

3.4 DRAINAGE CONTROLS

A. Provide all necessary temporary apparatus, pumps, curbs, or ditches as required to divert or convey water from any source away from the work. Do not allow water from any source to accumulate within or damage earthwork.

3.5 FINISH SITE GRADING/PROTECTION

A. General
1. Grade all surfaces on the site where indicated and within the construction areas to elevations indicated and as required to insure proper drainage and disposal of surface water. Shape grades to drain away from buildings at minimum 2% slope.
2. After grading is completed, and the Geotechnical Engineer has finished his observation of the work, no further excavation or filling shall be done except with the review of, and under the observation of, the Geotechnical Engineer.
3. Prevent erosion of the freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.7 TOLERANCES

A. Earthwork
1. All rough grading shall be placed to a vertical tolerance of plus or minus one tenth of a foot.
2. All rough grading shall be placed to a horizontal tolerance of plus or minus one quarter of a foot.

3.8 FIELD QUALITY CONTROL

A. Secure the Geotechnical Engineer's inspection and approval of subgrades and fill layers before subsequent construction is permitted thereon.
B. Provide at least the following tests to the approval of the soils engineer:
1. At paved areas, at least one field density test for every 2000 sq ft of paved area, but not less than three tests;
2. In each compacted fill layer, one field density test for every 2000 sq ft of overlaying paved area, but not less than three tests.
C. If, in the Geotechnical Engineer's opinion based on reports of the testing laboratory, subgrade or fills which have been placed are below specified density, provide additional compacting and testing under the provisions of Section 01400 of these Specifications.

3.9 MAINTENANCE

A. Protection of Newly Graded Areas:
1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;

2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.10 CERTIFICATION

A. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to the Architect a written report from the soils engineer certifying that the compaction requirements have been obtained. State in the report the area of the fill or embankment, the compaction density obtained, and the type or classification of fill material placed.

END OF SECTION

SECTION 32 0010 - FIELD ENGINEERING

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Provide such field engineering services as are required for proper completion of the Work including, but not necessarily limited to:
   1. Establishing and maintaining lines and levels;

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Division 1.
B. Upon request of the Architect, submit:
   1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.
   2. Documentation verifying accuracy of field engineering work.
   3. Certification, signed by the Contractor's retained field engineer, certifying that elevations and locations of improvements are in conformance or nonconformance with requirements of the Contract Documents.

1.4 PROCEDURES

A. In addition to procedures directed by the Contractor for proper performance of the Contractor's responsibilities:
   1. Locate and protect control points before starting work on the site.
   2. Preserve permanent reference points during progress of the Work.
   3. Do not change or relocate reference points or items of the Work without specific approval from the Architect.
   4. Promptly advise the Architect when a reference point is lost or destroyed, or requires relocation because of other changes in the Work.
      a. Upon direction of the Architect, require the field engineer to replace reference stakes or markers.
      b. Locate such replacements according to the original survey control.

END OF SECTION

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SECTION 321214 - SUBGRADE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes, but is not necessarily limited to the work necessary for the preparation of the subgrade.

1.2 RELATED WORK DESCRIBED ELSEWHERE

A. All underground work contemplated in the area of the subgrade shall be completed and properly backfilled before subgrade work is started.

B. These Specifications are to be used in conjunction with requirements in those sections of the Specifications having to do with specific types of base materials and pavements.
   1. Section 024119 Selective Demolition
   2. Section 311000 Site Clearing
   3. Section 312000 Earth Moving
   4. Section 321215 Aggregate Base
   5. Section 321216 Asphalt Concrete Paving
   6. Section 321313 Concrete Paving

C. The geohazard and geotechnical investigation reports
   a. Geohazards Report, Project No. 302429-001 by Earth Systems Pacific, dated 09-19-2018
   b. Grading Recommendations and Preliminary Structural Paving Sections, Report No. 18-10-6 by Earth Systems Pacific, dated 10-03-2018

PART 2 - PRODUCTS

2.1 EXCAVATION

A. The excavation shall include removal of materials which are encountered in excavating to the required grades, including existing pavement and curbs designated to be removed, or as required to accomplish the construction.

2.2 EQUIPMENT

A. Furnish equipment to accomplish the excavating, shaping, grading and rolling, and compaction.

PART 3 - EXECUTION

3.1 SUBGRADE

A. Excavate and shape subgrade to line, grade, and cross section. Roll subgrade with a roller until the top 12 inches is compacted to 95 percent of maximum density at optimum moisture

content as determined by ASTM D 1557. Remove unsuitable material disclosed by the rolling and replace with suitable material from the excavation. Fill holes, and depressions which develop under the roller, to the required grade and cross sections with material from the excavation. The finished subgrade shall be within a tolerance of plus or minus 0.10 of a foot of the grade and cross section shown, shall be smooth and free from irregularities and at the specified density. Compaction shall extend one foot beyond the edge of paving, curb, or form work.

B. The Contractor shall be responsible for the protection of existing improvements; any damage resulting from his operations shall be the Contractor's sole responsibility.

3.2 EXCAVATION BELOW GRADE

A. Where the Geotechnical Engineer deems subgrade material to be unsatisfactory, excavation below grade will be required to such depths as necessary to remove the unsatisfactory material. Excavation below grade shall be of the same classification as that above it provided it is removed in the same operation as the normal excavation. Where the Contractor has completed the excavation and is required to remove additional, unsuitable material beyond the scope provided in these specifications, or where the additional depth requires special equipment because of unforeseen conditions, the work shall be performed and a payment for excavation below grade will be made on the basis of extra work as provided in the Contract.

B. If the excavation below grade is required because of negligence on the part of the Contractor, the necessary excavation below grade and the backfilling required to restore the surface satisfactorily shall be at the Contractor's sole expense.

C. The subgrade shall be sprinkled with water as required, and in such quantities as necessary, to obtain the specified compaction.

D. Geotechnical inspections and reports will be required as deemed necessary by the geotechnical engineer for all excavations and recompaction.

E. Verified reports by the geotechnical engineer are required.

3.3 PROTECTION OF SUBGRADE

A. After preparing the subgrade as above specified, traffic shall be kept off. Should it be found necessary to haul over the prepared subgrade, the Contractor shall drag and roll the traveled way as frequently as may be necessary to remove ruts, cuts, and breaks in the surface. Cuts, ruts, and breaks in the surface of the subgrade that are not removed by the above operations shall be raked and hand-tamped. Equipment used for transporting materials over the prepared subgrade shall be equipped with pneumatic tires.

B. Continued use of sections of prepared subgrade for hauling, so as to cut up or deform it from the true cross section, will not be permitted. The Contractor shall protect the prepared subgrade from both construction and public traffic.

C. The subgrade shall be maintained in the finished condition until the first succeeding course is placed.

END OF SECTION

SECTION 321215 - AGGREGATE BASE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: This section covers the materials and work necessary for construction of aggregate base.

B. Related Sections:
   1. Section 321214 Subgrade and Roadbed.
   2. Section 321216 Asphalt Paving
   3. Section 321313 Concrete Paving
   4. The geohazard and geotechnical investigation reports
      a. Geohazards Report, Project No. 302429-001 by Earth Systems Pacific, dated 09-19-2018
      b. Grading Recommendations and Preliminary Structural Paving Sections, Report No. 18-10-6 by Earth Systems Pacific, dated 10-03-2018
      c. Response to Engineering Geology and Seismology Review, Report No. 19-1-89 by Earth Systems Pacific, dated 02-12-2019

1.2 SUBMITTALS

A. Samples and Testing: At least thirty (30) days prior to the use thereof, the Contractor shall submit to the Geotechnical Engineer a sample of aggregate, graded as intended for use. Provide sample size as directed by the Geotechnical Engineer, not to exceed 120 lbs. This requirement shall be complied with for each aggregate and grading thereof that has not been reviewed. The Geotechnical Engineer will test the sample at no cost to the Contractor, and will determine the acceptability of the aggregate.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate: The aggregate shall be free from vegetable matter and other deleterious substances. Aggregate for aggregate base shall consist of material of which at least 60 percent by weight shall be crushed particles as determined by Test Method No. Calif. 205.
   1. The percentage composition by weight of aggregate base shall conform to one of the following gradings when determined by Test Method No. Calif. 202.
   2. The particle size distribution shall be in accordance with the grading specified for 3/4-inch maximum size aggregate.

Percentage Passing

Sieve Size	1-1/2" Maximum	3/4" Maximum
2-Inch	100	
1-1/2-Inch	90-100	

1-Inch		100
3/4-Inch	50-85	90-100
No. 4	25-45	35-60
No. 30	10-25	10-30
No. 200	2-9	2-9

3. The aggregate base shall also conform to the following quality requirements:

Tests	Test Method No. Calif.	Requirements	
Resistance (R-Value)*	301	78	Minimum
Sand Equivalent	217	30	Minimum
Durability Index	229	35	Minimum

4. The aggregate shall not be treated with lime, cement, or other chemicals before the Durability Index test is performed.
5. Material yielding a maximum dry density of less than 112 pounds per cubic foot when tested in the laboratory in accordance with ASTM "Standard Methods of Test of Moisture-Density Relations of Soils, Using 10-Pound Rammer and 18-Inch Drop", Designation D 1557, shall not be used.
6. Any rock, including red rock, meeting all the requirements of this Section will be acceptable. Such rock shall be plant processed at an approved processing plant.

2.2 EQUIPMENT

A. Furnish all necessary equipment required to accomplish the spreading, shaping, and compaction required.

PART 3 - EXECUTION

3.1 SUBGRADE

A. Proof roll subgrade immediately prior to commencement of spreading of aggregate base. Make necessary repairs as directed by the Geotechnical Engineer and as described in Section 321214 – Subgrade.

3.2 DELIVERY AND SPREADING

A. Aggregate base material shall be delivered to the roadbed as uniform mixtures; each layer shall be spread in one operation.

B. At the time aggregate base is spread it shall have a moisture content sufficient to obtain the required compaction. Such moisture shall be uniformly distributed throughout the material.

C. The material shall be spread upon the prepared subgrade by means of vehicles equipped with approved spreading devices at a uniform quantity per linear foot, which quantity will provide the required compacted thickness within the tolerances specified.

D. Depositing and spreading shall commence at that part of the work farthest from the supply of base material and shall progress continuously without breaks, unless otherwise directed by the Geotechnical Engineer.

E. Where the required thickness is six inches or less, the base material may be spread and compacted in one layer. Where the required thickness is more than six inches, the base material shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any one layer shall not exceed six inches. Each layer shall be spread and compacted in a similar manner.

F. Base material placed in areas inaccessible to the spreading equipment may be spread in one or more layers by any means that will make possible the specified compaction and surface.

G. When the subgrade for aggregate base consists of cohesionless sand, and written permission is granted by the Geotechnical Engineer, the base material may be dumped in piles upon the subgrade and spread ahead from the dumped material.

H. The base material, after spreading, shall be shaped by means of a blade grader to such thickness that after watering and compacting, the completed base will conform to the required grade and cross section within the tolerances specified.

I. Segregation of aggregate shall be avoided; the base shall be free from pockets of coarse or fine material.

3.3 COMPACTION

A. Immediately following spreading, shaping, and smoothing, the full width of the base material shall be watered as ordered by the Geotechnical Engineer, and compacted by rolling with a minimum of two pieces of self-propelled reversible equipment. Compaction shall be as follows:

1. For initial rolling use a 3-wheel steel-tired roller, weighing not less than 12 tons distributed so that the rear wheels will apply to the surface being rolled not less than 325 pounds per linear inch of rear tire width. Rolling shall commence by covering completely the outer edge of the material. Subsequent passes shall lap at least 25 percent on previously rolled material.
2. For subsequent rolling use a pneumatic-tired roller of the oscillating type, having a width of not less than four feet and equipped with tires of equal size and diameter. Wobble wheel rollers will not be permitted. The tires shall be so spaced that the entire gap between adjacent tires will be covered by the tread of the following tire. The tires shall be inflated to 90 pounds per square inch minimum.
3. To compact all areas inaccessible to the rollers, use compressed air or gas powered tampers.

B. Notify the Geotechnical Engineer at least ten (10) days in advance and shall secure approval for the use of each piece of compacting equipment other than that specified, selection thereof and obtainment of the specified compaction throughout the volume of base and the specified surface shall be solely the responsibility of the Contractor.

C. If compaction is not uniform or tests show it to be inadequate, or if the surface is unsatisfactory, the Geotechnical Engineer may require the use of other or additional equipment.

D. Should low or high spots develop during rolling operations, such spots shall be smoothed by blading with a self-propelled, pneumatic-tired motor grader having a wheelbase not less than 15 feet long and a blade not less than 10 feet long.

E. Aggregate base shall be watered after compaction. Water shall be applied at the rate and in the quantities ordered by the Geotechnical Engineer.

F. The relative compaction of aggregate base, determined by tests of the in-place, field compacted base shall be not less than 95 percent of the maximum compaction at optimum moisture content determined by ASTM Methods of Test, Designation D 1556 and Method C of Designation D 1557. The tests will be conducted and evaluated in the laboratory by the Geotechnical Engineer at no cost to the Contractor.

G. The surface of the finished aggregate base at any point shall not vary more than 0.05 foot above or below proper grade; such surface shall contain no ridges, valleys or sharp breaks.

H. Finished base that does not conform to the foregoing requirements shall be reshaped or reworked, watered, and thoroughly recompacted to conform thereto.

I. The Contractor shall not allow any completed untreated rock base to be subject to public or construction traffic, except the latter necessary to the completion of the overlying surface courses.

END OF SECTION

SECTION 321216 - ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: This section covers the work necessary for construction of the asphalt concrete leveling course and surface course used for paving parking areas, and the repair and replacement of existing pavement that has been disturbed by trenching or other construction.

B. Related Sections:
   1. Section 312210 Grading.

1.2 SUBMITTALS

A. Submittals during construction shall be made in accordance with Division 1, General Requirements.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Certificates, signed by the materials producer and the asphalt paving subcontractor, stating that materials meet or exceed the specified requirements.
   3. Organic weed control solution

1.3 QUALITY ASSURANCE

A. Standards: The following shall form a part of this specification and shall have the same force as if reproduced in total herein:
   1. Standard Specifications.
   2. Materials Manual of Testing and Control Procedures, State of California, Business and Transportation Agency, Department of Transportation, herein after referred to as "Materials Manual".
   3. ASTM D 1577 shall be used for the method of performing compaction tests.

PART 2 - PRODUCTS

2.1 ASPHALT

A. Asphalt concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant.
   1. Asphalt concrete shall be as required by jurisdiction.
   2. Grade of asphalt shall be AR-4000.
   3. Density shall be 95% of maximum laboratory density as determined by California Test Method 304.
   4. Stability shall be 30 minimum.
   5. Mineral aggregate shall be Type B, ½" maximum size aggregate, medium grading, and shall conform to the following requirements:

a. The particle size distribution shall be in accordance with the grading specified for 1/2-inch maximum size aggregate.

Sieve Size	Maximum Percentage Passing
3/4-Inch	100
1/2-Inch	95-100
3/8-Inch	80-85
No. 4	54-64
No. 8	38-48
No. 30	20-30
No. 200	3- 8

6. Drying, proportioning and mixing of the materials shall conform to Section 39 of the Standard Specifications.

B. Slurry Seal Coat shall be a Type II slurry seal and shall be a one coat process, or approved equivalent. The manufacturer shall supply the product in sealed containers, or provide certification of manufacturer to the Engineer.

C. Seal Coat shall be equal to SS1H one coat process, or equal. The manufacturer shall supply the product in sealed containers, or provide certification of manufacturer to the Engineer.

2.2 AGGREGATE

A. Aggregate base shall conform to the provisions of Section 0321215 Aggregate Base and as provided herein.
1. The grading of the aggregate shall be "1/2 - inch Maximum, Medium" as described hereon, except in conform or overlay areas, the grading shall be 3/8 - inch maximum.

B. Sampling and testing will not be required. The Contractor shall provide test results as indicated in this section.

2.3 COMPOSITION OF MIXTURE

A. Submit a job - mix formula which meets the requirements herein specified.

B. Tests confirming the suitability of the material for the purpose intended shall be obtained by the Contractor at the Contractor's expense. Certified copies of the aggregate test results from an independent testing laboratory shall be furnished for review.

C. The Contractor shall make arrangement and pay for preparation of the asphalt concrete job mix formula. The job - mix formula for the asphalt concrete mixture shall establish the percentage of aggregate passing each sieve size, and the percentage of bituminous material to be added to said aggregate, and the temperature at which test results from a qualified, independent testing laboratory confirming the job - mix formula shall be submitted for review. Test results of aggregate used in asphalt shall be provided as indicated in this section.

D. The job – mix formula shall indicate the gradation of each of the several aggregate constituents to be used in the mixture and shall establish the exact proportion of each constituent to be used to produce a combined gradation of aggregate within the appropriate limits stated above.

E. After a job - mix formula is established and reviewed, all mixtures furnished under this Contract shall be conform to the requirements and tolerances as stated in these Specifications.

2.4 WEED CONTROL

A. Spray applied organic weed control solution (vinegar, salt, and soap) prior to placement of paving materials.

PART 3 - EXECUTION

3.1 ASPHALT CONCRETE PAVEMENT

A. The proportioning and mixing of asphalt concrete shall conform to the provisions provided herein. The pounds of asphalt per 100 pounds of dry aggregates shall not vary by more than 5% above or 10% below the amount indicated in the job - mix formula. This requirement shall apply to samples taken from a single batch, successive batches, at different locations in the production plant, or at any location on the construction site.
B. Paint binder shall be applied in conformance with the provisions provided herein.
C. Spreading equipment and methods shall conform to the provisions provided herein.. No asphalt concrete shall be placed on any section of compacted aggregate base that has not been reviewed by the Geotechnical Engineer.
D. The asphalt concrete shall be compacted in accordance with the provisions provided herein. The weight and pressure of the Contractor's pneumatic tired roller will be reviewed, but not designated or approved, by the Geotechnical Engineer.
E. Confirm areas associated with placement of asphalt concrete conform to the provisions provided herein.

3.2 PLACEMENT OF ASPHALT CONCRETE PAVING

A. Install the specified curbs, and headers and stakes, to achieve the arrangement of paving shown on the drawings. All unconfined edges shall be confined with 2 inch by 4 inch redwood header boards staked with a 1 inch by 3 inch redwood stake 18 inches long minimum at 6 feet on-center. Two 1 inch by 4 inch pieces may installed together for bending along curves. Offset all joints by 2 feet.
B. Remove all loose materials from the compacted base.
C. Apply the specified prime coat, and tack coat where required, and allow to dry, in accordance with the manufacturer's recommendations as approved by the Engineer.
D. Asphalt paving shall be installed in minimum lifts of 1.5 inches.
E. Adjust frames, covers and utility vaults, if so required, to meet final grades.
F. Do not accept receipt of asphalt concrete material unless it is covered with a tarpaulin until unloaded, and unless the material has a temperature of not less than 280 degrees Fahrenheit.

3.3 CONNECTIONS WITH EXISTING FACILITIES

A. Where it is necessary to remove existing asphalt surfaces to provide proper meet lines and riding surfaces, burn or chip the existing surface so that there will be sufficient depth to provide a minimum of one inch of asphalt concrete. Prior to placing the asphalt concrete these areas shall be tacked. Meet lines shall be straight and the edges vertical. The edges of meet lines cuts shall be painted with liquid asphalt or emulsified asphalt

prior to placing asphalt concrete. After placing the asphalt concrete, the meet line shall be sealed by painting with a liquid asphalt or emulsified asphalt and immediately covered with clean, dry sand.

B. Prior to laying the second strip of asphalt concrete pavement, the edge of the first strip laid and other contact surfaces such as curbs, manhole frames, and similar materials shall be painted with emulsified asphalt or liquid asphalt to provide closely bonded watertight joints. This work shall be done in a manner that will prevent staining adjacent surfaces not intended to be coated.

3.4 COMPACTION

A. Rolling shall continue until all roller marks are eliminated and a minimum density of 140 pcf has been obtained.

B. Field density tests shall be made by a commercial testing laboratory retained by the Owner, and the test results submitted to the Geotechnical Engineer for review.

3.5 JOINTS

A. The placing of the top or wearing course shall be as nearly continuous as possible, and the roller shall pass over the unprotected end of the freshly laid mixture only when the laying of the course is discontinued for such length of time as to permit the mixture to become chilled.

B. When the work is resumed the previously compacted mixture shall be cut back to produce a slightly beveled edge of the full thickness of the course. The material which is cut away shall be wasted and new mix shall be laid against the fresh cut. Rollers or tamping irons shall be used to seal the joints.

3.6 SURFACE TOLERANCE

A. Tests for Conformity with the specified crown and grade shall be made by the Contractor immediately after initial compression. Any variation shall be immediately corrected by the removal or addition of materials and by continuous rolling.

B. The completed surface of the top of wearing course shall be of uniform texture, smooth, uniform as to crown and grade and free from defects of all kinds. The completed surface shall not vary more than 1/8 inch from the lower edge of a 10 foot straight edge placed on the surface parallel to the centerline.

C. After completion of the final rolling, the smoothness and grade of the surface shall again be tested by the Contractor.

D. When deviations in excess of the above tolerances are found, the pavement surface shall be corrected by the addition of asphalt concrete mixture of an appropriate class to low places or the removal of material from high places by methods satisfactory to the Engineer, or by removal and replacement of the wearing course of asphalt concrete. Correction of defects shall be carried out until there are not deviations anywhere greater than the allowable tolerances.

E. All areas in which the surface of the completed pavement deviates more than twice the allowable tolerances described above shall be removed and replaced to the satisfaction of the Engineer.

F. All costs involved in making the corrections of defects described above shall be borne by the Contractor and no compensation will be made for this work.

3.7 APPLICATION OF SEAL OR SLURRY COAT

A. Areas that have received new AC shall have a minimum 30 day cure time prior to application of either seal or slurry coat.
Prepare the surfaces, mix the seal coat material, and apply in accordance with the manufacturer's recommendations as approved by the Geotechnical Engineer.

B. Apply one coat of the specified sealer.

C. Achieve a finished surface seal which, when dry and thoroughly set, is smooth, tough, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges, and other surface irregularities.

3.8 UNFAVORABLE WEATHER

A. Asphalt for prime coat shall not be applied when the ground temperature is lower than 50 degrees F without written permission of the Geotechnical Engineer.

B. Asphalt concrete shall not be placed when the atmospheric temperature is less than 40 degrees F nor during heavy rainfall.

3.9 ALLOWABLE TOLERANCES

A. Surface Smoothness:
   1. The surface of the finished base course shall not vary more than 3/8 inch, plus or minus, in 10 feet.
   2. The surface of the finished asphalt concrete shall not vary more than ¼ inch, plus or minus, in 10 feet.

B. The compacted paving or base course thickness shall not vary more than ¼ inch, plus or minus, based on an average of five (5) measurements per 10,000 square feet, taken at randomly selected locations by testing laboratory.

C. Provide hot plant mixed asphalt concrete paving materials:
   1. Temperature leaving the plant shall be 290 degrees Fahrenheit minimum, 320 degrees Fahrenheit maximum.
   2. Temperature at time of placing shall be 280 degrees Fahrenheit minimum.

3.10 SURFACE FINISH

A. Surface finish shall be uniform and consistent in color and texture throughout the extents of the project and shall be achieved, at a minimum, by applying a slurry coat.

END OF SECTION

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SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide Portland cement concrete paving .
B. Related Work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 321600 - Concrete Curbs, Gutters and Sidewalks

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are trained and experienced in the necessary crafts and who are familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
B. Do not commence placement of concrete until mix designs have been reviewed, and until copies of the final mix designs are at the job site and the batch plant.
C. Provide access for, and cooperate with, the inspector and testing laboratory described in Section 014000 – Quality Requirements.

1.4 REGULATORY REQUIREMENTS

A. Portland cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.

PART 2 - PRODUCTS

2.1 FORMS

A. Forms shall be made of wood or metal or other material capable of supporting mechanical concrete placing equipment without settling vertically, bowing inward or outward, or crushing. Forms shall have sufficient rigidity to maintain the lines and grades shown on the Drawings within a vertical tolerance of 0.05 feet and an alignment tolerance of 1 inch at any point. Forms shall be clean and free of dirt, rust, and hardened concrete.

B. Earth forms are not permitted for paving.

2.2 REINFORCEMENT

A. Comply with the following as minimums:
   1. Bars: ASTM A615, grade 60,
   2. Welded wire fabric: ASTM A185.
   3. Bending: ACI318.

B. Fabricate reinforcement to the required shapes and dimensions, with fabrication tolerances complying with the CRSI "Manual of Standard Practices". Do not use reinforcement having any of the following defects:
   1. Bar lengths, depths, or bends exceeding the specified fabricating tolerances;
   2. Bends or kinks not indicated on the Drawings or required for the work;
   3. Bars with cross-section reduced due to excessive rust or other causes.

C. Joint reinforcement:
   1. Dowel bars shall be plain bars.
   2. Tiebars shall be deformed bars.
   3. Dowel bars and tiebars shall be of sizes indicated in the Project Drawings.

2.3 CONCRETE

A. Comply with the following as minimums:
   1. Portland cement: ASTM C150, type I or II, low alkali.
   2. Aggregate, general:
      a. ASTM C30, uniformly graded and clean;
   3. Aggregate, coarse: Crushed rock or washed gravel with maximum size between ¾" and 1-1/2", and with minimum size number 4.
   4. Aggregate, fine: Natural washed sand of hard and durable particles varying from fine to particle passing a 3/8" screen, of which at least 12% shall pass a 50-mesh screen.
   5. Water: Clean and potable.
   6. 4" Max Slump
   7. W/CM Ratio of equal or less than 0.52
   8. Air-Entraining Ad Mixture shall meet ASTM C260, and shall be between 4 and 8 percent.

B. Use only such additives as are recommended in the mix design

2.4 MEMBRANE-FORMING CURING COMPOUNDS

A. Comply with ASTM C 309, Type 2, Class A.

2.5 ISOLATION JOINT MATERIAL

B. Comply with ASTM D 1751 or ASTM D 1752.

2.6 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper elimination of the work. Do not proceed until satisfactory conditions are corrected.

3.2 FINAL PREPARATION OF SUBGRADES

A. After preparation of subgrade as specified in Section 321214 - Subgrade and Roadbed, thoroughly scarify and sprinkle the entire area to be paved, and then compact to a smooth, hard, even surface of 95% compaction to receive the aggregates.

3.3 PLACEMENT OF BASE COURSE

A. Base:
   1. Spread the specified coarse aggregate to a thickness providing the compacted thickness shown on the Drawings or 4 inch thick if not shown.
   2. Compact to 95%.

B. Thickness Tolerance: Provide the compacted thickness within a tolerance of minus 0.0" to plus 0.5".

C. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 0.05 feet vertically and 1 inch in alignment at any point.

D. Correct deviations by removing materials, replacing with new materials, and reworking or recompacting.

E. Use only the amount of moisture needed to achieve the specified compaction.

3.4 INSTALLATION

A. Upon completion of base course and formwork, install reinforcement.
   1. Clean reinforcement to remove loose rust and mill scale, earth, and other materials that reduce bond or destroy bond with concrete.
   2. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placement operations.
   3. Place reinforcement to obtain the required coverages for concrete protection.

B. Transmit mix the concrete in accordance with provisions of ASTM C94.
   1. With each load, provide ticket certifying to the materials and quantities and to compliance with the mix design.
   2. On the transit-mix ticket, state the time water was first added to the mix.
   3. At the batch plant, withhold 2-1/2 gal of water per cu yd of concrete.
   4. Upon arrival at the job site, and as directed by the testing laboratory inspector, add all or part of the withheld water before the concrete is discharged from the mixer.
   5. Mix not less than five minutes after the withheld water has been added, and not less than one minute of that time immediately prior to discharge of the batch.
   6. Provide 15 minutes total mixing time per batch after first addition of water.

C. Do not use concrete that has stood over 30 minutes after leaving the mixer, or concrete that is not placed within 60 minutes after water is introduced into the mix.

D. Conveying:
   1. Place concrete in accordance with the following and pertinent recommendations contained in ACI 304.
   2. Deposit concrete continuously in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or places of weakness within the section.
   3. If a section cannot be placed continuously, provide construction joints as specified herein.
   4. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic.
   5. Deposit concrete as nearly as practicable in its final location so as to avoid segregation due to rehandling and flowing.
   6. Do not subject concrete to any procedure which will cause segregation.
   7. Do not use concrete which becomes non-plastic and unworkable, or does not meet required quality control limits, or has been contaminated to foreign materials.
   8. Remove any rejected concrete from the site.

E. Deposit and consolidate concrete in a continuous operation within the limits of construction joints until the placing of a panel or section is completed.
   1. Bring surfaces to the correct level with a straightedge, and then strike off.
   2. Use bullfloats or darbies to smooth the surface. Do not disturb the surfaces prior to start of finishing operations.

F. Finishing:
   1. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
   2. During or after the first floating, check the planeness of surface with a ten foot straightedge applied at not less than two different angles.
   3. Cut down high spots and fill low spots, and produce a surface level within ¼" in two feet as determined by a two foot straightedge placed anywhere on the surface in any direction.
   4. Re-float the surface immediately to a uniform sandy texture.
   5. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
      a. Unless otherwise directed by the Architect, provide the texturing in one direction only.
      b. Provide "light", "medium", or "coarse" texturing as directed by the Architect.

3.5 JOINTING

A. Construct joints at locations, depths, and with dimensions indicated on the Project Drawings.

B. The Contractor shall submit drawings describing jointing requirements:
   1. Indicate locations of all contraction joints, construction joins, and isolation joints. Locate joints at 12 feet on-center.
   2. The larger dimension of any panel shall not exceed 125 percent of the smaller dimension.
   3. The minimum angle between any two intersecting joints shall be 80 degrees.

4. Joints shall intersect pavement free edges at a 90 degree angle and shall extend straight for a minimum of 1.5 feet from the pavement edge
5. Align joints of adjacent panes. Align joints in attached curbs with joints in pavement.
6. Describe joint depths, widths, and keyway dimensions.
7. Use isolation joints only where pavement abuts buildings, foundations, manholes, and other fixed objects.

C. Construct contraction joints by one of the following methods:
1. Insert plastic strips vertically into the fresh concrete. Depress strips into pavement until flush with surface.
2. Saw-cut concrete after concrete has hardened sufficiently to prevent aggregate being dislodged and soon enough to control pavement cracking. If contraction joint sawing causes a crack, discontinue sawing that contraction joint and continue sawing other contraction joints.

D. Isolation joints:
1. Extend isolation joints through the full depth of the pavement. Fill the entire isolation joint with isolation joint material.
2. Do not permit reinforcement to extend continuously through any expansion joint.
3. Locate isolation joints at all beginning and ending of curves, filled to full depth with expansion joint material.
4. In curbs, locate ½" thick joint at the beginning and end of curves, and at a maximum of 40' centers elsewhere unless otherwise shown on the plans.
5. In curbs and paving, hold down ½" and seal exposed joints with a joint sealer.

3.6 CURING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

B. Apply membrane-forming curing compound to all exposed surfaces at a maximum coverage rate of 200 sq.ft./gal. Apply curing compound immediately after final surface texture has been obtained and water sheen has disappeared. Apply curing compound to pavement edges after forms have been removed.

C. Alternate curing methods may be used when specified and approved by the engineer.

3.7 TOLERANCES

A. The entire site is subject to frequent pedestrian traffic, and is subject to the guidelines presented in the Americans with Disabilities Act. Where stated on plans or where required by the ADA, the slopes are not to exceed the maximums set forth in this act.

END OF SECTION

SECTION 321600 - CONCRETE CURBS, GUTTERS AND SIDEWALKS

PART 1 - GENERAL

1.01 Description

A. Section Includes: Concrete curbs, gutters and sidewalks.
B. Related Work:
   1. Section 321313 Concrete Paving
   2. Section 321215 Aggregate Base

1.02 Submittals

A. Submit Product Information and Mix Design, Certification, Test Results, and Source of Expansion Joint Filler.

PART 2 - PRODUCTS

2.01 Forms

A. Materials for curb and gutter shall be 2-inch dressed dimension lumber or of metal of equal strength, free from defects which would impair the appearance or structural quality of the completed curb. Where short- radius forms are required, 1-inch dressed lumber or plywood may be used. Form material for the face of the curb shall not have any horizontal joints closer than seven inches from the top of the curb. Provide stakes and bracing materials as required to hold forms securely in place.
B. Materials for sidewalks shall be 2-inch dressed dimension lumber, straight and free of defects, or standard metal forms. Where short radius forms are required, 1-inch dressed lumber of plywood may be used. Provide stakes and bracing material as required to hold forms securely in place.

2.02 Crushed Rock Base

A. Clean 3/4 inch minus crushed rock or crushed gravel, free from foreign material and meeting the requirements of Section 321215 – Aggregate Base.

2.03 Expansion Joint Filler

A. Expansion joint filler shall be 1/2 inch thick, premolded joint filler material. It shall consist of premolded strips of a durable resilient material. Premolded joint filler shall be one of the following:
   1. Preformed Expansion Joint Filler (Bituminous) conforming to ASTM D 994.
   2. Nonextruding and Resilient Filler (Bituminous) conforming to ASTM D 1751.

2.04 Concrete

A. Concrete shall be ready-mixed, conforming to ASTM C 94, Alternate 2, and shall have a compressive strength of 3,000 psi at 28 days. Maximum size of aggregate shall be 1-1/2 inch. Slump shall be between two and four inches. Submit complete information regarding mix to the Engineer for review, in accordance with the requirements of the referenced ASTM Specifications.

2.05 Curing Compound

A. Liquid membrane-forming curing compound shall be clear or translucent, suitable for spray application and shall conform to ASTM C 309, Type 1.

PART 3 - EXECUTION

3.01 Excavation and Backfill

A. Perform all excavation and backfill required to accomplish the construction. After concrete forms have been removed and all debris cleaned up from the areas to be filled, place backfill from excavation in six inch lifts to grade and compact each lift thoroughly with pneumatic tamper or other suitable equipment to prevent future settlement. Dispose of all excess excavation offsite.

3.02 Preparation of Subgrade

B. Bring the area on which curbs, gutters and sidewalks to be constructed to required grade on undisturbed ground and compact by sprinkling and rolling or mechanical tamping. As depressions occur, refill with suitable material and recompact until the surface is at the proper grade. Subgrade shall be compacted to 95% of maximum density at optimum moisture content as determined by ASTM D 1557, Method C. Refer to the project's geotechnical investigation report for specific preparation requirements.

3.03 Setting Forms

A. Construct forms to the shape, lines, grades and dimension called for on the Drawings. Stake wood or steel frames securely in place, true to line and grade.

B. Forms on the face of the curb shall not have any horizontal joints within seven inches of the top of the curb. Brace forms to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement. Construct short-radius curved forms to exact radius. Tops of forms shall not depart from gradeline more than 1/8 inch when checked with a 10 foot straight edge. Alignment of straight sections shall not vary more than 1/8 inch in 10 feet.

3.04 Curb Construction

A. Place preformed asphalt-impregnated expansion joints at intervals not exceeding 40 feet and at the beginning and end of curved portions of the curb; also at connections to existing curbs.

B. Place weakend plane joints in the curb at intervals not exceeding 10 feet. Place, process, finish and cure concrete in accordance with the applicable requirements of ACI 614, and this Specification. Wherever the requirements differ, the higher shall govern. After initial set has occurred in the concrete and prior to removing the front curb form, the steel sheet shall be removed with a sawing motion. Finish top of curb with a steel trowel and finish edges with a steel edging tool.

C. As soon as the concrete has set sufficiently to support its own weight, remove the front form and finish all exposed surfaces. Finish formed face by rubbing with a burlap sack or similar device that will produce a uniformly textured surface, free of form marks, honeycomb and other defects. All defective concrete shall be removed and replaced at the Contractor's sole expense. Upon completion of the finishing, apply acuring compound to exposed surfaces of the curb. Curing shall continue for a minimum of five days.

D. Upon completion of the curing period, but not before seven days has elapsed since pouring the concrete, backfill the curb with earth, free from rocks two inches and larger and other foreign material. Tamp backfill firmly in place.

E. Finished curb shall present a uniform appearance for both grade and alignment. Remove any section of curb showing abrupt changes in alignment or grade, or which is more than 1/4 inch away from its location as staked, and construct new curb in its place at the Contractor's sole expense.

3.06 Sidewalk Construction

A. Sidewalks shall be a minimum of four inches thick in walk areas and six inches thick in driveway areas.

B. At locations where the new sidewalk is to abut existing concrete, sawcut concrete for a depth of two inches and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just prior to pouring the new sidewalk.

C. Place preformed asphalt expansion joints as in the adjacent curb, where the sidewalk ends at a curb, and around posts, poles, or other objects protruding through the sidewalk.

D. Provide weakend plane joints transversely to the walks at locations opposite the contraction joints in the curb. Plastic pulltop quickjoint strips or equal at 1-1/2 inch deep

E. Place, process, finish and cure concrete in conformance with the applicable requirements of ACI 614 and this Specification. Where the requirements differ, the higher shall govern.

F. At a minimum, broom the surface with a fine-hair broom at right angles to the length of the walk and tool at all edges, joints and markings or surface finish. Mark the walks transversely at five-foot intervals with a jointing tool. Upon completion of the finishing, apply a curing compound to the exposed surfaces. Protect the sidewalk from damage for a period of seven days.

END OF SECTION

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AMERISTAR® PERIMETER SECURITY USA INC.
Montage II® - Heavy Industrial Steel Ornamental Fence System – Fusion Welded and Rackable
CONSTRUCTION SPECIFICATION - SECTION 32 31 19

PART 1 - GENERAL

1.01 WORK INCLUDED

The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system defined herein at Sunkist Elementary School Sitework Improvements Project.

1.02 RELATED WORK

Section 31 20 00 - Earthwork
Section 32 13 13 - Concrete

1.03 SYSTEM DESCRIPTION

The manufacturer shall supply a total fence system of Montage II® ***Welded and Rackable*** (ATF – All Terrain Flexibility) Ornamental Steel Genesis™ design. The system shall include all components (i.e., panels, posts, gates and hardware) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

- ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus.
- ASTM D523 - Test Method for Specular Gloss.
- ASTM D714 - Test Method for Evaluating Degree of Blistering in Paint.
- ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.
- ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

1.06 SUBMITTAL

The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

1.08 PRODUCT WARRANTY

A. All structural fence components (i.e. rails, pickets, and posts) shall be warranted within specified limitations, by the manufacturer for a period of 20 years from date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling, chipping, blistering or corroding.

B. Reimbursement for labor necessary to restore or replace components that have been found to be defective under the terms of manufactures warranty shall be guaranteed for five (5) years from date of original purchase.

PART 2 - MATERIALS

2.01 MANUFACTURER

The fence system shall conform to Montage II® ***Welded and Rackable*** (ATF – All Terrain Flexibility) Ornamental Steel, Genesis™ design, extended picket bottom rail treatment 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.02 MATERIAL

A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi (310 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/ft2 (276 g/m2), Coating Designation G-90.

B. Material for pickets shall be 1" square x 14 Ga. tubing. The rails shall be steel channel, 1.75" x 1. 75" x .105". Picket holes in the rail shall be spaced 4.715" o.c. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.03 FABRICATION

A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.

B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

C. The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 (Note: The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408).

D. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.

E. Swing gates shall be fabricated using 1.75" x 14ga Forerunner double channel rail, 2" sq. x 12ga. gate ends, and 1" sq. x 14ga. pickets. Gates that exceed 6' in width will have a 1.75" sq. x 14ga. intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates will be welded at each upright to rail intersection. Cable kits will be provided for additional trussing for all gates leaves over 6'.

F. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48" width. Integrated hinge-closer set (2 qty) shall be ADA compliant that shall include a variable speed and final snap adjustment with compact design (no greater than 5" x 6" footprint). Hinge-closer set (2 qty) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 lbs. and maximum weight load capacity of 1,500 lbs. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (.5" - 1.375") and vertical (0 - .5"). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 F to 200 F degrees, and swings to negative 2 degrees to ensure reliable final lock engagement.

PART 3 - EXECUTION

3.01 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 FENCE INSTALLATION

Fence post shall be spaced according to Table 3, plus or minus ½". For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.03 FENCE INSTALLATION MAINTENANCE

When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces; 1) Remove all metal shavings from cut area. 2) Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry. 3) Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint

pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufactures' warranty.

3.04 GATE INSTALLATION

Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.

3.05 CLEANING

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 – Minimum Sizes for Montage II Posts

Fence Posts	Panel Height
2-1/2" x 12 Ga.	Up to & Including 6' Height
3" x 12 Ga.	Over 6' Up to & Including 8' Height

Gate Leaf	Gate Height		
	Up to & Including 4'	Over 4' Up to & Including 6'	Over 6' Up to & Including 8'
Up to 4'	2-1/2" x 12 Ga.	3" x 12 Ga.	3" x 12 Ga.
4'1" to 6'	3" x 12Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	3" x 12 Ga.	4" x 11 Ga.	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
10'1" to 12'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
12'1" to 14'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"
14'1" to 16'	6" x 3/16"	6" x 3/16"	6" x 3/16"

Table 2 – Coating Performance Requirements

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 1,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Montage II – Post Spacing By Bracket Type

Span	For INVINCIBLE® 8' Nominal (91-1/2" Rail)				For CLASSIC, GENESIS, & MAJESTIC 8' Nominal (92-5/8" Rail)					
Post Size	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"	2-1/2"	3"
Bracket Type	Industrial Flat Mount (BB301)*		Industrial Line 2-1/2" (BB319) 3" (BB320)		Industrial Universal 2.5" (BB302) 3" (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± ½" O.C.	94-1/2"	95"	94-1/2"	95"	96"	96-1/2"	96"	96-1/2"	*96"	*96-1/2"

*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel. When using the BB301 flat mount bracket for Invincible style, rail may need to be drilled to accommodate rail to bracket attachment.

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SECTION 32 31 20

CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Chain-Link Fences: Industrial.
   2. Gates: Horizontal Slide

B. Related Section s include the following:
   1. Division 3 Section "Cast-in-Place Concrete" for concrete post concrete fill.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
   1. Fence and gate posts, rails, and fittings.
   2. Chain-link fabric, reinforcements, and attachments.
   3. Gates and hardware.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, swing gate,, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

C. Samples for Initial Selection: Manufacturer's color charts or 6-inch lengths of actual units showing the full range of colors available for components with factory-applied color finishes.

D. Samples for Verification: For each type of chain-link fence and gate indicated.
   1. Polymer-coated steel wire (for fabric) in 6-inch lengths.

E. Product Certificates: For each type of chain-link fence, and gate, signed by product manufacturer.
   1. Strength test results for framing according to ASTM F 1043.

F. Qualification Data: For Installer.

G. Maintenance Data: For the following to include in maintenance manuals:
   1. Polymer finishes.

1.5 QUALITY ASSURANCE

A. Reference Standards:
   1. 2016 Building Standards Administrative Code, Part 1, CBSC.
   2. 2016 California Building Code (CBC), Part 2, CBSC (2015 IBC & California Amendments).
   3. 2016 California Fire Code, Part 9, CBSC (2015 International Fire Code & California Amendments).
   4. 2016 California referenced Standards, Part 12 CBSC.
   5. Title 19 C.C.R., Public Safety, SFM Regulations.
   6. Americans with Disabilities Act (ADA), Title II or Title III.

B. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

B. Interruption of Existing Utility Service: Do not interrupt utility services to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Architect no fewer than 2 days in advance of proposed interruption of utility services.
   2. Do not proceed with interruption of utility services without Architect's written permission.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chain-link fences and gates that fails in materials or workmanship within specified warranty period.
   1. Warranty Period: 2 years.

B. Installer's Warranty: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Chain-Link Fences and Gates: Subject to compliance with requirements, provide products by one of the following.
   1. Ameristar.
   2. Master-Halco.
   3. Anchor Fence.
   4. Merchants Metals.
   5. Or equal.

2.2 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
   1. Steel Wire Fabric: Polymer-coated wire with 9 gage (0.144 inches) core thickness.
      a. Mesh Size: 2 inches.
      b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
      c. Polymer Coating:
         1) Permafused II by Master Halco or equal.
         2) ASTM D 668, Class 2b, fluidized PVC bonded and cured onto metallic-coated steel wire.
         3) Color: As selected by Architect from manufacturer's full range, complying with ASTM F 934.
   2. Selvage: Knuckled at both selvages.

2.3 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, and the following:
   1. Group: Group IC round high yield pipe, ASTM F 1043, domestic (not imported) Deluxe Quality (DQ-40) Industrial (not Schedule 40).
   2. Fence Height: As indicated on Drawings.
   3. Strength Requirement: Heavy industrial according to ASTM F 1043.
   4. Post Diameter and Thickness:
      a. Top and Bottom Rail: 1-5/8 inch O.D. (nominal 1-1/4 inch).

b. Terminal Post (Corner, End, and Gate Post): 2-7/8 inch O.D. (nominal 2-1/2 inch).
c. Line and Brace Rail: 1-7/8 inch O.D. (nominal 1-1/2 inch).
d. Swing Gate Members: 1-7/8 inch O.D. (nominal 1-1/2 inch).
e. Horizontal-Slide Gate Post: [**According to ASTM F 1184.**]
   1) Openings up to 12 Feet Steel post, 2.875-inch diameter, and 4.64-lb/ft. weight.
   2) Openings Wider Than 12 Feet Steel post, 4-inch diameter, and 8.65-lb/ft. (weight.
   3) Guide posts for Class 1 horizontal-slide gates equal the gate post height, 1 size smaller, but weight is not less than 3.11 lb/ft. installed adjacent to gate post to permit gate to slide in space between.
f.

5. End and Corner Post Top: Dome.
6. Coating for Steel Framing:
   a. Metallic Coating:
      1) Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123 or 4.0-oz./sq. ft. zinc coating per ASTM A 653.
      2) Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
      3) External, Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- thick, zinc pigmented coating.
      4) Type C, Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. coating.
      5) Coatings: Any coating above.
   b. Polymer coating over metallic coating.

2.4 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:
   1. Location: Extended along bottom of fence fabric and along top when either top or bottom rails are not indicated on Drawings.

B. Metallic-Coated Steel Wire: Minimum 0.177-inch- diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:
   1. Metallic Coating: Matching chain-link fabric coating type and weight.

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Post and Line Caps: Provide for each post.
   1. Line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.

D. Rail Fittings: Provide the following:
1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.

G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
a. Hot-Dip Galvanized Steel: 0.148-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.

I. Finish:
1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.
2. Polymer coating over metallic coating.

2.6 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

2.7 POLYMER FINISHES

A. Supplemental Color Coating: In addition to specified metallic coatings for steel, provide fence components with polymer coating.

B. Metallic-Coated Steel Tension Wire: PVC-coated wire complying with ASTM F 1664, Class 2b.

C. Metallic-Coated Steel Framing and Fittings: Comply with ASTM F 626 and ASTM F 1043 for polymer coating applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces.
   1. Polymer Coating: Not less than 10-mil- thick PVC or 3-mil- thick polyester finish.

D. Color: Match chain-link fabric, complying with ASTM F 934.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
   1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

B. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
   2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
      a. Hole diameter dug or drilled minimum 4 times largest cross section of post and minimum depth of 24 inches plus additional 3 inch for each 1 feet increase in fence height over 4 feet.
      b. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.

C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

D. Line Posts: Space line posts equidistant at intervals not exceeding 10 feet o.c unless otherwise indicated.

E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
   1. Locate horizontal braces at midheight of fabric 6 feet or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.
   1. Top Tension Wire: Install tension wire through post cap loops.
   2. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.

G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.

H. Bottom Rails: Install, spanning between posts.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches o.c.

K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
   1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 32 31 20

SECTION 331000 - WATER UTILITIES

PART 1 - GENERAL

1.01 Description

A. Work included: Provide water distribution system as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Section 330010:Trenching, Backfilling, and Compacting

1.02 Quality Assurance

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 Submittals

A. Comply with pertinent provisions of Division 1.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, or within the timeframe specified in the Division 1 section, whichever is shorter, submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Names and addresses of the nearest service and maintenance organization that readily stocks repair parts.
4. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 Product Handling

A. Comply with pertinent provisions of Section 016000 – Product Requirements.

PART 2 - PRODUCTS

2.01 Pipe and Fittings

A. General:

1. Assume connection point to building service lines as being approximately five feet outside buildings and structures to which service is required.
2. Pipe materials 3" size and larger: Use plastic (PVC) pipes unless otherwise indicated or approved in advance by the Engineer.
3. Pipe materials less than 3" size: Use plastic or galvanized steel.

B. Pipe:
1. Cast iron pipe:
   a. Comply with ANSI A-21.6 or ANSI A-21.8, with working pressure of not less than 150 psi unless otherwise shown or specified.
   b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
2. Ductile iron pipe:
   a. Comply with ANSI A-21.51, with working pressure of not less than 150 psi unless otherwise shown or specified.
   b. Use cement mortar lining complying with ANSI A-21.4 or AWWA C205, standard thickness.
3. Plastic pipe:
   a. Use acrylonitrile-butadine-styrene (ABS) complying with ASTM D15527; or
   b. Use polyvinyl-chloride (PVC) complying with ASTM D1785, schedule 40.
4. Galvanized steel:
   a. Use schedule 40 steel pipe risers and fittings, with PVC or ABS couplings below grade to steel risers for hose bibbs, and complying with ASTM A120.
5. Fire Line:
   a. Use polyvinyl-chloride (PVC) complying with ANSI/AWWA C900, DR 14 (Class 200).

C. Joints
1. Cast iron or ductile iron pipe:
   a. Use mechanical joints of the stuffing-box type complying with ANSI A-21.11 as modified by ANSI A-21.51 for ductile iron pipe, with push-on joints complying with ANSI A-21.11 for cast iron, and ANSI A-21.51 for ductile iron;
   or
   b. Use rubber gaskets and lubricant complying with applicable requirements of ANSI A-21.11.
2. Plastic Pipe:
   a. Use solvent cement for PVC joints complying with ASTM D2564.
   b. Use solvent cement for ABS joints complying with ASTM D2235.
3. Steel pipe fittings 2-1/2" of less in diameter:
   a. Use malleable iron bonded screw fittings, manufactured to standards of ANSI B-16.3.
   b. Use unions, which are screwed, malleable iron, ground joint, 300 lb AAR, with bronze-to-iron seat.

4. Insulating joints:
   a. Provide between non-threaded ferrous and non-ferrous metallic pipe, fittings, and valves.
   b. Use sandwich type flange insulating gasket of the dielectric type, insulating washers, and insulating sleeves for flange bolts.
   c. Use full faced insulating gaskets with outside diameter equal to the flange outside diameter.
   d. Use full length bolt insulating sleeves.
   e. Install in a manner to prevent metal-to-metal contact of dissimilar metallic piping elements.
5. Make connections between asbestos cement pipe and cast iron fittings and valves, with jointing materials, which comply with AWWA C603.

D. Fittings and specials:
1. Cast iron pipe and ductile iron pipe:
   a. Use fittings and specials suitable for 150 psi pressure rating unless otherwise specified.
   b. For use with mechanical joint pipe, comply with ANSI A-21.10.
   c. For use with push-on joint pipe, comply with ANSI A-21.10 and ANSI A-21.11.
   d. Use cement mortar lining complying with ANSI A-21.4, standard thickness.
2. Plastic pipe:
   a. Use fittings and specials suitable for schedule 40 rating, unless otherwise specified or directed.
   b. Use fittings and specials for PVC pipe complying with ASTM D2468.
   c. For threaded PVC fittings, use schedule 80.
3. Steel pipe: Comply with ANSI B-16.3, using fittings and specials made for steel pipe.

E. Valves
1. Gate valves:
   a. Use gate valves designed for a working pressure or not less than 150 psi.
   b. Provide connections as required for the piping in which they are installed.
   c. Provide a clear waterway equal to the full nominal diameter of the valve, openable by turning counter clockwise.
   d. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.
   e. Valves smaller than 3":
      1) Provide all bronze, screwed, single wedge disc, screw-in bonnet, packing gland, and nut, with non-rising stem.
      2) Buried valves: Provide 2" operating nuts and in a suitable valve box with extension and marked cover.
      3) Provide tee handle socket operating wrenches of suitable size.
2. Check valves:

a. Use check valves designed for a working pressure of not less than 150 psi, or as indicated or directed, with a clear waterway equal to the full nominal diameter of the valve.
b. Use valves designed to permit flow in one direction, when the inlet pressure is greater than the discharge pressure, and to close tightly to prevent return flow when discharge pressure exceeds inlet pressure.
c. Distinctly cast on the body of each valve:
(1) Manufacturer's name, initials, or trademark by which he can be identified readily;
(2) Valve size;
(3) Working pressure;
(4) Direction of flow.
d. Valves 2" and smaller: Provide all bronze, designed for screwed fittings.
e. Valves larger than 2":
(1) Provide iron body, bronze mounted, with flanged ends, of the non-slam type;
(2) Provide class 125 flanges complying with ANSI B-16.1.

F. Service Fittings:
1. PVC mains smaller than 2" in diameter:
a. Make ¾" maximum service with tees or plastic valve tees.
b. Acceptable products:
(1) As manufactured by Mueller Company, Decatur, Illinois.
(2) Or approved equal.
2. PVC mains 2" to 3-1/2" in diameter: For ¾" service to 1" service, use bronze service clamp and bronze corporation stop designed for PVC pipe.
3. Service clamps and corporation stops:
a. Use bronze.
b. Provide service clamp with flattened straps and molded neoprene gaskets.
4. Services larger than those stated above: Make with standard tees on new lines, and tapping tees on existing lines.

2.02 Tapping Sleeves

A. Provide sleeve type coupling for existing water mains, furnished with outlet flanged to American 125 standard (ASA series 15):
1. Acceptable products:
a. Clow Corporation, Corona, California; boltless type:
(1) Model C1 series for existing cast iron mains, complying with AWWA class A;
(2) Model CA for class 150 and class 200 existing asbestos cement mains.
b. Or approved equal.
2. Coordinate requirements of tapping sleeves with gate valves and other fittings as required.

2.03 Valve Boxes

A. Valves 3" and larger:
   1. Use service box of cast iron, extension type of the required length, with screw adjustment.
   2. Provide the word "WATER" cast into cover.
   3. Acceptable products:
      a. Alhambra Foundry Company, Alhambra, California.
         (1) For valves 6" and smaller: Model A-3004;
         (2) For valves 8" and larger: Model 3005.
      b. Or approved equal.

B. Valves 2-1/2" and smaller:
   1. Use precast concrete box with the word "WATER" cast into the cover.
   2. Provide risers on pipe line to place valve within box depth.
   3. Acceptable products:
      a. Manufactured by Brooks Products, Inc., El Monte, California.
      b. Or approved equal.

PART 3 - EXECUTION

3.01 Surface Conditions

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 Field Measurement

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.03 Handling

A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition:
   1. Carry pipe into position; do not drag.
   2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.

B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other method approved by the Engineer.

C. Before installation, inspect each piece of pipe and each fitting for defects;
   1. Material found to be defective before or after laying: Replace with sound material meeting the specified requirements, and without additional cost to the Owner.

3.04 Pipe Cutting

A. Cut pipe neatly and without damage to the pipe.
B. Unless otherwise recommended by the pipe manufacturer, and authorized by the Engineer, cut pipe with mechanical cutter only.
   1. Use wheel cutters when practicable.
   2. Cut plastic pipe square, and remove all burrs.

3.05 Locating

A. Locate water pipe at least ten feet away, horizontally, from sewer pipes.
   1. Where bottom of the water pipe will be at least 12" above the top of the sewer pipe, locate water pipe at least six feet away, horizontally, from the sewer pipe.
B. Where water lines cross under gravity-flow sewer lines, fully encase the sewer pipe in concrete for a distance of at least ten feet each side of the crossing, or provide pressure pipe with no joint located within 36" of the crossing.
   1. Cross water lines in cases above sewage force mains or inverted siphons at least 24" above the sewer line.
   2. Encase in concrete those joints in the sewer main closer, horizontally, than 36" to the crossing.
C. Do not place water lines in the same trench with sewer lines or electric wiring.

3.06 Joint Deflection

A. Cast iron pipe:
   1. Maximum allowable deflection will be given in AWWA C600.
   2. Table I shows maximum deflections for 18 foot lengths of pipe. For other lengths, deflection may vary proportionately.
   3. If alignment requires deflection exceeding limits shown in Table I, furnish special bends or a sufficient number of shorter lengths of pipe to provide angular deflections within the limits shown.
   4. Table I, deflection in inches:

Diameter:	Push-on joint pipe:	Mechanical joint pipe:
3"	19"	31"
4"	19"	31"
6"	19"	27"
8"	19"	10"

B. Plastic pipe: Unless a lesser amount is recommended by the pipe manufacturer, maximum allowable deflections from a straight line or grade, or offsets, will be five degrees.

3.07 Placing and Laying

A. General:
   1. Lower pipe and accessories into trench by means of derrick, ropes, belt, slings, or other equipment approved by the Engineer.

2. Do not dump or drop any of the materials of this Section into the trench.
3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
5. Take up and relay pipe that has the grade or joint disturbed after laying.
6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
7. Securely close open ends of pipe, fittings, and valves when work is not in progress.
8. Where any part of coating or lining is damaged, repair to the approval of the Engineer and at no additional cost to the Owner.

B. Plastic pipe:
1. Position the pipe and fittings in trench in a manner that identifying markings will be readily visible for inspection.
2. Cutting and joining:
   a. Protect against abrasion from serrated holding devices.
   b. Remove burrs and glosses from surfaces to be jointed; use abrasive paper, file, or steel wool.
   c. Remove dirt, dust, and moisture by wiping clean with chemical cleaner or dry cloth.
   d. Using a pure bristle paint brush, apply an even coat of the specified solvent cement in the fitting socket and on the surface of the pipe to be joined.
   e. Promptly insert pipe into bottom of the fitting socket; turn the pipe slightly to assure an even distribution of cement.
   f. Remove excess solvent cement from exterior of the joint.
   g. Should cement begin to dry before the joint is made, reapply cement before assembling.
   h. Allow at least one hour for the joint to gain strength before handling or installing the pipe.
3. Do not thread plastic pipe; make connections only with the solvent cement or with special adapter fittings designed for the purpose.
4. Align pipe system components without strain.
5. Support piping at intervals of not more than four feet, at ends, branch fittings, and change of direction or elevation.
6. Support plastic pipe in trenches with a 3" layer of sand. Allow no rocks, debris, or potentially damaging substances within 6" of plastic pipe in trenches.
7. Provide an electrically continuous type TW insulated number 14 tracer wire in the trench along the pipe, fastened to the pipe at 20 foot intervals, and terminating aboveground with a 12" lead taped around each riser.

D. Connections: Use specials and fittings to suit the actual conditions where connections are made between new work and existing mains. Use only those specials and fittings approved by the utility having jurisdiction.

E. Sleeves:

1. Where pipe passes through walls of valve pits or structures, provide cast iron wall sleeves one size larger than pipe diameter.
2. Fill annular space between walls and sleeves with rich cement mortar.
3. Fill annular space between pipe and sleeves with mastic.

3.08 Jointing

A. Other joints:
1. Cast iron pipe, ductile iron pipe, mechanical joints, and push-on type joints: Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer to provide for special requirements of ductile iron pipe
2. Make connections between different types of pipe and accessories with transition fittings.
3. Rubber gaskets: Handle, lubricate where necessary, and install in strict accordance with the recommendations of the manufacturer.

3.09 Setting Valves and Valve Boxes

A. General:
1. Center valve boxes on the valves, setting plumb.
2. Tamp earth fill around each valve box to a distance of four feet on all sides, or to the undisturbed trench face if less than four feet.
3. Tighten stuffing boxes, and fully open and close each valve to assure that all parts are in working condition.

B. Service boxes:
1. Where water lines are located below paved streets having curbs, install boxes directly back of the curbs.
2. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks, and driveways.

3.10 Thrust Blocks

A. General:
1. Provide thrust blocks, or metal tie rods and clamps or lugs, on plugs, caps, tees, and bends deflecting 22-1/2 degrees or more either vertically or horizontally on water lines 4" in diameter or larger.
2. Provide concrete thrust blocking with a compressive strength of 2500 psi in 28 days.

B. Installation:
1. Locate thrust blocking between solid ground and the fitting to be anchored.
2. Unless otherwise shown or directed by the Engineer, place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
3. Sides of thrust blocking not subject to thrust may be placed against forms.
4. Place thrust blocking so the fitting joints will be accessible for repair.

5. Protect steel rods and clamps by galvanizing or by coating with bituminous paint.

3.11 Testing and Inspecting

A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been approved by the Engineer.

B. Hydrostatic tests:
1. Where any section of a water line is provided with concrete thrust blocking for fittings, do not make hydrostatic tests until at least five days after installation of the concrete thrust blocking, unless otherwise directed by the Engineer.
2. Devise a method for disposal of wastewater from hydrostatic tests, and for disinfection, as approved in advance by the Engineer.
3. Backfill and compaction shall be completed prior to the final 2-hour pressure test. Each section of the pipe to be tested shall be slowly filled with water, and all air shall be expelled from the pipe. The release of the air can be accomplished by opening hydrants and service cocks at the high points of the system and the blowoffs at all dead ends. The valve controlling the admission of water into the section of pipe to be tested should be opened wide before shutting the hydrants or blowoffs. After the system has been filled with water and all air expelled, all the valves controlling the section to be tested shall be closed, and the line shall be allowed to set for a period of not less than 24 hours.
4. The pipe shall then be refilled, if necessary, prior to the pressure tests.

C. Pressure tests:
1. After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, subject the newly laid piping and valved sections of water distribution and service piping to a hydrostatic pressure of 150 psi for two hours.
2. Open and close each valve several times during the test.
3. Carefully examine exposed pipe, joints, fittings, and valves.
4. Replace or remake joints showing visible leakage.
   a. Remove cracked pipe, defective pipe, and cracked or defective joints, fittings, and valves. Replace with sound material and repeat the test until results are satisfactory.
   b. Make repair and replacement without additional cost to the Owner.

D. Leakage test:
1. Conduct leakage test after the pressure test has been completed satisfactorily.
2. Duration of each leakage test: At least two hours.
3. During the test, subject water lines to a pressure of 150 psi.
4. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
   a. No piping installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

L = 0.00304 ND x sq. root of P

b. (L = 0.00054 ND x sq root of P); where

c. L = allowable leakage in gallons per hour;

d. N = number of joints in length of pipe under test;

e. D = nominal diameter of pipe in inches; and

f. P = average test pressure in lbs per sq inch.

g. The allowable leakage in gallons per hour, per joint, at 200 psi average test pressure shall be in accordance with Table II.

h. Should any test of pipe disclose leakage greater than that specified in Table II, locate and repair the defective joint or joints until the leakage is within the specified allowance, and at no additional cost to the Owner.

5. Table II:

Diameter:	Leakage in gal:	Diameter:	Leakage in gal:
2"	0.0153	12"	0.0915
3"	0.0231	14"	0.1070
4"	0.0306	16"	0.1225
6"	0.0458	18"	0.1375
8"	0.0610	20"	0.1530
10"	0.0765	24"	0.1830

E. Time for making test:

1. Except for joint material setting, or where concrete reaction backing necessitates a five day delay, pipelines jointed with rubber gaskets, mechanical, or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.

2. Asbestos cement pipe and cement mortar lined pipe may be filled with water as recommended by the manufacturer before being subjected to the pressure test and subsequent leakage test.

F. Disinfection:

1. Before acceptance of the potable water system, disinfect each unit of completed water supply, distribution, and service line in accordance with AWWA C651, latest edition.

2. Perform all such tests and disinfection in a manner approved by governmental agencies having jurisdiction.

3. Furnish two copies of a Certificate of Disinfection to the Engineer.

END OF SECTION

SECTION 333000 -SANITARY SEWER UTILITIES

PART 1 - GENERAL

1.1. Description

A. Provide sanitary sewerage system as needed for a complete and proper installation.

B. Related sections:

1. Division 1 General Requirements
2. Contract General Conditions
3. Supplementary General Conditions
4. Section 330010: Trenching, Backfilling, and Compacting
5. Templeton Community Services District Standard Improvements Specifications and Drawings

1.2. Quality Assurance

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3. Submittals

A. Comply with pertinent provisions of Section 013000 – Submittals

B. Product data: Prior to starting work submit:

1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other date needed to prove compliance with the specified requirements.
3. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.

PART 2 - PRODUCTS

2.1 Pipe and Fittings

A. Polyvinyl chloride pipe and fittings (PVC):
1. Use extra strength, minimum of SDR 35.
2. Comply with ASTM D3034.

2.2 Manholes

A. General:
1. Construct manholes, structures of reinforced concrete or precast reinforce concrete, complete with metal frames and covers or gratings, and with fixed ladder rungs where required. Prefabricated structures may be used when approved by the engineer and University.
2. Rungs: Individual wall-mounted aluminum, plastic-covered steel, or galvanized.

B. Materials:
1. Concrete: Comply with provisions for 3,250 psi concrete specified in Section 321313 Concrete Pavement.
2. Mortar for pipe joints and connections to other drainage structures, and manhole construction.
a. Comply with requirements of ASTM C270, type M, except the maximum placement time shall be one hour.
b. Hydrated line complying with ASTM C141, type B, may be added to the mixture of sand and cement in an amount equal to 25% of the volume of cement used.
c. Provide a quantity of water in the mixture sufficient to produce a stiff workable mortar, which shall be clean and free from harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after water is added to the mix.
3. Precast reinforced concrete manholes:
a. Comply with ASTM C478, precast rings and cone sections.
b. Fully bed the joints between precise concrete risers and tops in mortar, and smooth both interior and exterior surfaces uniformly.
c. Acceptable products:
1. Manufactured by Ameron Pipe Products Group, El Monte, California.
2. Manufactured by Santa Rosa Cast Products Company, 471 West college Avenue, Santa Rosa, CA 95401. Phone: (707) 546-5016, Fax: (707) 571-7768.

3. Manufactured by Associated Concrete Products, Inc., 4301 W. Mac Arthur Boulevard, Santa Ana, CA 92704. Phone: (800) 862-6465, Fax: (714) 540-0538.
4. Approved equivalent.

4. Reinforcement: Provide intermediate grade billet steel complying with ASTM a 615, grade 40.
5. Frames and covers:
   a. Provide all gratings or covers form the same manufacturer/
   b. Provide standard black finish, supplied as a total unit, sized as necessary, and with the wording "SEWER" cast into the cover.
   c. Acceptable products:
      (1) Manufactured by Alhambra foundry, Alhambra, California.
      (2) Approved equivalent.

2.3 Cleanouts

A. Provide cleanouts as required.
   1. Provide traffic weight covers and frames where cleanouts are within traffic areas, with the letters "SSCO" cast into the cover. Clean outs shall be spaced no greater than 150 feet apart.
   2. Products shall be submitted and approved by the Engineer and University.

2.4 Other Materials – Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Design Builder subject to the approval of the Engineer and University.

PART 3 - EXECUTION

3.1 Surface Conditions – Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 Field Measurement – Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 Installation
A. Trench, backfill, and compact for the work of this Section in strict accordance with the pertinent provisions of Section 330010 – Trenching, Backfilling, and Compacting of these Specifications.
B. Location:
   1. Locate the sewer.
      a. Not closer than ten feet from a water supply main or service line.

a. Where the bottom of the water pipe will be at least 12" above the top of the sewer pipe, the horizontal spacing may be a minimum of six feet.
b. Where the gravity flow sewers cross above water lines, fully encase the sewer pipe for a distance of ten feet on each side of the crossing; or
c. Use acceptable pressure pipe with no joint closer horizontally than three feet from the crossing.
d. Where concrete encasement is used, provide not less than 4" thickness including that on pipe joints.

C. Pipe Laying:
1. Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.
2. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of flow.
3. Lay each pipe accurately to the indicated line and grade, aligning so the sewer has a uniform invert.
4. Continually clear interior of the pipe free from foreign material.
5. Before making pipe joints, clean and dry all surfaces of the pipe to be joined.
6. Use lubricants, primers, and adhesives recommended for the purpose by the pipe manufacturer.
7. Place, fit, join, and adjust the joints to obtain the degree of water tightness required.

3.4 Wye Branches

A. Provide wye branches where sewer connections are indicated or required.
1. Where joining an existing line, join by placing a saddle over the line, and make connection in a manner that will not obstruct or interfere with the existing flow.
2. When conditions are such that connection pipe cannot be supported adequately on undisturbed earth or compacted fill, encase the pipe in a concrete backfill, or support on a concrete cradle.

B. Provide concrete required because of conditions resulting from faulty construction methods or negligence, at no additional cost to the Owner.

3.5 Building Connections

A. Terminate building connections where required.
B. Provide temporary closures at terminals where the building pipe is not installed.
1. Place marker post at grade end of plugged line.

2. Where building piping has been installed, make connection to the building piping system.

END OF SECTION

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APPENDIX A

Fire Alarm System Submittal
With Voltage Drop and Battery Calculations

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ABOVE GRADE ENGINEERING

address: 245 Higuera Street
San Luis Obispo, CA 93401
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web: www.abovegradeengineering.com

HUENEME ELEMENTARY SCHOOL DISTRICT

SUNKIST ELEMENTARY SCHOOL
2019 RELOCATABLE (PRE-SCHOOL) CLASSROOM PROJECT

FIRE ALARM SYSTEM SUBMITTAL
WITH
VOLTAGE DROP
AND
BATTERY CALCULATIONS

01/14/2019

A.G.E. Project #16257

BATTERY CALCULATIONS - (N) Fire Alarm Control Panel "FACP-S"

HESD - SUNKIST ELEMENTARY RELOCATABLE (PRESCHOOL)

EQUIPMENT AND MODULES	MANUFACTURER / MODEL	QTY	STANDBY CURRENT DRAW	STANDBY CURRENT TOTAL	ALARM CURRENT DRAW	ALARM CURRENT TOTAL
(N) Main FACP Panel Modules:	**Gamewell / E3**					
Motherboard / 2 SLC / 2 NAC	ILI-MB-E3	1	0.0810	0.0810 Amps	0.1500	0.1500 Amps
LCD Touchscreen Display Module	LCD-SLP	2	0.0300	0.0600 Amps	0.0650	0.1300 Amps
Power Supply	PM-9	1	0.0500	0.0500 Amps	0.0500	0.0500 Amps
Switch / Control Module	ASM-16	1	0.0590	0.0590 Amps	0.0590	0.0590 Amps
DACT Module	DACT-E3	1	0.0180	0.0180 Amps	0.0180	0.0180 Amps
Onboard NAC-1	ILI-MB-E3	1	0.0000	0.0000 Amps	0.0000	0.0000 Amps
Onboard NAC-2 (SPARE)	ILI-MB-E3	1	0.0000	0.0000 Amps	0.0000	0.0000 Amps
Voice Module	INI-VGX	1	0.1500	0.1500 Amps	0.1500	0.1500 Amps
Microphone (Current Draw included in INI-VGX)	INCC-MIC	1	0.0000	0.0000 Amps	0.0000	0.0000 Amps
50 Watt Amplifier (worst case scenario)	AM-50-25	1	0.0860	0.0860 Amps	2.2060	2.2060 Amps
Fiber Loop Module	FSL-E3	1	0.0790	0.0790 Amps	0.0790	0.0790 Amps
ADDRESSABLE DEVICES						
(N) Smoke Detector	Gamewell / ASD-PL2F	5	0.00030	0.00150 Amps	0.00650	0.0325 Amps
Heat Detector 135 Degree	Gamewell / ATD-L2F		0.00030	0.00000 Amps	0.00650	0.0000 Amps
(N) Heat Detector 190 Degree	Gamewell / ATD-HL2F	6	0.00030	0.00180 Amps	0.00650	0.0390 Amps
(N) Manual Pull Station	Gamewell / MS-7ASF	1	0.00030	0.00030 Amps	0.00300	0.0030 Amps
Monitor Module	Gamewell / AMM-2F		0.00038	0.00000 Amps	0.00060	0.0000 Amps
Dual Monitor Module	Gamewell / AMM-2IF		0.00750	0.00000 Amps	0.00570	0.0000 Amps
Control Module	Gamewell / AOM-2RF		0.00038	0.00000 Amps	0.00650	0.0000 Amps
Control Module, Supervised	Gamewell / AOM-2SF		0.00030	0.00000 Amps	0.00030	0.0000 Amps
NOTIFICATION DEVICES						
(N) 15cd Visual (Strobe)	System Sensor / SRL-P	3	0.00000	0.00000 Amps	0.04300	0.1290 Amps
30cd Visual (Strobe)	System Sensor / SRL-P		0.00000	0.00000 Amps	0.06300	0.0000 Amps
75cd Visual (Strobe)	System Sensor / SRL-P		0.00000	0.00000 Amps	0.10700	0.0000 Amps
110cd Visual (Strobe)	System Sensor / SRL-P		0.00000	0.00000 Amps	0.14800	0.0000 Amps
15cd Visual (Combination Speaker/Visual)	System Sensor / SPSRL		0.00000	0.00000 Amps	0.04300	0.0000 Amps
(N) 75cd Visual (Combination Speaker/Visual)	System Sensor / SPSRL	1	0.00000	0.00000 Amps	0.10700	0.1070 Amps
110cd Visual (Combination Speaker/Visual)	System Sensor / SPSRL		0.00000	0.00000 Amps	0.14800	0.0000 Amps
1/8 watt Speaker (Combination Speaker/Visual)	System Sensor / SPSRL		0.00000	0.00000 Amps	0.00500	0.0000 Amps
1/4 watt Speaker (Combination Speaker/Visual)	System Sensor / SPSRL		0.00000	0.00000 Amps	0.01000	0.0000 Amps
(N) 1/2 watt Speaker (Combination Speaker/Visua	System Sensor / SPSRL	1	0.00000	0.00000 Amps	0.02000	0.0200 Amps
1 watt Speaker (Combination Speaker/Visual)	System Sensor / SPSRL		0.00000	0.00000 Amps	0.04000	0.0000 Amps
2 watt Speaker (Combination Speaker/Visual)	System Sensor / SPSRL		0.00000	0.00000 Amps	0.08000	0.0000 Amps
1/8 watt Speaker (Exterior Weatherproof)	System Sensor / SPRK		0.00000	0.00000 Amps	0.00500	0.0000 Amps
1/4 watt Speaker (Exterior Weatherproof)	System Sensor / SPRK		0.00000	0.00000 Amps	0.01000	0.0000 Amps
(N) 1/2 watt Speaker (Exterior Weatherproof)	System Sensor / SPRK	1	0.00000	0.00000 Amps	0.02000	0.0200 Amps
1 watt Speaker (Exterior Weatherproof)	System Sensor / SPRK		0.00000	0.00000 Amps	0.04000	0.0000 Amps
(N) 2 watt Speaker (Exterior Weatherproof)	System Sensor / SPRK	1	0.00000	0.00000 Amps	0.08000	0.0800 Amps
			TOTAL STANDBY	**0.5866 Amps**	**TOTAL ALARM**	**3.2725 Amps**

0.5866	AMPS x	24 HOURS =	14.0784	Amp Hr	STANDBY LOAD
3.2725	AMPS x	15 MIN (0.25hr) =	0.8181	Amp Hr	ALARM LOAD
			14.8965	AMP HR	TOTAL LOAD
			1.20	DERATE FACTOR	
			17.8758	**AMP HOURS**	**REQUIRED**
		(20% MIN SAFETY FACTOR REQUIRED)	**8.1242**	**AMP HOURS**	**SPARE CAPACITY**
			USE	**26**	**AMP HOUR BATTERIES**

Voltage Drop Calculations - Visual NAC's - Fire Alarm Control Panel "FACP-S"

HESD - SUNKIST ELEMENTARY RELOCATABLE (PRESCHOOL)

VISUAL CIRCUIT #1

ID	Device	Manufacturer / Model	Settings	Device Current	Current at Device	Distance	AWG	Panel Voltage	Voltage Drop	Ohm/Foot
V1-01	Visual 15cd (wall)	System Sensor / SRL-P	15 cd	0.043 Amps	0.236 Amps	15 Feet	12 AWG	24	0.014 Volts	0.002010
V1-02	Visual 15cd (wall)	System Sensor / SRL-P	15 cd	0.043 Amps	0.193 Amps	6 Feet	12 AWG	24	0.005 Volts	0.002010
V1-03	Visual 15cd (wall)	System Sensor / SRL-P	15 cd	0.043 Amps	0.150 Amps	8 Feet	12 AWG	24	0.005 Volts	0.002010
V1-04	Visual 75cd (Speaker/Visual Combo)	System Sensor / SPSRL	75 cd	0.107 Amps	0.107 Amps	88 Feet	12 AWG	24	0.038 Volts	0.002010
V1-05			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-06			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-07			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-08			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-09			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-10			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-11			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-12			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-13			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-14			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-15			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-16			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-17			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-18			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-19			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
V1-20			cd	Amps	0.000 Amps	Feet	12 AWG	24	0.000 Volts	0.002010
					0.000					
			Total Current:	**0.236 Amps**	**Total Distance:**	**117 Feet**				

Voltage Drop	**0.062 Volts**
85% OF 24V CIRCUIT VOLTAGE (PER NFPA 72, 10.3.5(1)):	**20.4 Volts**
Voltage at Final Device	**20.3 Volts**
% Voltage Drop	**0.303 %**
MAXIMUM ALLOWED % VOLTAGE DROP:	**10 %**

Voltage & dB Drop Calculations - Speaker NAC's - Fire Alarm Control Panel "FACP-S"

HESD - SUNKIST ELEMENTARY RELOCATABLE (PRESCHOOL)

SPEAKER CIRCUIT #1

ID	Device		Settings	Device Current	Current at Device	Distance	AWG	Panel Voltage	Voltage Drop	Ohm/Foot
S1-01	Speaker 1/2 watt, Exterior Weatherproof	System Sensor / SPRK	0.5 Watts	0.02 Amps	0.125 Amps	63 Feet	12 AWG	24	0.0317 Volts	0.002010
S1-02	Speaker 2 watt	System Sensor / SPRK	2 Watts	0.08 Amps	0.104 Amps	2 Feet	12 AWG	24	0.0008 Volts	0.002010
S1-03	Speaker 1/2 watts (Speaker/Visual Combo)	System Sensor / SPSRL	0.5 Watts	0.02 Amps	0.021 Amps	52 Feet	12 AWG	24	0.0044 Volts	0.002010
S1-04				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-05				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-06				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-07				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-08				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-09				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-10				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-11				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-12				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-13				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-14				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-15				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-16				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-17				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-18				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-19				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
S1-20				Amps	0.000 Amps	Feet	12 AWG	24	0.0000 Volts	0.002010
					0.000					
			Total Current:	**0.125 Amps**	**Total Distance:**	**117 Feet**				

Voltage Drop	**0.037 Volts**
Voltage at Final Device	**24.0 Volts**
% Voltage Drop	**0.154 %**
MAXIMUM ALLOWED % VOLTAGE DROP:	**10 %**

Total Wattage: **3 Watts**

dB drop = 10 x log ((Panel Voltage^2/Total Wattage)/((Panel Voltage^2/Total Wattage)+((Total Distance*2)*Ohms per foot)) **dB Drop: -0.011 dB**

dB drop = 10 x log (1-(2 x (Ohms Per foot x Total Wire Length) / (2 x (Ohms Per foot x Total Wire Length) + (Panel Voltage ^2 / Total Wattage)) **dB Drop: -0.011 dB**

MAXIMUM dB DROP FOR SPEAKER CIRCUIT: 0.5 dB

Honeywell | Analog and Networking Systems

Gamewell FCI

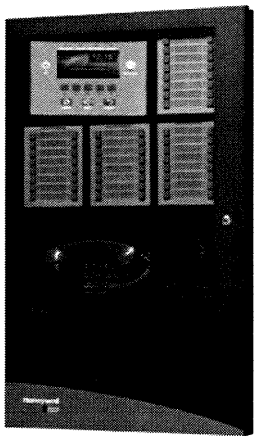
E3 Series® Control Panel

Expandable Emergency Evacuation System

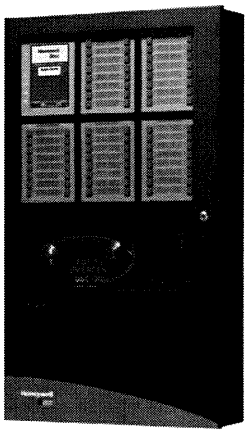
General

The E3 Series® Expandable Emergency Evacuation System by Gamewell-FCI is in the forefront of the latest generation of fire alarm control panels. The E3 Series System is designed for use in virtually any application because it features a modular assembly that is configured per project requirements. Employing the new high-speed Velociti® sensors, the E3 Series provides previously unattainable polling speed and response together with the flexibility demanded by today's emergency evacuation systems. In addition to the sensors' high-speed polling rate, the Velociti Series of sensors feature bi-polar LEDs that flash green for normal polling, and light red steadily to indicate an alarm.

The E3 Series is equipped with an 80-character LCD-E3 alphanumeric LCD display or 4.3" color touchscreen LCD-SLP display. Up to six keyboard LCD displays may be remotely located. In addition, you can install five of the familiar LCD-7100/RAN-7100 remote displays. The displays show instant system status information and can be connected in any desired area of an installation.



E3 Series with LCD-SLP Display



E3 Series with LCD-E3 Display

FEATURES & BENEFITS

- Styles 4, 6, or 7* signaling line circuits
- IBC Seismic Certified
- Listed under UL® Standard 864, 9th Edition
- Listed under UL Standard UL2572 for Mass Notification
- UL Listed for smoke control (dedicated and non-dedicated) when properly configured
- UL Listed and FM Approved for Pre-action/Deluge and Agent Releasing
- Two to 244 SLCs each supporting 159 sensors, 159 modules and 159 addressable sounder bases
- 625K bits per second ARCNET communications using wire, fiber, or mixed configurations for installation flexibility
- High-speed 32 bit processor and 8100 event history log
- Advanced Boolean logic-based programming such as AND, OR, NOT, time delay and calendar functions configurable via computer programming
- Supports up to (16), ASM-16 addressable switch or ANU-48 LED driver modules per ILI-MB-E3/ILI95-MB-E3
- Two Class A, Style Z or Class B, Style Y, notification appliance circuits rated at 2.0 amps. per circuit
- Integral city connection
- Up to 9 levels of sensitivity adjustment
- Flexible 115,200 baud high speed RS-232 interface
- 40 character user-defined text per device
- Supports the following:
  - 15 LCD-SLP displays/ annunciators
  - 6 LCD-E3 displays/ annunciators
  - 5 LCD-7100/RAN-7100 remote LED annunciators per ILI-MB-E3/ ILI95-MB-E3
- Polls 318 devices in less than two seconds
- Activate up to 159 outputs in less than five seconds
- LED's blink associated device address during Walk Test.
- Fully digital, high-precision protocol
- Drift compensation
- Pre-Alarm adjustable between 15 levels for both Alert and Action
- Day/night automatic sensing adjustment
- Sensitivity windows
- Ion 0.05 - 2% obscuration
- Photo 1 - 3% obscuration
- Laser 0.02 - 2% obscuration
- MCS Acclimate 2.5 - 4%, also self-adjustable options: 1-2%, 2-3%, 3-4%
- HARSH 1-3% obscuration
- Each Loop Card has its own integral processor providing maximum survivability on loss of any other component. SLC provides full response on loss of any other system processor
- Optional programmable switches can be configured to enable, disable or group any combination of output devices
- Integrated point or Grouped Cross Zoning allows for numerous devices installed at any location to cooperate and determine alarm condition
- Automatic detector sensitivity testing
- Signals DIRTY and VERY DIRTY detector maintenance alerts

General

A high-speed 32-bit processor can easily implement a wide array of applications used in small office buildings or used in multi-complex, high-rise installations. The 64 node networking is made possible by 625K bits per second ARCNET communications using twisted-pair copper cable, fiber-optic cable, or a combination of both. In addition, the Addressable Node Expander (ANX) board expands the network to 122 nodes. The basic E3 Series is equipped with the following modules:

- PM-9 Power Supply
- ASM-16 (Addressable Switch Module)
- ILI-MB-E3/ILI95-MB-E3 (Intelligent Loop Interface-Main Board)
- ILI-S-E3/ILI95-S-E3 (Intelligent Loop Interface-Expansion Board)
- LCD-E3 (LCD Keypad Display)

The ASM-16 features 16 software programmable switches, each accompanied by red, green and yellow LEDs that can be programmed to indicate the operation of the switches. Additional ASM-16 modules may be added to expand the operation to a plateau previously unimagined.

The Intelligent Loop Interface - Expansion Board (ILI-S-E3/ILI95-S-E3 provides the E3 Series control panel with two additional electrically isolated signaling line circuits. The layout is similar to the ILI-MB-E3/ILI95-MB-E3 with the exception that a number of components are omitted. It occupies one node on the Broadband network.

Each ILI-MB-E3/ILI95-MB-E3 can support as many as sixteen ANU-48 LED Driver modules supporting hundreds of LEDs on a third party graphic annunciator to use for remote annunciation. The ANU-48 modules may be installed in any Listed remote annunciator. It can be remotely located via an RS-485 serial interface. An array of cabinets allows for neat, compact, attractive installations.

Installation

The E3 Series Expandable Emergency Evacuation System offers four cabinet size options. A typical cabinet includes a backbox, an inner door, and an outer door. The E3 Series cabinet assembly is a compact 19 3/8" (49 cm) wide, wall-mounted enclosure.

- Cabinet A includes the following four options:
  - Cabinet A1 inner door mounted to the backbox. The backbox houses one NGA module.
  - Cabinet A2 inner door mounted to the backbox. The backbox houses one LCD-E3 module.
  - Two or three-bay inner door mounted to the backbox.
  - The backbox typically houses one LCD-E3, or one NGA, and one or two ASM-16 modules.
- Cabinet B contains a space for the following modules installed inside the backbox:
  - ILI-MB-E3
  - ILI95-MB-E3
  - PM-9
  - PM-9G

Additional module options mounted on the backbox include the following:

- ANX
- ILI-S-E3
- RPT-E3-UTP
- DACT-E3
- ILI95-S-E3
-

The 2-bay inner door houses one LCD-E3 module and one ASM-16 module.

- Both Cabinets C and D include the following:
  - Pre-assembled outer door that provides visibility to the fire fighter's phone handset and a microphone voice messaging system.
  - Two inner door panel selections that may contain optional modules to meet the facility operation requirements.

In the Cabinet B, C and D backboxes, the ANX appears in the same place as the ILI-MB-E3/ILI95-MB-E3 and PM-9/PM-9G.

For information on the installation instructions for any of the E3 Series cabinets, refer to the E3 Series® Expandable Emergency Evacuation Manual, Part Number: LS10080-051GF-E.

For other options including information on the system's compatibility with the retrofit equipment, refer to the panel's installation manual, P/N:LS10080-051GF-E or the Compatibility Addendum for Gamewell-FCI Manuals, P/N: 9000-0427-L8.

Ordering Information

ILI-MB-E3: Intelligent Loop Interface-Main Board
ILI95-MB-E3: Intelligent Loop Interface-Main Board
ILI-S-E3: Intelligent Loop Interface-Expansion Board
ILI95-S-E3: Intelligent Loop Interface-Expansion Board
ANX-SR: Addressable Node Expander-Single Ring
ANX-MR-FO: Addressable Node Expander-Multi-Ring Fiber Optic
ANX-MR-UTP: Addressable Node Expander-Multi-Ring Twisted-pair
LCD-E3: LCD-E3, LCD Keypad Display
LCD-SLP: LCD Color Touchscreen with five programmable switches
RPT-E3-UTP: Network Repeater, unshielded, twisted-pair
FML-E3: Multi-Mode Fiber-Optic Module
FSL-E3: Single-Mode Fiber-Optic Module
DACT-E3: Digital Alarm Communicator Transmitter
ANU-48: ANU-48 LED Driver Module
ASM-16: Addressable Switch Module
NGA: LCD Network Graphic Annunciator
PM-9: Power Supply Module, 120 VAC
PM-9G: Power Supply Module, 220/240 VAC
LCD-7100: Remote LCD Display
RAN-7100: Remote LCD Display

Note: For additional information on the cabinets, refer to the E3 Series Cabinets data sheet (Part Number: 9020-0649).

E3 Series® Control Panel Technical Specifications

Seismic Battery Bracket Kits

For information on the types of Seismic Battery Bracket Kits that are available, the Seismic Battery Bracket Kit Part Numbers and the Installation Instructions, refer to the following documents:

- Seismic Battery Bracket Installation Guide, P/N: 53839
- E3 Series Cabinets Data Sheet, P/N: 9020-0649

SYSTEM

Operating Voltage: 24 VDC
Operating Temperature: Not to exceed the range of 32°-120° F (0 -49° C)
Relative Humidity: Not to exceed 93%, non-condensing at 90° F (32° C)
Primary Power Supply: 9 amps @ 55 AH capacity

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The E3 Series fire alarm control panel is designed to comply with the following standards:

UL Standards

UL 864 9th Edition:
- Automatic Fire Detector Alarm
- Manual Fire Alarm
- Waterflow Alarm
- Supervisory
- Releasing Device Service
- Releasing/Pre-Action Deluge
- Releasing/Agent Releasing
- Automatic Smoke Alarm,
- Non-coded and Master Coded Operation

UUKL for Smoke Control
UL 2572 for Mass Notification Systems

NFPA Standards

NFPA 13 - Standard for Installation of Sprinkler Systems
NFPA 16 - Standard for Foam-Water Sprinkler and Foam Water Spray Systems
NFPA 72 - National Fire Alarm Code:
Central Station Fire Alarm Systems
- Auxiliary Fire Alarm Systems
- Proprietary Fire Alarm Systems
- Local Fire Alarm Systems
- Remote Station Fire Alarm Systems

NFPA 13 Sprinkler
NFPA 12A Halon 1301
NFPA 15 Water Spray
NFPA 16 Foam Water
NFPA 750 Water Mist
NFPA 2001 Clean Agent
NFPA 12 CO2 Carbon Dioxide
NFPA 17 Dry Chemical/17A Wet Chemical
Seismic Codes
International Building Code
- IBC 2013
- IBC 2009
- IBC 2006
- IBC 2003
- IBC 2000 (Seismic)

California Building Code CBC 2007 (Seismic)

STANDARDS

The E3 Series Control Panel is designed to comply with the following standards:

UL Standards: UL 864 9th Edition
- UL 2572 for Mass Notification

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL: S1869, 2572 for Mass Notification
FM: 3025415
MEA FDNY: 6175, COA #: 231-06-E
CSFM: 7165-1703:0125
City of Chicago: Class 1, Class 2, High Rise
City of Denver Approved
The VMC Group, Reference Certificate of Compliance: VMA-45894-02C (Revision 1)
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's E3 Series® Control Panel and other products available by visiting www.Gamewell-FCI.com

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Gamewell FCI

E3 Series® Cabinets

Cabinets used for the E3 Series

General

The E3 Series® Expandable Emergency Evacuation System by Gamewell-FCI offers several cabinet size options. The E3 Series System is a modular design that allows a wide range of configurations to form an integrated, distributed fire alarm system. These cabinet options allow for sturdy and modern installations. The E3 Series cabinet assembly is a compact, wall-mounted enclosure. A typical cabinet includes a backbox and an outer locking door. In addition, there are several inner door options and mounting plates to accommodate a variety of E3 Series sub-assemblies.

Each cabinet backbox includes mounting patterns for plates to allow the installer to arrange and secure the sub-assemblies to the backbox. The backbox knockouts are also positioned at numerous points to allow a conduit access into the enclosure.

The following four Annunciator cabinet sizes provide the maximum flexibility that can meet any application.

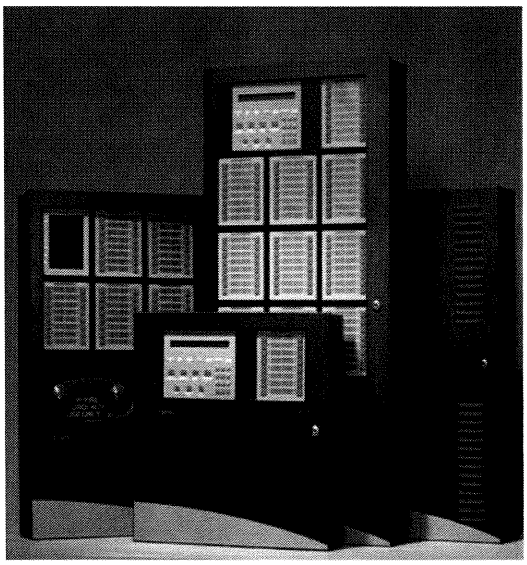
- Cabinet AA offers 2-slot or 3-slot options to accommodate any of the following configurations:
  - Inner door, 2-slots allows space for one LCD-E3 or LCD-SLP and one ASM-16
  - Inner door, 3-slots allows space for any combination of three modules: ASM-16, NGA or an ANU-48
- Cabinet A1 houses one NGA or one ASM-16/ANU-48.
- Cabinet A2 accommodates a single LCD-E3.
- E3BB-FLUSH-LCD or E3BB-NGA-FLUSH.

The E3BB-R-BSlim or B-Slim contains the 600 Series cabinet. Cabinet B includes a mounting plate that contains a space for the following modules:

- ILI-MB-E3/ILI95-MB-E3
- PM-9/PM-9G sub-assemblies
- Batteries set inside the backbox

Additional sub-assembly options mounted on the backbox include the DACT-E3 and RPT-E3. The 2-slot inner door houses the following options:

- one LCD-E3 module and• either one ASM-16/ANU-48 or one NGA module



E3 Series® Cabinets

FEATURES & BENEFITS

- IBC Seismic Certified
- 16-gauge steel backbox
- Contains removable outer and inner doors
- Lexan® windows appear on the doors of most cabinets, except the Cabinet "C" and "D" INX cabinets and the INX CAB-B cabinet which contain louvered doors
- Built with an inner door bonding strap used to provide electrical continuity for grounding
- Cabinets are available in either black or red
- Backbox and door ground studs provide positive grounding, and 180° opening door with full clearance
- Offers 90° opening door with zero clearance
- Includes a keylock with quarter turn latch
- Trim Ring accessories available

General

Both the C and D-size Command Center cabinets house a variety of E3 Series Broadband sub-assemblies that can be used in multiple configurations that provide a solution to a wide range of applications. Two flexible inner door panel selections are available for C and D-size Command Center cabinets that may contain any of the following:

- fire fighter's phone handset
- microphone
- optional modules to meet the facility operation requirements

Refer to the Inner Door and Backbox Mounting Capacities in the Ordering Information Section.

Ordering Information

Inner Door Mounting Capacity

Part Number	Description
Cabinet "AA" Size	
Dimensions:	19 1/4" W x 10" H x 4 1/2" D (49 W x 25 H x 11.4 D cm)
E3BB-BAA	Enclosure, Black, "AA" (LOC) Size
E3BB-RAA	Enclosure, Red, "AA" (LOC) Size
E31D2-TA	Inner Door, 2-slots (INCC-TEL & ASM-16)
E3ID2-A	Inner Door, 2-slots (LCD-E3 or LCD-SLP & ASM-16)
E3ID3-A	Inner Door, 3-slots (NGA, ASM-16 and MIC)
Cabinet "AA1" Size:	
Dimensions:	8 3/4" W x 10" H x 4 1/2" D (22 W x 25 H x 11.4 D cm)
E3BB-BAA1	Remote Enclosure, Black, w/Inner Door, 1 slot, (NGA)
E3BB-RAA1	Remote Enclosure, Red, w/Inner Door, 1-slot, (NGA)
Cabinet "A2" Size:	
Dimensions:	13 1/4" W x 10" H x 4 1/2" D (40 W x 25 H x 11.4 D cm)
E3BB-BA2	Remote Enclosure, Black, w/Inner Door, 1-slot, (LCD-E3 or LCD-SLP)
E3BB-RA2	Remote Enclosure, Red, w/Inner Door, 1-slot, (LCD-E3 or LCD-SLP)
Flush Cabinet A2 Annunciators:	
Dimensions:	13 1/4" W x 10" H x 4 1/2" D (40 W x 25 H x 11.4 D cm)
E3BB-FLUSH-LCD	CAB A2 Remote Flush LCD ANN with Key switch operation
E3BB-NGA-FLUSH	CAB A2 Remote Flush NGA ANN with Password protected
Cabinet "B-Slim" Size: (Retrofit Kits)	
Dimensions:	14" W x 20" H x 4 1/2: D (35.5 W x 50.8 H x 11 D cm)
E3BB-RBSLIM	Assy, Enclosure, B-SLIM, Red with Backplate and LCD-E3 Keyswitch plate
IF600-RETROFIT	Door and Cab mounting plates, disable key switch and door lock (PK-625) for E3 Series upgrade.
Cabinet "B" Size:	
Dimensions:	19 3/8"W x 19 3/8"H x 4 1/2"D (49 W x 49 H x 11 D cm)
E3BB-BB	Assy, Backbox Enclosure, Black,"B" Size
E3BB-RB	Assy, Backbox Enclosure, Red, "B" Size
E3ID2-B	Inner Door, 2-slots, "B" Size
1100-0458	B Size INCC Command Center enclosure, black
1100-0459	B Size INCC Command Center enclosure, red door
1100-0460	INX-Transponder 19" (cm) Backbox with Door, Black

Ordering Information (Continued)

Part Number	Description
Cabinet "B" Size (Continued)	
Dimensions:	19 3/8"W x 19 3/8"Hx4 1/2"D (49 W x 49 H x 11.43 D cm)
Cabinet "C" Size:	
Dimensions:	19 3/8" W x 30" H x 4 1/2" D (49 W x 76 H x 11 D cm)
E3BB-BC/INCC	Enclosure, Command Ctr, Black, "C" Size
E3BB-RC/INCC	Enclosure, Command Ctr, Red, "C" Size
E3ID2-C	Assy, Inner Door, Command Ctr.2- Bay "C" Size
E3ID3-C	Assy, Inner Door, Command Ctr, 3-Bay "C" Size
E3BB-BC/INX	Assy, Transponder, Black, "C" Size
E3BB-RC/INX	Assy, Transponder, Red, "C" Size
E3-INCC-CPLATE	Command Center module mounting plate, "C" Size
E3-INX-CPLATE	Transponder mounting plate, "C" Size
Inner Door Mounting Capacity	
E3-ILI-CPLATE	Intelligent loop module mounting plate "C" Size
Cabinet "D" Size:	
Dimensions:	19 3/8" W x 41" H x 4 1/2" D (49 W x 104 H x 11 D cm)
E3BB-BD/INCC	Enclosure, Command Ctr, Black, "D" Size
E3BB-RD/INCC	Enclosure, Command Center, Red, "D" Size
E3ID2-D	Assy, Inner Door, 2-Bay, "D" Size
E3ID3-D	Assy, Inner Door, 3-Bay, "D" Size
E3BB-BD/INX	Enclosure, Transponder, Black "D" Size
E3BB-RD/INX	Enclosure, Transponder, Red, "D" Size
E3-INCC-D-PLATE	Command Center module mounting plate, "D" Size
E3-INX-D-PLATE	Transponder module mounting plate, "D" Size
Optional Extender Plates	
AM-50 Plate	AM-50 Extender Plate
FPT-GATE-3-EXT	FPT-GATE-3 Extender Plate
Optional Accessories	
1100-0450	Command Center, blank plate, single size
E3-BP	Inner door panel, blank, double size
90375	PM-9/PM-9G Adapter Plate Kit,Hardware
E3-TRIMKIT-A	Trim kit for "A"/"AA" size enclosure, black
E3-TRIMKIT-A1	Trim kit for "AA1" size enclosure, black
E3-TRIMKIT-A2	Trim kit for "A2" size enclosure, black
E3-TRIMKIT-B	Trim kit for "B" size enclosure, black
E3-TRIMKIT-C	Trim kit for "C" size enclosure, black
E3-TRIMKIT-D	Trim kit for "D" size enclosure, black
Bulk Amplification	
AA-100	100 W Audio Amp.@70.7 V_{RMS} w/120 VAC
AA-120	120 W Audio Amp. @25 V_{RMS} w/ 120 VAC
ACT-1	Audio coupling transformer, for audio systems w/multiple supplies
FCI-CHG-120	Battery Charger, 25-120 A/H Gel cell
FCI-LBB	Battery box, accommodates batteries up to 55 A/H, (Black)
Cabinet C:	
FCI-DR-C4B	Large Battery Backbox,blank door,lock and keys for backbox accepting 3 chassis, (Black)
FCI-DR-C4BR	Blank door, lock and keys, for backbox accepting 3 chassis, (Red)
SBB-C4	Backbox, 3 chassis, (Black)
Cabinet D:	
FCI-DR-D4B	Blank door, lock and keys, for backbox accepting 4 chassis, (Black)
FCI-DR-D4BR	Blank door, lock and keys, for backbox accepting 4 chassis, (Red)
SBB-D4	Backbox, 4 chassis, (Black)
90516	7100-Slim 7A/H Seismic Battery Bracket Kit

Seismic Battery Bracket Kits

Part Number	Description
	E3 B-Slim 7 A/H Seismic Battery Bracket Kit
90517	7100-Slim 12 A/H Seismic Battery Bracket Kit
	E3 B-Slim 12 A/H Seismic Battery Bracket Kit
90518	E3 CAB-B 7 A/H Seismic Battery Bracket Kit

Ordering Information (Continued)

Seismic Battery Bracket Kits (Continued)

Part Number	Description
	E3 CAB-C 7 A/H Seismic Battery Bracket Kit
	E3 CAB-D 7 A/H Seismic Battery Bracket Kit
	NetSOLONS-INX-7A/H Seismic Battery Bracket Kit
	NetSOLO-7100-7A/H Seismic Battery Brckt Kit
90519	E3 CAB-C (INX only) 12 A/H Seismic Battery Bracket Kit
	E3 CAB-D (INX only) 12 A/H Seismic Battery Bracket Kit
	NetSOLO NS-INX 12 A/H Seismic Battery Bracket Kit
90520	E3 CAB-B 18 A/H Seismic Battery Bracket Kit
	E3 CAB-C 18 A/H Seismic Battery Bracket Kit
	E3 CAB-D 18 A/H Seismic Battery Bracket Kit

Retrofit Kits

For information on the Gamewell and 7200 Retrofit Kits, refer to the following Data Sheets.

9021-60678	Gamewell Retrofit Kits Data Sheet
9021-60733	7200 Retrofit Kits Data Sheet

Inner Door Mounting Capacity

Part Number	Components
Cabinet AA	
E3ID2-A	Cabinet AA, Inner Door, 2-slots
1	LCD-E3 Display and
1	ASM-16/ANU-48
E3ID2-TA	Assembly, Door, Inner, TEL-E3
E3ID3-A,	Cabinet A, Inner Door, 3-slots
1	NGA or ASM-16
2	ASM-16s/ANU-48
Cabinet AA1	
E3ID-A1	Cabinet AA1,Inner Door (Includes Box)
1	NGA or ASM-16
Cabinet A2	
E3ID-A2	Cabinet A2, Inner Door, (Includes Box)
1	LCD-E3
Cabinet B	
E3ID2-B	Cabinet B, Inner Door, (Includes Box)
1	LCD-E3 Display and one ASM-16/ANU-48
1	NGA and one ASM-16/ANU-48
B-Slim Cabinet	
1	LCD-E3 Display & one RPT-E3 or one DACT-E3
1	ILI-MB-E3 or one ILI95-MB-E3
1	PM-9 or one PM-9G
Cabinet C	
E3ID2-C	Cabinet C, Inner Door, 2-slots
1	LCD-E3 Display and
5	Any combination of ASM-16/ANU-48, NGA or Microphone Assemblies
1	Telephone Assembly
E3ID3-C	Cabinet C, Inner Door, 3-slots
7	Any Combination of ASM-16/ANU-48, NGA, or Microphone Assemblies
1	Telephone Assembly
Cabinet D	
E3ID2-D	Cabinet D, Inner Door, 2-slots
1	LCD-E3 Display
11	Any Combination of ASM-16/ANU-48, or NGA or Microphone and
1	Telephone Assembly
E3ID3-D	Cabinet D, Inner Door, 3-slots
13	Any Combination of ASM-16/ANU-48, NGA or Microphone Assemblies
1	Telephone Assembly
1	Loop Interface or ANX or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater

Backbox Mounting Capacity

E3BB-BAA	Enclosure 'AA' (LOC) Size Black
1	INI-VG Series Voice Gateway
E3BB-BAA1	AA1 Size Box/Door, Black
1	RPT-E3 Network Repeater
E3BB-BB	B-Size Box/Door, Black
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3/ILI95-MB-E3 and

Backbox Mounting Capacity (Continued)

Part Number	Components
E3BB-BB	B-Size Box/Door, Black
1	Additional ILI-MB-E3/ILI95-MB-E3
1	Loop Interface or ANX or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
INX CAB-B Mounting Plate	
1	PM-9 or PM-9G
1	INI-VGX
4	AM-50 Series amplifiers
E3-INCC-C Plate	
1	PM-9/PM-9G Power Supply
1	INI-VG Series Voice Gateway
1	ILI-MB-E3/ILI95-MB-E3 Loop Interface and Additional ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
1	Optional AM-50 or FPT-GATE-3 Extender Plate
E3-ILI-C Plate	
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3 or ILI95-MB-E3
2	Additional ILI-MB-E3/ILI95-MB-E3 or ILI-S-E3/ILI95-S-E3 or ANX
1	DACT-E3
1	RPT-E3
1	Optional FPT-GATE-3 Extender Plate
E3-INX-C Plate	
1	PM-9/PM-9G Power Supply with one PM-9/PM-9G Adapter Plate
1	INI-VGX Voice Gateway
1	ILI-MB-E3 Loop Interface and
1	Additional ILI-MB-E3/LI95-MB-E3/ANX
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
4	AM-50 Series Amplifier
1	Optional FPT-GATE-3 Extender Plate
E3-INCC-D Plate	
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3 or ILI95-MB-E3
4	Additional ILI-E3 or ILI95-E3 Series or ANX
1	DACT-E3 Digital Communicator
1	RPT-E3 Network Repeater
1	INI-VG Series
1	Optional AM-50 or FPT-GATE-3 Extender Plate
E3-INX-D Plate	
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3 or ILI95-MB-E3
1	DACT-E3 Digital Communicator
1	RPT-E3 Network Repeater
1	INI-VG Series
4	AM-50 Series Amplifier
1	Optional FPT-GATE-3 Plate
E3BB-BD	D-size Box/Command Center (Voice), Black
1	PM-9/PM-9G Power Supply
1	INI-VG Series Voice Gateway
4	ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface
1	Additional ILI-MB-E3/ILI95-MB-E3/ ANX Loop Interface or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
1	Optional FPT-GATE-3 Plate
E3BB-BD	D-size Box/Command Center, Black
1	PM-9/PM-9G Power Supply
7	ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface & Additional ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
Optional Extender Plates	
AM-50 Extender Plate	
1	AM-50-25 or AM-50-70
FPT-GATE-3 Extender Plate	
1	FocalPoint® Gateway
1	PNET-1
1	Optional FPT-GATE-3 Extender Plate

E3 Series® Cabinets Technical Specifications

STANDARDS

The E3 Series fire alarm control panel cabinets are designed to comply with the following standards:

UL Standards: UL 864 9th Edition:

- Automatic Fire Detector Alarm
- Manual Fire Alarm
- Waterflow Alarm
- Supervisory
- Releasing Device Service
- Releasing/Pre-Action Deluge
- Releasing/Agent Releasing
- Automatic Smoke Alarm, Non-coded and Master Coded Operation

Underwriters Laboratories Standard UL 2572 (Mass Notification Systems).

UUKL for Smoke Control

UL2572 1st Edition

NFPA Standards

NFPA 13 - Standard for Installation of Sprinkler Systems

NFPA 16 - Standard for Foam-Water Sprinkler and Foam Water Spray Systems

NFPA 72 - National Fire Alarm Code:

- Central Station Fire Alarm Systems
- Auxiliary Fire Alarm Systems
- Proprietary Fire Alarm Systems
- Local Fire Alarm Systems
- Remote Station Fire Alarm Systems

NFPA 13 Sprinkler

NFPA 12A Halon 1301

NFPA 15 Water Spray

NFPA 16 Foam Water

NFPA 750 Water Mist

NFPA 2001 Clean Agent

NFPA 12 CO2 Carbon Dioxide

NFPA 17 Dry Chemical/17A Wet Chemical

Seismic Codes

International Building Codes:

- IBC 2013
- IBC 2009
- IBC 2006
- IBC 2003
- IBC 2000 (Seismic)

California Building Code CBC 2007 (Seismic)

STANDARDS

The E3 Series Cabinets are designed to comply with the following standard:

UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL Listed: S1869
MEA Approved: 6177
Fire Dept. of New York: COA# 6077
CSFM: 7165-1703-0125
FM Approved: 3025415
City of Chicago
City of Denver
VMA Seismic Certified
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's E3 Series® Cabinets and other products available by visiting www.Gamewell-FCI.com

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Gamewell FCI

ILI-E3 Series

Intelligent Loop Interface-Main Board

ILI-MB-E3

The Intelligent Loop Interface-Main Board (ILI-MB-E3) is the main interface for the E3 Series® product line. With its state-of-the-art 32 bit RISC processor, this compact "panel on a board" provides a powerful addition to the Gamewell-FCI's single-pair conductor solutions. The ILI-E3 Series is used in the following systems.

- E3 Series Expandable Emergency Evacuation System
- E3 Series Combined Fire and Mass Notification System
- E3 Series Broadband Voice Command Center

This intuitive design provides the following features:

- two signaling line circuits
- local energy city box output
- two notification application circuits
- auxiliary power output
- auxiliary relay functions

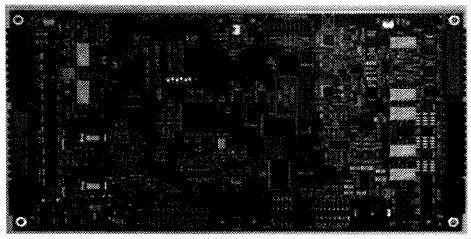
These features, combined with the built-in network and the serial protocols, allow this module to support a host of new and existing products, resulting in a building block approach to the fire alarm control panel design.

The ILI-MB-E3 is network-ready and occupies 1 of 64 nodes operating at 625K baud. In addition, the Addressable Node Expander (ANX) board expands the network to 122 nodes. When this sub-assembly is integrated with proven Broadband components, the result is a flexible yet powerful integrated audio solution. When the system transmits to remote locations, the optional RPT-E3-UTP provides the ILI-MB-E3 with valuable signal boosting and transient protection, as well as connectivity using both wire and fiber-optic cables.

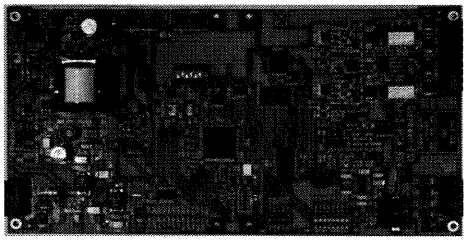
The ILI-MB-E3 provides two signaling line circuits and terminals for the connections to up to 159 detectors, 159 modules and 159 addressable sounder bases per SLC in Velociti® mode. In CLIP™ mode, each SLC supports 99 detectors and 99 modules. The RS-485 interface can support a variety of peripheral devices.

The ILI-MB-E3 relay outputs include system alarm, supervisory, and system trouble contacts. The ILI-MB-E3 provides output for a local energy city master box or remote location which is non power-limited. All other wiring is Class 2 power-limited.

*Style 7 wiring requires the use of the System Sensor M500X Isolator Modules.



ILI-MB-E3



ILI-S-E3

FEATURES & BENEFITS

ILI-MB-E3 & ILI-S-E3:

- Listed under UL® Standard 864, 9th Edition
- Listed under UL Standard UL2572 for Mass Notification
- UL Listed and FM Approved for Pre-Action/Deluge and Agent Releasing
- Provides signaling line circuits with the following:
  - 2 Class A, Style 6, 7* or Class B, Style 4 circuit
  - 40 Character user-defined text per device
- Capacity of 159 sensors, 159 addressable modules and 159 addressable sounder bases per circuit
- Includes 8100 Event History Log
- Uses a network ready integral 625K baud ARCNET
- Supports 115.2K baud RS-232

ILI-MB-E3 Only:

- Automatically adjusts to any NAC End-of-Line Resistor (EOL) value (1k-55k ohm) for legacy audible/visual appliances
- Two notification appliance circuits, Class "A", Style Z or Class B, Style Y rated at 2.0 amps. per circuit
- Offers an RS-485 supporting 16 ASM-16 switch modules and/or ANU-48 LED driver modules

ILI-S-E3

The Intelligent Loop Interface - Expansion Board (ILI-S-E3) provides the E3 Series control panel with two additional electrically isolated signaling line circuits. The layout is similar to the ILI-MB-E3 except a number of components are omitted. The ILI-S-E3 occupies one node on the Broadband network. The ILI-S-E3 provides two signaling line circuits and terminals for the connections to up to 159 detectors, 159 modules and 159 addressable sounder bases per SLC in Velociti mode. In CLIP mode, each SLC supports 99 detectors and 99 modules.

Installation

Typically, the ILI-MB-E3 or ILI-S-E3 can be mounted in the following E3 Series cabinets:

Cabinet B Backbox: B-Slim-E3

Cabinet C Backbox: E3-ILI-CPLATE
E3-INCC-CPLATE
E3-INX-CPLATE

Cabinet D Backbox: E3-INCC-DPlate
E3-INX-DPLATE

ILI-MB-E3/ILI-S-E3

For instructions on the installation of the ILI-MB-E3 or ILI-S-E3, refer to the following documents:

- E3 Series® Expandable Emergency Evacuation Manual, Part Number: LS10080-051GF-E
- ILI-MB-E3 Installation Instructions, Part Number: 9000-0579
- ILI-S-E3 Installation Instructions, Part Number: 9000-0569

For information on the ILI95-MB-E3 and ILI95-S-E3, refer to the ILI95-E3 Series Data Sheet, Part Number, 9021-60336.

For information on the ANX, refer to the ANX Data Sheet, Part Number, 9021-60497.

Ordering Information

ILI-MB-E3: Intelligent Loop Interface-Main Board

ILI-S-E3: Intelligent Loop Interface-Expansion Board

ILI-E3 Series Technical Specifications

SYSTEM

ILI-MB-E3 only

ILI-MB-E3 Operating Current: 0.081 amp

ILI-MB-E3 Alarm Current: 0.150 amp max.

ILI-S-E3 Operating Current: 0.118 amp

ILI-S-E3 Alarm Current: 0.119 amp

ILI-MB-E3 and ILI-S-E3

Operating Voltage: 24 VDC FWR (from the PM-9/ PM-9G Power Supply)

Operating Temperature: 32° to 120° F (0° to 49° C)

Relative Humidity: 0 to 93%, non-condensing at 90° F (32° C)

Supervised

Class 2 Power-Limited

SLC 40 Ohms maximum line impedance 0.5 if maximum line capacitance

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The ILI-E3 Series are designed to comply with the following standard:

UL Standard: UL 864 9th Edition
UL 2572 for Mass Notification

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.

UL Listed: S1869, UL 2572 for Mass Notification

FM Approved: 3025415

MEA Approved, Fire Dept. of New York: COA# 6077

CSFM: 7165-1703-0125

City of Chicago : Class 1, Class 2 and High Rise

City of Denver

ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

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For more information

Learn more about Gamewell-FCI's ILI-E3 Series and other products available by visiting www.Gamewell-FCI.com

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RPT-E3

Network Repeater

General

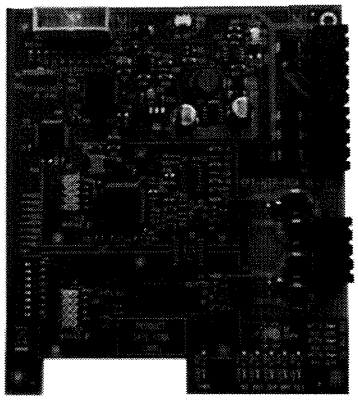
The ARCNET Repeater Module (RPT-E3) is an optional component of the E3 Series® and S3 Series fire alarm control panels. It allows the following remote E3 Series and S3 Series sub-assemblies to connect to the Broadband network from remote locations:

- ILI-MB-E3/ILI95-E3 Series
- S3 Series, SLP (Smart Loop Panel-Main Board)
- ANX-SR/ANX-MR-UTP/ANX-MR-FO
- NGA

The RPT-E3 is a standard sub-assembly with network connections using unshielded, twisted-pair, copper wire. The following optional fiber-optic network connections using add-on modules are available.

- FML-E3 multi-mode fiber module (optional)
- FSL-E3 single-mode fiber module (optional)

In addition, you can use the RPT-E3 to connect remotely-mounted NGA modules to the network.



RPT-E3

Installation

The RPT-E3 is adaptable for an installation in the standard E3 Series and S3 Series cabinets. Typically, the RPT-E3 module is mounted on standoffs on the top of the right side of the ILI-MB-E3/ILI95-MB-E3/ANX modules and SLP motherboard.

For instructions on the installation of the RPT-E3, refer to the following documents:

- E3 Series® UL Listing Document, P/N: LS10080-051GF-E
- S3 Series UL Listing Document, P/N:LS10005-051GF-E
- RPT-E3-UTP Installation Instructions, P/N: 9000-0580
- FML-E3/FSL-E3 Installation Instructions, P/N:LS10046-000GF-E

Ordering Information

RPT-E3-UTP: Network Repeater, unshielded, twisted-pair

FML-E3: Multi-mode fiber-optic module for RPT-E3-UTP (one channel)

FSL-E3: Single-mode fiber-optic module for RPT-E3-UTP (one channel)

FEATURES & BENEFITS

- Listed under UL® Standard 864, 9th Edition
- Offers the 625K baud ARCNET Repeater
- Provides the capability for networked E3 Series and S3 Series sub-assemblies to connect in Styles 4 or 7 configurations
- Connects to the network via the standard unshielded, twisted-pair copper wire
- Includes add-on fiber-optic modules that allow the network connection through single or multi-mode fiber-optic cables
- Use the RPT-E3 to connect remotely-mounted NGA modules to the network

RPT-E3 Technical Specifications

SYSTEM

Operating Voltage: 24 VDC FWR
Operating Current: 0.016 amp
Alarm Current: 0.017 amp
Operating Temperature: 32° to 120° F (0° to 49° C)
Relative Humidity: 0 to 93%, non-condensing at 90° F (32° C)
Wiring Specifications:
Copper Wire: 16 to 18 AWG twisted-pair, unshielded. Up to 3,000 ft. (914.4 m) between each node.
Fiber-Optic Cable (FML-E3 only): Up to 200 microns optimized for 62.5/125 microns.
Up to 8 dB loss between nodes.
Fiber-Optic Cable (FSL-E3 only): Optimized for 9/125 micrometer cable @ 1310 nm.
Up to 30dB loss between nodes.

STANDARDS

The RPT-E3 is designed to comply with the following standard:
UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.
UL Listed: S1869
FM Approved: 3025415
MEA Approved, Fire Dept. of New York: COA# 6077
CSFM: 7165-1703-0125
City of Chicago: Class 1, Class 2 and High Rise
City of Denver
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

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For more information
Learn more about Gamewell-FCI's RPT-E3 and other products available by visiting www.Gamewell-FCI.com

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DACT-E3

Digital Alarm Communicator Transmitter

General

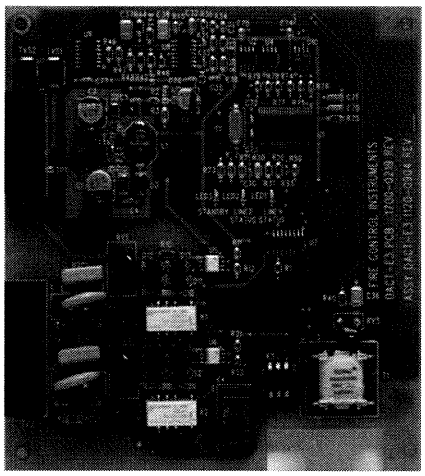
The Digital Alarm Communicator Transmitter (DACT-E3) is a digital communications circuit. It is an optional component of the following systems.

- E3 Series® Expandable Emergency Evacuation System
- S3 Series Small Addressable Fire Alarm Control Panel

The DACT-E3 sends digital signals over the telephone network that transmits to a central station. This module can be located in the main cabinet or remotely located via a local RS-485 serial interface.

The DACT-E3 is compatible with digital alarm communicator receivers (DACRs) that receive the following signaling formats:

- SIA DC8
- SIA DCS20
- Ademco Contact ID
- 3+1 1400 Hz
- 3+1 2300 Hz
- 4+2 1400 Hz
- 4+2 2300 Hz



DACT-E3

In addition to the DACT-E3 being compatible with digital signaling formats, the DACT-E3 features numerous formats for communication to a central station. As a digital communicator, the DACT-E3 complies with FCC Part 8, Telecommunication Standards for DC and AC Ringer Equivalence.

Installation

The DACT-E3 is adaptable for installation in the standard E3 Series and S3 Series System cabinets. Typically, the DACT-E3 module mounts on standoffs on top of the left side of the ILI-MB-E3/ILI95-MB-E3 or SLP (Smart Loop Panel) module. Either unit can be easily connected to the backbox or sub-assembly plate depending on the cabinet module.

For instructions on how to install the DACT-E3, refer to the following documents:

- E3 Series Expandable Emergency Evacuation Manual, P/N:LS10080-051GF-E
- DACT-E3 Installation Instructions, P/N:9000-0581
- S3 Series (Small Addressable Fire Alarm Control Panel) UL Listing Document, P/N:LS10005-051GF-E

Ordering Information

DACT-E3: Digital Alarm Communicator Transmitter

FEATURES & BENEFITS

- Listed under UL® Standard 864, 9th Edition
- Transmits and verifies data to the central station
- Communicates with the following sub-assemblies via the RS-485:
  - E3 Series
  - ILI-MB-E3
  - ILI95-MBE3
  - S3 Series, SLP
- Sends information in a variety of formats (including full Contact ID)
- Offers pre-programmed dialing to the central station phone number
- Performs on and off-hook status to the phone lines
- Traces proper central station "ACK" and "Kiss-off" tone
- Activates hang-up and release phone lines
- Compatible with the IPDACT Internet Communicator

DACT-E3 Technical Specifications

SYSTEM

Operating Voltage: 24 VDC (from the PM-9/ PM-9G power supply)

Operating Current: 0.018 amp

Alarm Current: 0.018 amp

Operating Temperature: 32° to 120° F (0° to 49° C)

Relative Humidity: 0 to 93%, non-condensing at 90° F (32° C)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The DACT-E3 is designed to comply with the following standard:

UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.

UL Listed: S1869

FM Approved: 3025415

MEA Approved, Fire Dept. of New York: COA# 6077

CSFM: 7165-1703-0125

City of Chicago: Class 1, Class 2 and High Rise

City of Denver

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's DACT-E3 and other products available by visiting www.Gamewell-FCI.com

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Gamewell FCI

ASM-16

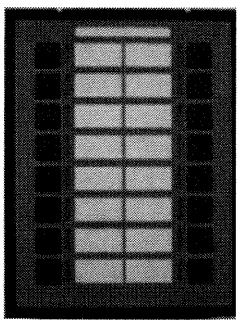
ASM-16 Addressable Switch Module

General

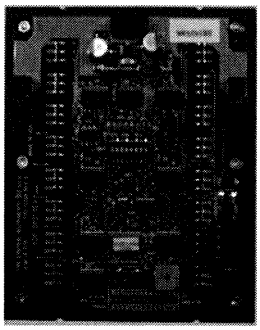
The Gamewell-FCI, ASM-16 Addressable Switch Module serves as the point of interface between an operator and the system's audio evacuation, fire fighter intercom, and building control circuits. It is a component of the following systems:

- E3 Series® Expandable Emergency Evacuation System
- E3 Series Combined Fire and Mass Notification System
- E3 Series Broadband Voice Evacuation System

The ASM-16 is a configurable switch input sub-assembly with 16 switches and 48 status LEDs. It may be remotely located via the RS-485 serial interface. Each ASM-16 addressable switch module has 16 push-button switches that can be programmed to serve any function the application demands.



ASM-16 Front View



ASM-16 Rear View

An ASM-16 switch can be programmed to operate as any of the following functions:

- Speaker circuit switch
- Auxiliary control switch (using a bank of 2 switches 1 switch each for on-off-auto functions).
- Fire fighter phone switch
- Switches with custom-defined functions:
  - System Reset
  - System Silence
  - System Acknowledge
  - All-call, phone patch
  - Lamp test, alarm tone on
  - Manual select, etc.

Each ASM-16 switch has three fully programmable LEDs that appear in red, yellow, and green. These LEDs can be programmed to work in concert with their associated pushbutton switch or they can be programmed to work independently as status indicators (for example, ON, OFF, NORMAL etc.). An INI-VGC assembly or ILI-MB-E3/ ILI95-MB-E3 can accommodate up to 16 ASM-16 modules for a total of 256 switches and 768 LEDs.

Ordering Information

1100-0455: Programmable Addressable Switch Module

FEATURES & BENEFITS

- Listed under UL® Standard 864, 9th Edition
- Listed under UL® Standard UL2572 for Mass Notification
- Each INI-VGC supports up to 16 ASM-16 switch modules for a total of 256 switches
- All switch functions are fully software programmable
- Each ILI-MB-E3/ ILI95-MB-E3 supports up to 16 ASM-16 switch modules for a total of 256 switches
- Each ASM-16 switch has three fully programmable status, indicating LEDS: red, yellow, and green
- Slip-in label inserts allow easily modified switch designations

ASM-16 Technical Specifications

SPECIFICATIONS

Operating Voltage: 24 VDC (nominal) (from the PM-9/PM-9G power supply)

Operating Current: 0.011 amp. (with no LEDs lit)

Each LED draws 3mA when active.

With all 48 LEDs activated, the ASM-16 draws 155 mA.

Operating Temperature: 32° to 120° F (0° to 49° C)

Relative Humidity: 0 to 93% (non-condensing) at 90° F (32° C)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The ASM-16 is designed to comply with the following standard:

UL Standard: UL 864 9th Edition
UL 2572 for Mass Notification

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.

UL Listed: S1869, UL 2572
FM Approved: 3017416
MEA FDNY: COA 231-06-E
CSFM: 7165-1703:0125, 7165-1703:0126
City of Chicago Approved: Class 1, Class 2,High Rise
City of Denver Approved
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

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For more information
Learn more about Gamewell-FCI's ASM-16 and other products available by visiting www.Gamewell-FCI.com

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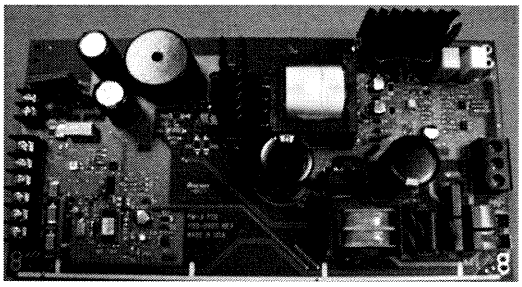
Gamewell FCI

PM-9

120 VAC Power Supply

General

The Gamewell-FCI, PM-9 Power Supply is a 120 VAC, 60 Hz switching power supply that provides 9 amperes of filtered and regulated 24 VDC (nominal). It provides the power to all of the E3 Series components.



PM-9

It is a component of the following systems:

- E3 Series® Expandable Emergency Evacuation System
- E3 Series Combined Fire and Mass Notification System
- E3 Series Broadband Voice Evacuation System

The PM-9 has an internal battery charging circuit capable of maintaining up to 55 A/H batteries.

Installation

Typically, the PM-9 Module can be mounted in the following E3 Series cabinets:

- Cabinet B backbox
- Cabinet C, INX-E3 sub-assembly plate
- Cabinet C, INCC-E3 sub-assembly plate
- Cabinet D, E3-INX-D Plate
- Cabinet D, E3-ILI-D Plate
- Retrofit Kits

For information on the installation of the PM-9, refer to the following documents:

- E3 Series Expandable Emergency Evacuation Manual, P/N: LS10080-000GF-E
- PM-9 Installation Instructions, P/N: 9000-0548
- Mass Notification System Manual, P/N:LS10013-000GF-E

Ordering Information

PM-9: Power supply and battery charger, 120 VAC

29229: AC Line Filter Kit

FEATURES & BENEFITS

- Listed under UL® Standard 864, 9th Edition
- Listed under UL Standard UL2572 for Mass Notification
- Includes 9 ampere, filtered, regulated power supply
- Provides 1 ampere battery charging current
- Offers energy and space saving switching technology
- Contains an integral battery charger capable of recharging up to 55 AH batteries. (Batteries not furnished)

PM-9 Technical Specifications

SYSTEM

Input Voltage: 120 VAC 60 Hz @ 3.5 A. max.
Output Voltage: 24 VDC (nominal) FWR
Output Current: 9 amperes
Output Current: 1 ampere battery charging current
Alarm Current: 0.050 amp
Operating Temperature: 32° to 120° F (0° to 49° C)
Relative Humidity: 0 to 93% (non-condensing) at 90° F (32° C)
Dimensions: 10 1/2" W x 5" H x 2" D (27 x 13 x 5 cm)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The PM-9 is designed to comply with the following standards:

UL Standards: UL 864 9th Edition
UL 2572 for Mass Notification

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.

UL Listed: S1869, Vol. 14
UL Listed: S1949, Vol. 19
FM Approved: 3017416
MEA FDNY: COA 6077
CSFM: 7165-1703:0125
City of Chicago Approved: Class 1, Class 2,High Rise
City of Denver Approved
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

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For more information
Learn more about Gamewell-FCI's PM-9 and other products available by visiting www.Gamewell-FCI.com

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Gamewell FCI

AM-50 Series Amplifiers

50 Watt Digital Amplifiers

General

The Gamewell-FCI, AM-50 Series amplifiers are a 50 watt, digital, switching power amplifier. The following lists the two types of AM-50 Series amplifiers that may be ordered.

- The AM-50-25 amplifier produces 25 V_{RMS} audio output.
- The AM-50-70 amplifier produces 70.7V_{RMS} audio output.

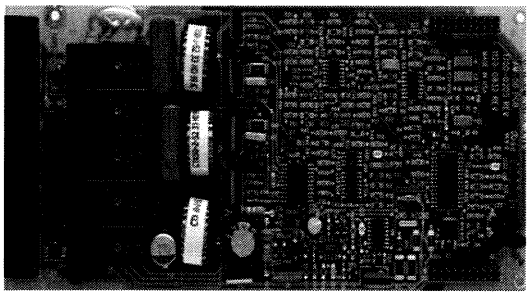
The amplifiers are components of the following E3 Series® Systems.

- E3 Series Expandable Emergency Evacuation System
- E3 Series Combined Fire and Mass Notification System
- E3 Series Broadband Voice Evacuation System

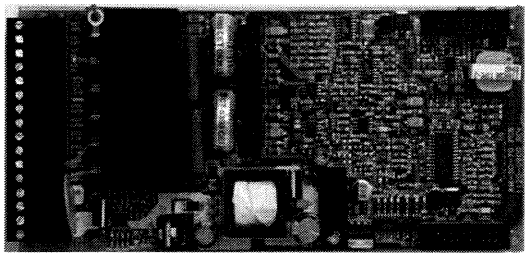
Each AM-50 Series amplifier provides two speaker circuits that can be wired Style Y (Class "B") or Style Z (Class "A"). The terminal connections can accommodate up to 12 AWG, twisted-pair, shielded wire. Both speaker circuits produce a combined total of 50 watts of power. The 50 watts of power can be divided between the two integral Class A/B speaker circuits. The two speaker circuits may be individually activated and supervised by an INI-VGX Transponder Voice Gateway.

The AM-50 Series amplifier can be programmed to broadcast sixteen messages generated from its local INI-VGX Voice Gateway. In addition, the AM-50 Series amplifiers produce superior clarity for intelligible LIVE voice paging.

When the selected System Sensor, speakers are used with the Manufacturer's 520 Hz audiophile, the E3 Series® System is compliant with UL Standard 464 Low Frequency requirements.



AM-50-25



AM-50-70

Installation

As many as four AM-50 Series amplifiers can be installed in the following cabinets when supervised and controlled by an INI-VGX Voice Gateway.

- Cabinet B, INX CAB-B • Cabinet C, INX-CAB-C • Cabinet D, INX-CAB-D

WARNING: AM-50 Series Amplifiers Node Restriction:
The INI-VGX can support up to four AM-50 Series amplifiers with the same output voltage. However, you cannot wire an AM-50-25 amplifier and an AM-50-70 amplifier to the same INI-VGX Voice Gateway Node between the four amplifiers, max. of 150 watts are allowed.

The AM-50 Series amplifiers can be installed using the AM-50 Extender Plate whenever the E3 Series control panel is used in conjunction with the Autonomous Control Unit (ACU) of the E3 Series Combined Fire and Mass Notification System.

FEATURES & BENEFITS

- Listed under UL® Standard 864, 9th Edition
- Listed under UL Standard UL2572 for Mass Notification
- Complies with UL Standard 464 for 520 Hz Low Frequency
- Provides digital, switching amplifier technology
- Produces 50 watts of digital power
- Includes 2 speaker circuits, wired Style Y (Class B) or Style Z (Class A)
- Up to 4 AM-50 Series amplifiers with the same output voltage can be controlled by the INI-VGX voice gateway

AM-50 Series Amplifiers Technical Specifications

SPECIFICATIONS

AM-50-25 Amplifier

Operating Voltage: 27.3 to 20.4 VDC

Operating Current: 0.086 amp normal standby

Alarm Current: 2.206 amp max. alarm @ 50 Watt

Audio Output: 50 watts max. @ 25 V_{RMS}

AM-50-70 Amplifier

Operating Voltage: 27.3 to 20.4 VDC

Operating Current: 0.049 amp normal standby

Alarm Current: 2.30 amp max. alarm @ 50 watt

Audio Output: 50 watts max. @ 70.7 V_{RMS}

AM-50 Series Amplifiers

Relative Humidity: 0 to 93% max., (non-condensing) at 90° F (32° C)

Operating Temperature: 32° to 120° F (0° to 49° C)

Dimensions: 7 1/2" W x 3 1/2" H x 1 1/4" D
(19 W x 9 H x 3 D cm)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

Ordering Information

1100-0456: AM-50, 25V_{RMS} audio output, 50 watt amplifier

AM-50-70: AM-50, 70.7V_{RMS} audio output, 50 watt amplifier

STANDARDS

The AM-50 Series amplifiers are designed to comply with the following standards:

UL Standards: 864 9th Edition
2572 for Mass Notification
464 Low Frequency

AGENCY LISTINGS AND APPROVALS

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UL Listed: S1869

FM Approved: 3017416

MEA Approved, Fire Dept. of New York: COA# 6077

CSFM: 7165-1703-0125

City of Chicago: Class 1, Class 2, High Rise

City of Denver Approved

ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

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For more information

Learn more about Gamewell-FCI's AM-50 Series Amplifiers and other products available by visiting www.Gamewell-FCI.com

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INI-VG Series

Intelligent Network Interface Voice Gateway

General

The INI-VG Series (Intelligent Network Interface-Voice Gateway) is a network interface with superior Audio and Command/Control that is used for E3 Series fire alarm and voice evacuation systems. The modular design allows the INI-VG Series to be used in any type of system configuration to function as a voice network interface for any of the following:

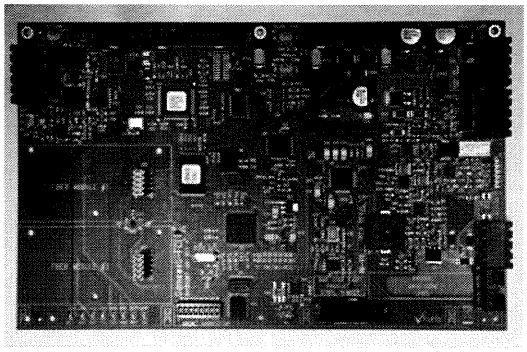
- Fire Command Center
- Digital Audio Voice Transponder
- Analog Audio Voice Transponder
- Autonomous Control Unit (ACU) for Mass Notification
- Local Operating Console (LOC) for Mass Notification

With a Class B signaling line circuit (SLC), the INI-VG can monitor and control up to sixteen AOM-TELF telephone modules to use with the fire fighter telephones or serve as value Local Operating Consoles (LOC). In addition, it can support up to 16 AOM-2SF, signal output modules that can be used for distributed audio control.

Networked through fiber-optics and/or twisted-pair wire, the INI-VG Series resides on the E3 Series and/or S3 Series network, represented as a node with fully independent control. Each INI-VG Series provides its own internal recorded message storage that operates as a redundant back-up in case another panel is no longer functional.

Each version of the INI-VG Series features a unique functionality that can operate as any of the following, depending on how each version is used with the application:

- Digital Audio Voice Transponder (INI-VGX) connects up to three main amplifiers and one back-up amplifier to control over 150 watts of audio per board.
- Analog Audio Voice Transponder (INI-VGE) connects to analog bulk amplifiers and distributes audio using 16 AOM-2SF modules.
- Fire Command Center (INI-VGC) connects hand-held microphones and main fire fighter telephones.



INI-VG Series

FEATURES & BENEFITS

- Listed under UL® Standard 864, 9th Edition
- Listed under UL Standard UL2572 for Mass Notification
- Supports a network data transfer rate at 625K baud
- Controls all communication signals and control-by-event sequences over twisted, unshielded pair of wires or fiber-optic cable
- All INI-VG Series Modules connect to a voice page microphone and fire fighter's handset
- Uses advanced Digital Signal Processor (DSP) technology that provides efficient audio compression and filtering
- Offers the following fiber-optic plug-in modules used for fiber-optic connectivity
  - FML-E3 (fiber-optic multi-mode)
  - FSL-E3 (fiber-optic single-mode)
- Supports Distributed Architecture, including Style 7 wiring configuration, that allows system components to continue normal operation with NO loss of function during single line fault conditions
- Provides Redundant Command Centers with a microphone and a fire fighter's handset which can easily be configured by adding INCCs

INI-VGC

The INI-VGC Voice Gateway Module is optimized to provide command and control functions for the INCC Command Center. The INCC serves as the point of interface between an operator and the system's audio evacuation, fire fighter intercom, and building control circuits.

A typical INCC assembly consists of the following:

- an Intelligent Network Interface-Voice Gateway (INI-VGC) Module
- one or more Addressable Switch Modules (ASM-16)
- a Voice Page Microphone (INCC-MIC)

Each INI-VGC can support up to 16 ANU-48 LED Driver Modules or ASM-16s for a total of 256 fully programmable switches and 768 LEDs that light in red, yellow, and green.

The INI-VGC occupies a single node on the E3 Broadband network and it is connected by a single, pair of twisted, unshielded wire, fiber-optic cable or any combination of the two. The INCC Command Center's INI-VGC module also provides connections for an optional fire fighter telephone handset.

The INI-VGC is a fully digital voice/tone generator using state-of-the-art Digital Signal Processing (DSP) technology to produce superior audio signals. The INI-VGC provides an output to a local speaker for message verification and testing.

INI-VGE

The INI-VGE Voice Gateway Module provides an audio interface to the bulk analog amplifiers and command and control functions for the INCC Command Center.

A typical INCC assembly consists of the following:

- an Intelligent Network Interface-Voice Gateway (INI-VGE) Module
- one or more Addressable Switch Modules (ASM-16)
- a Voice Page Microphone (INCC-MIC)

Each INI-VGE can support up to 16 ANU-48 LED Driver Modules or ASM-16s for a total of 256 fully programmable switches and 768 LEDs that light in red, yellow, and green.

The INI-VGE occupies a single node on the E3 Series Classic network and is connected by a single pair of twisted, unshielded wire, fiber-optic cable or any combination of the two. The INCC Command Center's INI-VGE module also provides connections for an optional fire fighter telephone handset. The INI-VGE's one Signaling Line Circuit (SLC) loop supports the following:

- 16 remote Fire Fighter Phones
- 32 Supervised Audio Control Relays

The INI-VGE is a fully digital voice/tone generator using state-of-the-art Digital Signal Processing (DSP) technology to produce superior audio signals. The INI-VGE provides an audio output capable of driving up twenty 100 watt (AA-100) or 120 watt (AA-120) amplifiers.

INI-VGX

The INI-VGX Transponder Voice Gateway is a component of the E3 Broadband Audio Evacuation System and an optional component of the E3 Series Expandable Emergency Evacuation System. It is a multi-function module that incorporates the following:

- Software-programmable multi-channel digital audio applications.
- One Class B, Style 4 Signaling Line Circuit (SLC) supporting up to 32 addressable speaker circuits (AOM-2SF) and 16 addressable phone circuits (AOM-TELF).
- Supports up to 150 watts of audio power (using the AM-50 Series amplifiers operating at 50 watts of power @ either $25V_{RMS}$ or $70.7V_{RMS}$ output) with backup amplifier support.
- Offers a sixteen message capacity with up to 3 minute total duration per INI-VGX. The messages are easily field-configured via a laptop computer.
- Network interface using twisted, unshielded wire or fiber-optic cable.
- Local fire fighter phone riser.

The INI-VGX provides command and control for up to four AM-50 Series amplifiers, operating at 50 watts of power @ either $25V_{RMS}$ or $70.7V_{RMS}$ audio output (up to 150 W of audio may be delivered at any given time). The amplifiers are installed in a single cabinet. The INI-VGX uses advanced Digital Signal Processing (DSP) technology for audio compression and filtering. This feature allows the E3 Series Broadband System to produce superior clarity for intelligible LIVE voice paging. The background noise is automatically filtered during voice paging and fire fighter communications which increases the audibility and eliminates the need for Push-to-Talk devices.

INI-VG Series Technical Specifications

SPECIFICATIONS

INI-VGC, INI-VGE and INI-VGX:
Operating Voltage: 24 VDC (nominal) from the PM-9/PM-9G Power Supply
Operating Current: 0.150 amp. supervisory and alarm
Operating Temperature: 32 - 120° F (0 - 49° C)
Relative Humidity: 0 to 93% (non-condensing)
Supervised
Class 2 Power-Limited
Protocol: Asynchronous with half-duplex data flow
Wiring Specifications:
INI-VG Series (Third Generation Voice Gateway and Legacy-UTP Models):
Copper Wire: 16 to 18 AWG twisted-pair, unshielded. Up to 3,000 ft. (914.4 m) between each node.
Fiber-Optic Cable: Up to 200 microns (optimized for 62.5/125 microns). Signal loss up to 8 dB loss between each node.

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

ORDERING INFORMATION

INI-VG Series (Third Generation-Voice Gateway Models):
INI-VGC: (Command Center Voice Gateway with unshielded twisted-pair wire networking, optional fiber-optic module connection
INI-VGE: Classic Built Voice Gateway with unshielded twisted-pair wire networking, optional fiber-optic module connection.
INI-VGX: Voice Transponder Gateway with unshielded twisted-pair wire networking, optional fiber-optic module connection.
FML-E3: Fiber-optic module, multi-mode fiber connector, single channel
FSL-E3: Fiber-optic module, single-mode fiber connector, single channel
INI-VG Series Legacy Models:
1100-1321: INI-VGC-FO (Command Center Voice Gateway-fiber-optic module)
1100-1322: INI-VGC-UTP (Command Center Voice Gateway-unshielded twisted-pair only)
1100-1325: INI-VGE-FO (Classic Bulk Voice Gateway-fiber-optic module)
1100-1326: INI-VGE-UTP (Classic Bulk Voice Gateway-unshielded twisted-pair only)
1100-1323: INI-VGX-FO (Voice Transponder Gateway-fiber-optic module)
1100-1324: INI-VGX-UTP (Voice Transponder Gateway-unshielded twisted-pair only)

STANDARDS

The INI-VG Series is designed to comply with the following standards:
UL Standards: UL 864 9th Edition
UL 2572 for Mass Notification

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.
UL Listed: S1869
S1949
2572 for Mass Notification
FM Approved: 30006578
MEA Approved FDNY: COA #:-6077
CSFM: 7165-1703:125
City of Chicago Approved: Class 1 Class 2 High Rise
City of Denver Approved
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information
Learn more about Gamewell-FCI's INI-VG Series and other products available by visiting www.Gamewell-FCI.com

Honeywell Gamewell-FCI
12 Clintonville Road
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www.honeywell.com

9020-0648 | J | 10/18

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LCD-SLP

LCD Touchscreen Annunciator Display

General

The Gamewell-FCI, Liquid Crystal Display, Smart Loop Panel (LCD-SLP) is a touchscreen annunciator display used with the S3 Series and E3 Series® Systems. The LCD-SLP provides an easy-to-use, intuitive interface for the operator's control. The 4.3" (10.92 cm) color touchscreen display shows the following:

- System Status
- Event Details
- Service Modes

The following identify the LED Indicators that display on the panel.

- AC (green)
- Fire Alarm (red)
- Hazard (blue)
- Supervisory (yellow)
- Trouble (yellow)
- Silenced (yellow)

The five fully-programmable front panel switch/LED combinations provide a direct access to perform the following tasks:

- Device Bypass
- Lamp Test
- Enable/Disable Groups or Devices

The display features the following physical switches.

- Menu
- System Reset
- Drift Walk Test
- Five Programmable Switches

LCD-SLP

Installation

The LCD-SLP panel's adaptable design allows it to be mounted in a variety of S3 Series, E3® Series or Retrofit cabinet installations. For additional information, refer to the E3 Series Cabinets Data Sheet, P/N:9020-0649.

- S3 Series Cabinets
  - SLP-BB basic system enclosure
  - S3BB-BB/S3BB-RB system enclosure
- E3 Series® Cabinets
  - AA size cabinet (E3BB-BAA, E3BB-RAA)
  - A2 size cabinet (E3BB-BA2, E3BB-RA2)
  - A size flush cabinet (E3BB-FLUSH-LCD)
  - B-Slim cabinet (E3BB-RBSLIM)
  - B size cabinet (E3BB-BB, E3BB-RB)
  - C size cabinet (E3BB-BC/INCC, E3BB-RC/INCC)
  - D size cabinet (E3BB-BD/INCC, E3BB-RD/INCC)
- Retrofit Cabinets
  - 600-RETROFIT
  - 7200-B-RETROFIT
  - 7200-C-RETROFIT

Ordering Information

LCD-SLP: LCD Touchscreen display unit

E3BB-BA2: Remote enclosure with inner door, black, one LCD slot

E3BB-RA2: Remote enclosure with inner door, red, one LCD slot

E3BB-FLUSH-LCD: Remote flush mounting enclosure, black, LCD slot

FEATURES & BENEFITS

- Listed per ANSI/UL® Standard 864 9th Edition
- UL Listed and FM approved for Pre-Action/Deluge and Agent Releasing
- Provides 4.3" (10.92 cm) color touchscreen display of System Events
- Includes five custom function buttons with LEDs for direct access to system controls.
- Shows the Hazard LED to indicate gas, carbon monoxide or other toxic gases
- Both the E3 Series (ILI-MB-E3/ILI95-MB-E3) and the S3 Series (SLP) support up to 15 LCD-SLP displays via the RS-485 serial interface
- Offers the following installation options:
  - Locally mounted in the E3 Series and S3 Series panels
  - Remotely mounted in the E3 Series, A2 cabinet
  - LCD Flush enclosure
- Displays the following six LED indicators:
  - AC Power
  - Alarm
  - Hazard
  - NAC Silence
  - Supervisory
  - Trouble

LCD-SLP Technical Specifications

SPECIFICATIONS

Operating Voltage: 24 VDC FWR
Operating Current: 0.030 amp
Alarm Current: 0.065 amp
Operating Temperature: 32°to120° F (0°to49° C)
Relative Humidity: 0 to 93%,non-condensing at 90° F (32° C)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The LCD-SLP is designed to comply with the following standard:
UL Standard: UL 864 9th Edition:

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.
UL Listed: S1869
FM Approved
MEA FDNY: COA # 6162
CSFM: 7165-1703:0176
City of Chicago Approved: Class 1
Reference Certificate of Compliance: VMA 45894-02C
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information
Learn more about Gamewell-FCI's LCD-SLP and other products available by visiting www.Gamewell-FCI.com

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www.honeywell.com

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Gamewell FCI

FML-E3/FSL-E3

Fiber Loop Modules

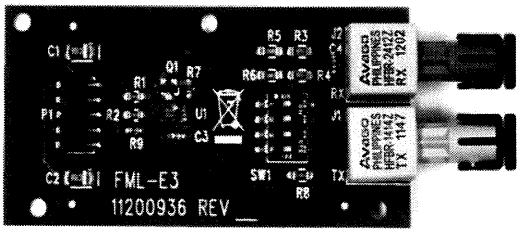
General

The Gamewell-FCI®, FML-E3 (Fiber-Optic Multi-Mode) and FSL-E3 (Fiber-Optic Single-Mode) are plug-in fiber loop modules used with the RTP-E3-UTP. The two types of fiber option modules are used as one channel to transmit or receive communications with the RPT-E3-UTP (Network Repeater), ARCNET communication circuit in the E3 Series® System.

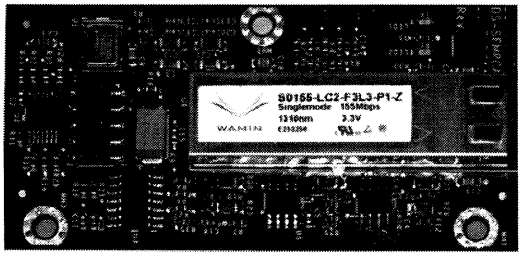
The following describe the two types of fiber option modules.

- The FML-E3 is a fiber module that allows the multi-mode fiber to network between nodes. It features the ST style connectors with a maximum attenuation of 8db with 62.5/125 micrometer cable.
- The FSL-E3 is a fiber module that allows the single-mode fiber to network between nodes. It features the LC style connectors with a maximum attenuation of 30db with 9/125 micrometer cable.

Each fiber loop module can Transmit (TX) or Receive (RX) fiber-optic cable connecting to the RPT-E3-UTP. Up to two fiber loop cards can be added to the RPT-E3-UTP, and both cards may be combined in the same configuration.



FML-E3



FSL-E3

Installation

The FML-E3/FSL-E3 modules are designed as a plug-in card that can be secured to the designated mounting pattern on the RPT-E3-UTP circuit board.

Note: For information on the installation of the FML/FSL-E3 modules, refer to the FML-E3/FSL-E3 Installation Instructions, P/N:LS10046-000GF-E.

Ordering Information

FML-E3: Fiber Loop Module - Multi-mode fiber, single TX or RX channel for RPT-E3-UTP

FSL-E3: Fiber Loop Module - Single-mode fiber, single TX or RX channel for RPT-E3-UTP

RPT-E3-UTP: Network Repeater, unshielded twisted-pair for E3 or S3,optional FML-E3 or FSL-E3 fiber modules

FEATURES & BENEFITS

- Listed per ANSI/UL® Standard 864 9th Edition
- FML-E3 features ST-style connectors with a maximum attenuation of 8 dB with 62.5/125 micrometer cable
- FSL-E3 features LC-style connectors with a maximum attenuation of 30db with 9/125 micrometer cable
- Offers the option to combine single and multi-mode modules on the same network card
- Provides a simple, plug-in card installation

FML-E3/FSL-E3 Technical Specifications

SYSTEM

FML-E3
Connections: ST style
Cable type: 62.5/125 micrometers
Operating Current: 0.053 amp
Alarm Current: 0.053 amp
FSL-E3
Connections: LC style
Cable Type: 9/125 micrometers
Operating Current: 0.079 amp
Alarm Current: 0.079 amp
Operating Temperature: 32° to 120° F (0° to 49° C)
Relative Humidity: 0 to 93%,non-condensing at 90° F (32° C)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The FML-E3/FSL-E3 are designed to comply with the following standard:
UL Standard: S864 9th Edition
Seismic Codes: International Building Code
IBC 2013
IBC 2009
IBC 2006
IBC 2003
IBC 2000 (Seismic)
California Building Code CBC: 2007 (Seismic)

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.
UL Listed: S1869
FM Approved: 3025415
MEA Approved, Fire Dept. of New York: COA# 6162
CSFM: 7165-1703-0176
City of Chicago: Class 1
VMC Reference of Certification: VMA-45894-02C
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

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For more information
Learn more about Gamewell-FCI's FML-E3/FSL-E3 and other products available by visiting www.Gamewell-FCI.com

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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7165-1703:0125

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Pete Sennett (203) 484-6127 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: Model E3 Series® BROADBAND and E3 Series® CLASSIC Voice Evacuation System. The E3 Systems may also work in conjunction with all the sub-assemblies of listee's 7100 Series Control Panel and NetSOLO systems (CSFM Listing No. 7165-1703:105 and 6911-1703:116, and 6911-1703:118).

Unit conveys all fire alarm, audio evacuation, voice paging, and fire fighter communications. Power-limited; non-coded, automatic, manual, smoke control, water flow, sprinkler supervisory, local auxiliary, central station, remote station, and proprietary service. Refer to listee's data sheet for additional detailed product description and operational considerations.

System components:

ILI-MB-E3; Intelligent Loop Interface Master Board
PM-9, PM-9G*; Power Supply
ILI-95-MB-E3, ILI-95-S-E3; Loop Interface Subassemblies
E3BB-FLUSH-LCD; Enclosure for ICD-E3
E3BB-BA/-RA/-BAA/-RAA/-BB/-RB/-BC/-RC/-BD; Cabinets*
RPT-E3-FO or; Repeater Sub-assembly, Fiber Optic or
RPT-E3-UTP; Repeater Sub-assembly, Unshielded twisted pair wire
LCD-E3; LCD Keypad Display
DACT-E3 sub-assembly; Digital alarm communicator transmitter
ILI-S-E3; Intelligent Loop Unit, Expansion Board
ANX-SR, ANX-MR-FO, ANX-MR-UTR; Addressable Node Expanders Sub Assembly*
INCC-E; Intelligent Network Enclosure*
INCC; Intelligent Network Central Command*
INI-VG, INI-VGC-UTP, INI-VGC-FO, INI-VGX-UTP; Intelligent Network Interface Sub Assembly*
INI-VGX-FO, INI-VGE-UTP, INI-VGE-FO; Intelligent Network Interface Sub Assembly*
ASM-16; Annunciator Switch Sub Assembly*
INX; Network Audio Transponder Enclosure*
ANU-48; Annunciator Sub Assembly*
NGA; Touch Screen LCD Display Sub Assembly*
LCD-7100; Remote LCD Display*
SBB-C4, SBB-D4; Backbox*

*Rev. 03-18-11bh

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

FCI-VDR-D4B, FCI-DR-C4B, FCI-CR-D4B; Doors with locks*
AA-100, AA-120; Amplifiers*
AM-50-25, AM-50-70; Amplifier Sub Assembly*
CHG120; Battery Charger with Cabinet*
BC-1/FCI-LBB; Backbox*
IPDACT-2; IP Digital Alarm Communicator*
FPJ; Firefighters's Telephone Jack Receptacle*
FHS; Portable Firefighters's Telephone Handset*
7100 Series#; Fire Alarm Control Panel or
INI-7100 UTP#; Intelligent Network Interface Sub-assembly, [Twisted, unshielded wire] or
INI-7100 FO#; Intelligent Network Interface

RATING: 120 V, 60 Hz, 3.5 A Primary; 24 V dc, 9A Secondary

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model designation, electrical rating and UL label.

APPROVAL: Listed as fire alarm control unit for use with separately listed electrically and functionally compatible initiating and indicating devices. Suitable for high-rise applications when used with the above voice evacuation systems.

This control unit can generate a distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NPFA 72, 2002 Edition.

This control unit meets the requirements of UL Standard 864, 9th Edition.

NOTE: For Fire Alarm Verification Feature (delay of alarm signaling), the Retard/Reset/Restart period shall be 30 seconds or less.

*Rev. 03-18-11bh

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7165-1703:0176

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Hardik Upadhyay (203) 484-6127 Fax (203) 484-7309
Email: Hardik.Upadhyay@honeywell.com

DESIGN: Model S3 fire alarm control unit. Automatic, manual, waterflow, sprinkler supervisory, local, remote station (PPU), and central station (PPU) services. System components:

SLP-E3; Smart Loop Panel Main Board Subassembly
LCD-SLP; Liquid Crystal Display- Smart Loop Panel Subassembly
FML-E3; Fiber Optic Multi Mode Board
FSL-E3; Fiber Optic Single Model Board
SLC-PM; Signaling Line Circuit for System Sensor Devices
SLC95-PM; Signaling Line Circuit for Apollo Devices
SLP-BB; Basic System Enclosure - Backbox, Door, Mounting Plate
*DACT-E3; Digital Alarm Communication Transmitter
*LCD-E3; LCD Display
*FLPS-7-RB; Power Supply
*RPT-E3-UPT; Network Repeater
*ASM-16 P/N1100-0455; Annunciator Switch
*ANU-48; P/N 1100-0503; Annunciator
*LCD-7100; Remote LCD Display.

Refer to the listee's data sheet for additional detailed product description and operational considerations

RATING: 120 V, 60 Hz, 2.75 A
240 V, 50/60 Hz, 1.4 A

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as fire alarm control units for use with separately listed compatible initiating and indicating devices. Refer to manufacturer's installation manual for details.

NOTE: For Fire Alarm Verification feature (delay of fire alarm), the retard/reset/restart period shall not exceed 30 seconds.

*Rev 08-30-17 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

Honeywell | Accessories

IPGSM-4G

IP Internet and GSM Dual Path Communicator

General

The IPGSM-4G is a 4G Fire Alarm Communicator that offers Contact ID reporting that operates in conjunction with any Fire Alarm Control Panel (FACP) that has a built-in dialer. This easy-to-install, dual path communicator connects directly to the primary and secondary communication ports of a Fire Panel's Digital Alarm Communicator Transmitter (DACT). It offers three selectable reporting paths which include the following:

- Cellular only
- IP only
- IP primary/cellular backup

In the event of an off-normal condition, the fire panel sends the Contact ID formatted information to the IPGSM-4G Communicator Panel. The IPGSM-4G then reformats the data into highly, encrypted Ethernet packets that are used for transmission to the Alarm-Net Receiver, via either the customer-provided Internet/Intranet connection or to the Global System for the Mobile Communications (GSM) network.

Alternative communication methods are critical in the marketplace, due to the VoIP (Voice over IP) migration from POTS (Plain Old Telephone Service) and the growth of the digital radio networks. The IPGSM-4G's exclusive dual path communications solution combines Internet service with GSM to offer an added reliability and an extra level of security.

All signals from the IPGSM-4G Communicator Panel are delivered to Honeywell's AlarmNet® Network Control Center, which routes the information to the appropriate Central Station. The state-of-the-art, AlarmNet Network Control Center is fully redundant and monitored 24/7. AlarmNet has the capability to route messages using AlarmNet-i and 800 PLUS Services, providing true redundancy and multi-path message delivery.

The IPGSM-4G is designed to operate over the most common GSM networks. Its multi-GSM platform technology automatically chooses the best available cellular signal in the area based on the signal strength, and it seamlessly self-adjusts to maintain critical life safety communications.

IPGSM-4G

FEATURES & BENEFITS

- Saves the cost of two dedicated phone lines
- Offers dual path communications that can communicate to a Central Station using the Internet or the cellular technology
- Includes a Base network connection (LAN or WAN), DSL modem or cable modem
- Requires no change to the existing Fire Alarm Control Panel configuration. The IPGSM-4G connects directly to the primary and secondary telephone ports
- Operates over any type of customer provided Ethernet 10/100
- Uses a 7720P Hand-held programmer for easy setup
- Transmits over the following communication protocols:
  - HSPA+ (4G) HSPA (HSDPA
  - HSUPA) (3G) EDGE (2G) GPRS (2G)
- Data transmits over a standard Contact-ID protocol, and it is secured with the Industry's Advanced Encryption Standard (AES 256 bit)
- Supports both dynamic (DHCP) or Public and Private Static IP Addressing
- Provides a built-in power supply module that has the following:
  - An on-board charging circuit design that accommodates the back-up battery
  - The primary power and the battery supervision
- Diagnostic LEDs: Signal strength and status indications
- Reliable connection: IP and GSM connection tested every day
- QOS: Quality of Service diagnostics via AlarmNet conveys vital communicator information including the following:
  - the time a message was received
  - signal strength
  - message path used

Installation

UL® Compliance

To comply with UL Standard 864/NFPA, ensure the following installation requirements are met:

- IPGSM-4G must be installed in accordance with NFPA
- (National Fire Protection Association) Standards 70 and 72
- IPGSM-4G must be mounted in the same room and within 20 feet of the fire panel.
- IPGSM-4G, and all equipment used for the IP connection (such as: the router, hub, modem, etc.) must comply with the following:
  - Listed
  - Powered from an un-switched branch circuit
  - Provided with the appropriate standby power
- IPGSM-4G must use the 7A/H battery (not supplied) to provide 24-hour backup capability.

Programming

The IPGSM-4G Communicator can be pre-programmed using the 7720P Programmer that allows you to enter all central-station information. This program is saved to the IPGSM-4G Communicator panel memory. When the IPGSM-4G Communicator is installed at the site and it is connected to the Internet/ Intranet, it registers itself with the AlarmNet Receiver.

For most installations, the only required parameters are:

- Primary City ID (two digits) obtained from your monitoring station
- Primary Central Station ID (two digits) obtained from your monitoring station
- Primary Subscriber ID (four digits) obtained from your monitoring station
- Communication Module's MAC ID, and MAC CRC number located on the outside of the box, and the inside of the module

Note: All parameters are assigned by the monitoring station.

Ordering Information

IPGSM-4G : Internet and GSM Cellular Communicator
Includes the following:

Red cabinet with key
Wall outlet box
Dialer Capture Module
GSM Communications Module
Antenna and mounting adapter
Power Boost Power Supply

7626-50HC: Antenna Cable IPGSM-4G 50 FT Coax
7626-25HC: Antenna Cable IPGSM-4G 25 FT Coax
GSM-ANT3DB: 3 dB External/Remote Weatherproof Antenna
7720P: Handheld Programmer, IPGSM-4G
HPTCOVER: Plug-in transformer box
BAT-1270: Battery 12 Volts, 7 A/H Sealed

IPGSM-4G Technical Specifications

SYSTEM

Power Transformer
Input Operating Voltages:
Primary: 120 VAC, 60 Hz, 0.50A
Secondary: 18 VAC, 50 VA
Backup Battery: 12 V 7.0 A (24 hours standby)
Current Requirements: - 230 mA standby
950 mA during transmission
Transmission Power: 850 MHz - 1 Watt
1900 MHz - 2 Watts
Mechanical
Dimensions: 12.75"W x 14.875"H x 3.0" D
(32.4 W x 37.6 H x 7.6 D cm)
Operating Temperature: 32° F to 120° F
(0° C to 49° C)
Humidity: 0% - 93% non-condensing

TEMPERATURE AND HU1MIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The IPGSM-4G is designed to comply with the following standard:
UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.
UL Listed: S1869
FM Approved
MEA FDNY: COA 6162
CSFM: 7165-1703:0176
City of Chicago Approved : Class 1
Reference Certificate of Compliance: VMA 45894-02C
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

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For more information
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www.honeywell.com

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Gamewell FCI

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7165-1703:0176

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Hardik Upadhyay (203) 484-6127 Fax (203) 484-7309
Email: Hardik.Upadhyay@honeywell.com

DESIGN: Model S3 fire alarm control unit. Automatic, manual, waterflow, sprinkler supervisory, local, remote station (PPU), and central station (PPU) services. System components:

SLP-E3; Smart Loop Panel Main Board Subassembly
LCD-SLP; Liquid Crystal Display- Smart Loop Panel Subassembly
FML-E3; Fiber Optic Multi Mode Board
FSL-E3; Fiber Optic Single Model Board
SLC-PM; Signaling Line Circuit for System Sensor Devices
SLC95-PM; Signaling Line Circuit for Apollo Devices
SLP-BB; Basic System Enclosure - Backbox, Door, Mounting Plate
*DACT-E3; Digital Alarm Communication Transmitter
*LCD-E3; LCD Display
*FLPS-7-RB; Power Supply
*RPT-E3-UPT; Network Repeater
*ASM-16 P/N1100-0455; Annunciator Switch
*ANU-48; P/N 1100-0503; Annunciator
*LCD-7100; Remote LCD Display.

Refer to the listee's data sheet for additional detailed product description and operational considerations

RATING: 120 V, 60 Hz, 2.75 A
240 V, 50/60 Hz, 1.4 A

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as fire alarm control units for use with separately listed compatible initiating and indicating devices. Refer to manufacturer's installation manual for details.

NOTE: For Fire Alarm Verification feature (delay of fire alarm), the retard/reset/restart period shall not exceed 30 seconds.

*Rev 08-30-17 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

Honeywell | Analog and Networking Systems

LCD-SLP

LCD Touchscreen Annunciator Display

General

The Gamewell-FCI, Liquid Crystal Display, Smart Loop Panel (LCD-SLP) is a touchscreen annunciator display used with the S3 Series and E3 Series® Systems. The LCD-SLP provides an easy-to-use, intuitive interface for the operator's control. The 4.3" (10.92 cm) color touchscreen display shows the following:

- System Status
- Event Details
- Service Modes

The following identify the LED Indicators that display on the panel.

- AC (green)
- Fire Alarm (red)
- Hazard (blue)
- Supervisory (yellow)
- Trouble (yellow)
- Silenced (yellow)

The five fully-programmable front panel switch/LED combinations provide a direct access to perform the following tasks:

- Device Bypass
- Lamp Test
- Enable/Disable Groups or Devices

The display features the following physical switches.

- Menu
- System Reset
- Drift Walk Test
- Five Programmable Switches

LCD-SLP

Installation

The LCD-SLP panel's adaptable design allows it to be mounted in a variety of S3 Series, E3® Series or Retrofit cabinet installations. For additional information, refer to the E3 Series Cabinets Data Sheet, P/N:9020-0649.

- S3 Series Cabinets
  - SLP-BB basic system enclosure
  - S3BB-BB/S3BB-RB system enclosure
- E3 Series® Cabinets
  - AA size cabinet (E3BB-BAA, E3BB-RAA)
  - A2 size cabinet (E3BB-BA2, E3BB-RA2)
  - A size flush cabinet (E3BB-FLUSH-LCD)
  - B-Slim cabinet (E3BB-RBSLIM)
  - B size cabinet (E3BB-BB, E3BB-RB)
  - C size cabinet (E3BB-BC/INCC, E3BB-RC/INCC)
  - D size cabinet (E3BB-BD/INCC, E3BB-RD/INCC)
- Retrofit Cabinets
  - 600-RETROFIT
  - 7200-B-RETROFIT
  - 7200-C-RETROFIT

Ordering Information

LCD-SLP: LCD Touchscreen display unit

E3BB-BA2: Remote enclosure with inner door, black, one LCD slot

E3BB-RA2: Remote enclosure with inner door, red, one LCD slot

E3BB-FLUSH-LCD: Remote flush mounting enclosure, black, LCD slot

FEATURES & BENEFITS

- Listed per ANSI/UL® Standard 864 9th Edition
- UL Listed and FM approved for Pre-Action/Deluge and Agent Releasing
- Provides 4.3" (10.92 cm) color touchscreen display of System Events
- Includes five custom function buttons with LEDs for direct access to system controls.
- Shows the Hazard LED to indicate gas, carbon monoxide or other toxic gases
- Both the E3 Series (ILI-MB-E3/ILI95-MB-E3) and the S3 Series (SLP) support up to 15 LCD-SLP displays via the RS-485 serial interface
- Offers the following installation options:
  - Locally mounted in the E3 Series and S3 Series panels
  - Remotely mounted in the E3 Series, A2 cabinet
  - LCD Flush enclosure
- Displays the following six LED indicators:
  - AC Power
  - Alarm
  - Hazard
  - NAC Silence
  - Supervisory
  - Trouble

LCD-SLP Technical Specifications

SPECIFICATIONS

Operating Voltage: 24 VDC FWR
Operating Current: 0.030 amp
Alarm Current: 0.065 amp
Operating Temperature: 32°to120° F (0°to49° C)
Relative Humidity: 0 to 93%,non-condensing at 90° F (32° C)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The LCD-SLP is designed to comply with the following standard:
UL Standard: UL 864 9th Edition:

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult the factory for the latest listing status.
UL Listed: S1869
FM Approved
MEA FDNY: COA # 6162
CSFM: 7165-1703:0176
City of Chicago Approved: Class 1
Reference Certificate of Compliance: VMA 45894-02C
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information
Learn more about Gamewell-FCI's LCD-SLP and other products available by visiting www.Gamewell-FCI.com

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12 Clintonville Road
Northford, CT 06472-1610
203.484.7161
www.honeywell.com

9021-60782 | F | 09/17

Honeywell

Honeywell | Analog and Networking Systems

Gamewell FCI

E3 Series® Cabinets

Cabinets used for the E3 Series

General

The E3 Series® Expandable Emergency Evacuation System by Gamewell-FCI offers several cabinet size options. The E3 Series System is a modular design that allows a wide range of configurations to form an integrated, distributed fire alarm system. These cabinet options allow for sturdy and modern installations. The E3 Series cabinet assembly is a compact, wall-mounted enclosure. A typical cabinet includes a backbox and an outer locking door. In addition, there are several inner door options and mounting plates to accommodate a variety of E3 Series sub-assemblies.

Each cabinet backbox includes mounting patterns for plates to allow the installer to arrange and secure the sub-assemblies to the backbox. The backbox knockouts are also positioned at numerous points to allow a conduit access into the enclosure.

The following four Annunciator cabinet sizes provide the maximum flexibility that can meet any application.

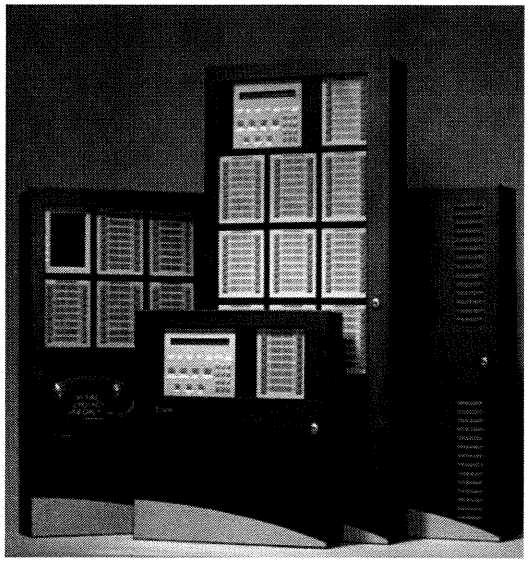
- Cabinet AA offers 2-slot or 3-slot options to accommodate any of the following configurations:
  - Inner door, 2-slots allows space for one LCD-E3 or LCD-SLP and one ASM-16
  - Inner door, 3-slots allows space for any combination of three modules: ASM-16, NGA or an ANU-48
- Cabinet A1 houses one NGA or one ASM-16/ANU-48.
- Cabinet A2 accommodates a single LCD-E3.
- E3BB-FLUSH-LCD or E3BB-NGA-FLUSH.

The E3BB-R-BSlim or B-Slim contains the 600 Series cabinet. Cabinet B includes a mounting plate that contains a space for the following modules:

- ILI-MB-E3/ILI95-MB-E3
- PM-9/PM-9G sub-assemblies
- Batteries set inside the backbox

Additional sub-assembly options mounted on the backbox include the DACT-E3 and RPT-E3. The 2-slot inner door houses the following options:

- one LCD-E3 module and• either one ASM-16/ANU-48 or one NGA module



E3 Series® Cabinets

FEATURES & BENEFITS

- IBC Seismic Certified
- 16-gauge steel backbox
- Contains removable outer and inner doors
- Lexan® windows appear on the doors of most cabinets, except the Cabinet "C" and "D" INX cabinets and the INX CAB-B cabinet which contain louvered doors
- Built with an inner door bonding strap used to provide electrical continuity for grounding
- Cabinets are available in either black or red
- Backbox and door ground studs provide positive grounding, and 180° opening door with full clearance
- Offers 90° opening door with zero clearance
- Includes a keylock with quarter turn latch
- Trim Ring accessories available

General

Both the C and D-size Command Center cabinets house a variety of E3 Series Broadband sub-assemblies that can be used in multiple configurations that provide a solution to a wide range of applications. Two flexible inner door panel selections are available for C and D-size Command Center cabinets that may contain any of the following:

- fire fighter's phone handset
- microphone
- optional modules to meet the facility operation requirements

Refer to the Inner Door and Backbox Mounting Capacities in the Ordering Information Section.

Ordering Information

Inner Door Mounting Capacity

Part Number	Description
Cabinet "AA" Size	
Dimensions:	19 1/4" W x 10" H x 4 1/2" D (49 W x 25 H x 11.4 D cm)
E3BB-BAA	Enclosure, Black, "AA" (LOC) Size
E3BB-RAA	Enclosure, Red, "AA" (LOC) Size
E31D2-TA	Inner Door, 2-slots (INCC-TEL & ASM-16)
E3ID2-A	Inner Door, 2-slots (LCD-E3 or LCD-SLP & ASM-16)
E3ID3-A	Inner Door, 3-slots (NGA, ASM-16 and MIC)
Cabinet "AA1" Size:	
Dimensions:	8 3/4" W x 10" H x 4 1/2" D (22 W x 25 H x 11.4 D cm)
E3BB-BAA1	Remote Enclosure, Black, w/Inner Door, 1 slot, (NGA)
E3BB-RAA1	Remote Enclosure, Red, w/Inner Door, 1-slot, (NGA)
Cabinet "A2" Size:	
Dimensions:	13 1/4" W x 10" H x 4 1/2" D (40 W x 25 H x 11.4 D cm)
E3BB-BA2	Remote Enclosure, Black, w/Inner Door, 1-slot, (LCD-E3 or LCD-SLP)
E3BB-RA2	Remote Enclosure, Red, w/Inner Door, 1-slot, (LCD-E3 or LCD-SLP)
Flush Cabinet A2 Annunciators:	
Dimensions:	13 1/4" W x 10" H x 4 1/2" D (40 W x 25 H x 11.4 D cm)
E3BB-FLUSH-LCD	CAB A2 Remote Flush LCD ANN with Key switch operation
E3BB-NGA-FLUSH	CAB A2 Remote Flush NGA ANN with Password protected
Cabinet "B-Slim" Size: (Retrofit Kits)	
Dimensions:	14" W x 20" H x 4 1/2: D (35.5 W x 50.8 H x 11 D cm)
E3BB-RBSLIM	Assy, Enclosure, B-SLIM, Red with Backplate and LCD-E3 Keyswitch plate
IF600-RETROFIT	Door and Cab mounting plates, disable key switch and door lock (PK-625) for E3 Series upgrade.
Cabinet "B" Size:	
Dimensions:	19 3/8"W x 19 3/8"H x 4 1/2"D (49 W x 49 H x 11 D cm)
E3BB-BB	Assy, Backbox Enclosure, Black,"B" Size
E3BB-RB	Assy, Backbox Enclosure, Red, "B" Size
E3ID2-B	Inner Door, 2-slots, "B" Size
1100-0458	B Size INCC Command Center enclosure, black
1100-0459	B Size INCC Command Center enclosure, red door
1100-0460	INX-Transponder 19" (cm) Backbox with Door, Black

Ordering Information (Continued)

Part Number	Description
Cabinet "B" Size (Continued)	
Dimensions:	19 3/8"W x 19 3/8"Hx4 1/2"D (49 W x 49 H x 11.43 D cm)
Cabinet "C" Size:	
Dimensions:	19 3/8" W x 30" H x 4 1/2" D (49 W x 76 H x 11 D cm)
E3BB-BC/INCC	Enclosure, Command Ctr, Black, "C" Size
E3BB-RC/INCC	Enclosure, Command Ctr, Red, "C" Size
E3ID2-C	Assy, Inner Door, Command Ctr.2- Bay "C" Size
E3ID3-C	Assy, Inner Door, Command Ctr, 3-Bay "C" Size
E3BB-BC/INX	Assy, Transponder, Black, "C" Size
E3BB-RC/INX	Assy, Transponder, Red, "C" Size
E3-INCC-CPLATE	Command Center module mounting plate, "C" Size
E3-INX-CPLATE	Transponder mounting plate, "C" Size
Inner Door Mounting Capacity	
E3-ILI-CPLATE	Intelligent loop module mounting plate "C" Size
Cabinet "D" Size:	
Dimensions:	19 3/8" W x 41" H x 4 1/2" D (49 W x 104 H x 11 D cm)
E3BB-BD/INCC	Enclosure, Command Ctr, Black, "D" Size
E3BB-RD/INCC	Enclosure, Command Center, Red, "D" Size
E3ID2-D	Assy, Inner Door, 2-Bay, "D" Size
E3ID3-D	Assy, Inner Door, 3-Bay, "D" Size
E3BB-BD/INX	Enclosure, Transponder, Black "D" Size
E3BB-RD/INX	Enclosure, Transponder, Red, "D" Size
E3-INCC-D-PLATE	Command Center module mounting plate, "D" Size
E3-INX-D-PLATE	Transponder module mounting plate, "D" Size
Optional Extender Plates	
AM-50 Plate	AM-50 Extender Plate
FPT-GATE-3-EXT	FPT-GATE-3 Extender Plate
Optional Accessories	
1100-0450	Command Center, blank plate, single size
E3-BP	Inner door panel, blank, double size
90375	PM-9/PM-9G Adapter Plate Kit,Hardware
E3-TRIMKIT-A	Trim kit for "A"/"AA" size enclosure, black
E3-TRIMKIT-A1	Trim kit for "AA1" size enclosure, black
E3-TRIMKIT-A2	Trim kit for "A2" size enclosure, black
E3-TRIMKIT-B	Trim kit for "B" size enclosure, black
E3-TRIMKIT-C	Trim kit for "C" size enclosure, black
E3-TRIMKIT-D	Trim kit for "D" size enclosure, black
Bulk Amplification	
AA-100	100 W Audio Amp.@70.7 V_{RMS} w/120 VAC
AA-120	120 W Audio Amp. @25 V_{RMS} w/ 120 VAC
ACT-1	Audio coupling transformer, for audio systems w/multiple supplies
FCI-CHG-120	Battery Charger, 25-120 A/H Gel cell
FCI-LBB	Battery box, accommodates batteries up to 55 A/H, (Black)
Cabinet C:	
FCI-DR-C4B	Large Battery Backbox,blank door,lock and keys for backbox accepting 3 chassis, (Black)
FCI-DR-C4BR	Blank door, lock and keys, for backbox accepting 3 chassis, (Red)
SBB-C4	Backbox, 3 chassis, (Black)
Cabinet D:	
FCI-DR-D4B	Blank door, lock and keys, for backbox accepting 4 chassis, (Black)
FCI-DR-D4BR	Blank door, lock and keys, for backbox accepting 4 chassis, (Red)
SBB-D4	Backbox, 4 chassis, (Black)
90516	7100-Slim 7A/H Seismic Battery Bracket Kit

Seismic Battery Bracket Kits

Part Number	Description
90517	E3 B-Slim 7 A/H Seismic Battery Bracket Kit 7100-Slim 12 A/H Seismic Battery Bracket Kit
90518	E3 B-Slim 12 A/H Seismic Battery Bracket Kit E3 CAB-B 7 A/H Seismic Battery Bracket Kit

Ordering Information (Continued)

Seismic Battery Bracket Kits (Continued)

Part Number	Description
	E3 CAB-C 7 A/H Seismic Battery Bracket Kit
	E3 CAB-D 7 A/H Seismic Battery Bracket Kit
	NetSOLONS-INX-7A/H Seismic Battery Bracket Kit
	NetSOLO-7100-7A/H Seismic Battery Brckt Kit
90519	E3 CAB-C (INX only) 12 A/H Seismic Battery Bracket Kit
	E3 CAB-D (INX only) 12 A/H Seismic Battery Bracket Kit
	NetSOLO NS-INX 12 A/H Seismic Battery Bracket Kit
90520	E3 CAB-B 18 A/H Seismic Battery Bracket Kit
	E3 CAB-C 18 A/H Seismic Battery Bracket Kit
	E3 CAB-D 18 A/H Seismic Battery Bracket Kit

Retrofit Kits

For information on the Gamewell and 7200 Retrofit Kits, refer to the following Data Sheets.

9021-60678	Gamewell Retrofit Kits Data Sheet
9021-60733	7200 Retrofit Kits Data Sheet

Inner Door Mounting Capacity

Part Number	Components
Cabinet AA	
E3ID2-A	Cabinet AA, Inner Door, 2-slots
1	LCD-E3 Display and
1	ASM-16/ANU-48
E3ID2-TA	Assembly, Door, Inner, TEL-E3
E3ID3-A,	Cabinet A, Inner Door, 3-slots
1	NGA or ASM-16
2	ASM-16s/ANU-48
Cabinet AA1	
E3ID-A1	Cabinet AA1,Inner Door (Includes Box)
1	NGA or ASM-16
Cabinet A2	
E3ID-A2	Cabinet A2, Inner Door, (Includes Box)
1	LCD-E3
Cabinet B	
E3ID2-B	Cabinet B, Inner Door, (Includes Box)
1	LCD-E3 Display and one ASM-16/ANU-48
1	NGA and one ASM-16/ANU-48
B-Slim Cabinet	
1	LCD-E3 Display & one RPT-E3 or one DACT-E3
1	ILI-MB-E3 or one ILI95-MB-E3
1	PM-9 or one PM-9G
Cabinet C	
E3ID2-C	Cabinet C, Inner Door, 2-slots
1	LCD-E3 Display and
5	Any combination of ASM-16/ANU-48, NGA or Microphone Assemblies
1	Telephone Assembly
E3ID3-C	Cabinet C, Inner Door, 3-slots
7	Any Combination of ASM-16/ANU-48, NGA, or Microphone Assemblies
1	Telephone Assembly
Cabinet D	
E3ID2-D	Cabinet D, Inner Door, 2-slots
1	LCD-E3 Display
11	Any Combination of ASM-16/ANU-48, or NGA or Microphone and
1	Telephone Assembly
E3ID3-D	Cabinet D, Inner Door, 3-slots
13	Any Combination of ASM-16/ANU-48, NGA or Microphone Assemblies
1	Telephone Assembly
1	Loop Interface or ANX or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater

Backbox Mounting Capacity

E3BB-BAA	Enclosure 'AA' (LOC) Size Black
1	INI-VG Series Voice Gateway
E3BB-BAA1	AA1 Size Box/Door, Black
1	RPT-E3 Network Repeater
E3BB-BB	B-Size Box/Door, Black
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3/ILI95-MB-E3 and

Backbox Mounting Capacity (Continued)

Part Number	Components
E3BB-BB	B-Size Box/Door, Black
1	Additional ILI-MB-E3/ILI95-MB-E3
1	Loop Interface or ANX or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
INX CAB-B Mounting Plate	
1	PM-9 or PM-9G
1	INI-VGX
4	AM-50 Series amplifiers
E3-INCC-C Plate	
1	PM-9/PM-9G Power Supply
1	INI-VG Series Voice Gateway
1	ILI-MB-E3/ILI95-MB-E3 Loop Interface and Additional ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
1	Optional AM-50 or FPT-GATE-3 Extender Plate
E3-ILI-C Plate	
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3 or ILI95-MB-E3
2	Additional ILI-MB-E3/ILI95-MB-E3 or ILI-S-E3/ILI95-S-E3 or ANX
1	DACT-E3
1	RPT-E3
1	Optional FPT-GATE-3 Extender Plate
E3-INX-C Plate	
1	PM-9/PM-9G Power Supply with one PM-9/PM-9G Adapter Plate
1	INI-VGX Voice Gateway
1	ILI-MB-E3 Loop Interface and
1	Additional ILI-MB-E3/LI95-MB-E3/ANX
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
4	AM-50 Series Amplifier
1	Optional FPT-GATE-3 Extender Plate
E3-INCC-D Plate	
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3 or ILI95-MB-E3
4	Additional ILI-E3 or ILI95-E3 Series or ANX
1	DACT-E3 Digital Communicator
1	RPT-E3 Network Repeater
1	INI-VG Series
1	Optional AM-50 or FPT-GATE-3 Extender Plate
E3-INX-D Plate	
1	PM-9/PM-9G Power Supply
1	ILI-MB-E3 or ILI95-MB-E3
1	DACT-E3 Digital Communicator
1	RPT-E3 Network Repeater
1	INI-VG Series
4	AM-50 Series Amplifier
1	Optional FPT-GATE-3 Plate
E3BB-BD	D-size Box/Command Center (Voice), Black
1	PM-9/PM-9G Power Supply
1	INI-VG Series Voice Gateway
4	ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface
1	Additional ILI-MB-E3/ILI95-MB-E3/ ANX Loop Interface or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
1	Optional FPT-GATE-3 Plate
E3BB-BD	D-size Box/Command Center, Black
1	PM-9/PM-9G Power Supply
7	ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface & Additional ILI-MB-E3/ILI95-MB-E3/ANX Loop Interface or
1	DACT-E3 Digital Communicator and
1	RPT-E3 Network Repeater
Optional Extender Plates	
AM-50 Extender Plate	
1	AM-50-25 or AM-50-70
FPT-GATE-3 Extender Plate	
1	FocalPoint® Gateway
1	PNET-1
1	Optional FPT-GATE-3 Extender Plate

E3 Series® Cabinets Technical Specifications

STANDARDS

The E3 Series fire alarm control panel cabinets are designed to comply with the following standards:

UL Standards: UL 864 9th Edition:

- Automatic Fire Detector Alarm
- Manual Fire Alarm
- Waterflow Alarm
- Supervisory
- Releasing Device Service
- Releasing/Pre-Action Deluge
- Releasing/Agent Releasing
- Automatic Smoke Alarm, Non-coded and Master Coded Operation

Underwriters Laboratories Standard UL 2572 (Mass Notification Systems).

UUKL for Smoke Control

UL2572 1st Edition

NFPA Standards

NFPA 13 - Standard for Installation of Sprinkler Systems

NFPA 16 - Standard for Foam-Water Sprinkler and Foam Water Spray Systems

NFPA 72 - National Fire Alarm Code:

- Central Station Fire Alarm Systems
- Auxiliary Fire Alarm Systems
- Proprietary Fire Alarm Systems
- Local Fire Alarm Systems
- Remote Station Fire Alarm Systems

NFPA 13 Sprinkler

NFPA 12A Halon 1301

NFPA 15 Water Spray

NFPA 16 Foam Water

NFPA 750 Water Mist

NFPA 2001 Clean Agent

NFPA 12 CO2 Carbon Dioxide

NFPA 17 Dry Chemical/17A Wet Chemical

Seismic Codes

International Building Codes:

- IBC 2013
- IBC 2009
- IBC 2006
- IBC 2003
- IBC 2000 (Seismic)

California Building Code CBC 2007 (Seismic)

STANDARDS

The E3 Series Cabinets are designed to comply with the following standard:

UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL Listed: S1869
MEA Approved: 6177
Fire Dept. of New York: COA# 6077
CSFM: 7165-1703-0125
FM Approved: 3025415
City of Chicago
City of Denver
VMA Seismic Certified
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's E3 Series® Cabinets and other products available by visiting www.Gamewell-FCI.com

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www.honeywell.com

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Honeywell

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7165-1703:0176

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Hardik Upadhyay (203) 484-6127 Fax (203) 484-7309
Email: Hardik.Upadhyay@honeywell.com

DESIGN: Model S3 fire alarm control unit. Automatic, manual, waterflow, sprinkler supervisory, local, remote station (PPU), and central station (PPU) services. System components:

SLP-E3; Smart Loop Panel Main Board Subassembly
LCD-SLP; Liquid Crystal Display- Smart Loop Panel Subassembly
FML-E3; Fiber Optic Multi Mode Board
FSL-E3; Fiber Optic Single Model Board
SLC-PM; Signaling Line Circuit for System Sensor Devices
SLC95-PM; Signaling Line Circuit for Apollo Devices
SLP-BB; Basic System Enclosure - Backbox, Door, Mounting Plate
*DACT-E3; Digital Alarm Communication Transmitter
*LCD-E3; LCD Display
*FLPS-7-RB; Power Supply
*RPT-E3-UPT; Network Repeater
*ASM-16 P/N1100-0455; Annunciator Switch
*ANU-48; P/N 1100-0503; Annunciator
*LCD-7100; Remote LCD Display.

Refer to the listee's data sheet for additional detailed product description and operational considerations

RATING: 120 V, 60 Hz, 2.75 A
240 V, 50/60 Hz, 1.4 A

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as fire alarm control units for use with separately listed compatible initiating and indicating devices. Refer to manufacturer's installation manual for details.

NOTE: For Fire Alarm Verification feature (delay of fire alarm), the retard/reset/restart period shall not exceed 30 seconds.

*Rev 08-30-17 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7165-1703:0125

CATEGORY: 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Pete Sennett (203) 484-6127 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: Model E3 Series® BROADBAND and E3 Series® CLASSIC Voice Evacuation System. The E3 Systems may also work in conjunction with all the sub-assemblies of listee's 7100 Series Control Panel and NetSOLO systems (CSFM Listing No. 7165-1703:105 and 6911-1703:116, and 6911-1703:118).

Unit conveys all fire alarm, audio evacuation, voice paging, and fire fighter communications. Power-limited; non-coded, automatic, manual, smoke control, water flow, sprinkler supervisory, local auxiliary, central station, remote station, and proprietary service. Refer to listee's data sheet for additional detailed product description and operational considerations.

System components:

ILI-MB-E3; Intelligent Loop Interface Master Board
PM-9, PM-9G*; Power Supply
ILI-95-MB-E3, ILI-95-S-E3; Loop Interface Subassemblies
E3BB-FLUSH-LCD; Enclosure for ICD-E3
E3BB-BA/-RA/-BAA/-RAA/-BB/-RB/-BC/-RC/-BD; Cabinets*
RPT-E3-FO or; Repeater Sub-assembly, Fiber Optic or
RPT-E3-UTP; Repeater Sub-assembly, Unshielded twisted pair wire
LCD-E3; LCD Keypad Display
DACT-E3 sub-assembly; Digital alarm communicator transmitter
ILI-S-E3; Intelligent Loop Unit, Expansion Board
ANX-SR, ANX-MR-FO, ANX-MR-UTR; Addressable Node Expanders Sub Assembly*
INCC-E; Intelligent Network Enclosure*
INCC; Intelligent Network Central Command*
INI-VG, INI-VGC-UTP, INI-VGC-FO, INI-VGX-UTP; Intelligent Network Interface Sub Assembly*
INI-VGX-FO, INI-VGE-UTP, INI-VGE-FO; Intelligent Network Interface Sub Assembly*
ASM-16; Annunciator Switch Sub Assembly*
INX; Network Audio Transponder Enclosure*
ANU-48; Annunciator Sub Assembly*
NGA; Touch Screen LCD Display Sub Assembly*
LCD-7100; Remote LCD Display*
SBB-C4, SBB-D4; Backbox*

*Rev. 03-18-11bh

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

FCI-VDR-D4B, FCI-DR-C4B, FCI-CR-D4B; Doors with locks*
AA-100, AA-120; Amplifiers*
AM-50-25, AM-50-70; Amplifier Sub Assembly*
CHG120; Battery Charger with Cabinet*
BC-1/FCI-LBB; Backbox*
IPDACT-2; IP Digital Alarm Communicator*
FPJ; Firefighters's Telephone Jack Receptacle*
FHS; Portable Firefighters's Telephone Handset*
7100 Series#; Fire Alarm Control Panel or
INI-7100 UTP#; Intelligent Network Interface Sub-assembly, [Twisted, unshielded wire] or
INI-7100 FO#; Intelligent Network Interface

RATING: 120 V, 60 Hz, 3.5 A Primary; 24 V dc, 9A Secondary

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model designation, electrical rating and UL label.

APPROVAL: Listed as fire alarm control unit for use with separately listed electrically and functionally compatible initiating and indicating devices. Suitable for high-rise applications when used with the above voice evacuation systems.

This control unit can generate a distinctive three-pulse Temporal Pattern Fire Alarm Evacuation Signal (for total evacuation) in accordance with NPFA 72, 2002 Edition.

This control unit meets the requirements of UL Standard 864, 9th Edition.

NOTE: For Fire Alarm Verification Feature (delay of alarm signaling), the Retard/Reset/Restart period shall be 30 seconds or less.

*Rev. 03-18-11bh

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

Honeywell | Addressable Devices

Gamewell FCI

MS-7 Series

Manual Fire Alarm Pull Stations

General

The Gamewell-FCI, MS-7 Series manual fire alarm pull stations are available in a wide variety of configurations. The pull stations comply with the Americans with Disabilities Act (ADA) 5-lb. maximum pull force requirement. Operating instructions and Braille text are engraved in the handle. All pull stations include a key lock/reset which is keyed alike with the Gamewell-FCI fire alarm control panels and other manual fire alarm pull stations.

MS-7 Series

MS-7AF Velociti Addressable Station

The MS-7AF Velociti® Series addressable station is a double action pull station designed for installation in the signaling line circuit of Gamewell-FCI analog addressable control panels. Activation of the pull station causes its assigned address to register at the fire alarm control panel. The door contains an LED which flashes green in normal condition and lights steady red when the station has been activated.* The station features screw terminals.

MS-7ASF Velociti Addressable Station

The MS-7ASF Velociti® Series addressable pull station is a single action station designed for installation in the signaling line circuit of Gamewell-FCI analog addressable control panels. Activation of the station causes its assigned address to register at the control panel. The door contains an LED which flashes green in normal condition and lights steady red when the pull station is activated.* The station features screw terminals.

The Velociti® Series pull stations use a communication protocol that substantially increases the speed of communication between the sensors and certain Gamewell-FCI analog addressable fire alarm controls. These devices operate in a grouped fashion. If one of the devices in the group has a status change, the panel's microprocessor stops the group poll and focuses on the single device. The net effect offers a response speed up to five times greater than earlier designs.

MS-7 Double Action Station

The MS-7 double action pull station is used with conventional fire alarm control panels. It features a set of single pole contacts and screw terminals for connection to an initiating circuit.

FEATURES & BENEFITS

- Addressable stations compatible with all Gamewell-FCI analog addressable fire alarm controls
- Conventional stations suitable for use with any UL® Listed control panel
- The pull stations (MS-7LOB) are Listed for outdoor applications
- Complies with ADA pull force requirements
- Offers surface or semi-flush mounting
- Shock and vibration resistant
- Both single and double action pull stations available
- Includes a tumbler lock for test and reset keyed alike with analog addressable fire alarm controls

*Only the red LED is operative in panels that do not operate in Velociti mode

MS-7S Single Action Station

The MS-7S single action pull station is used with conventional fire alarm control panels. It features a set of single pole contacts and wire leads for connection to an initiating circuit.

MS-7SP Double Action Station

The MS-7SP is a double action pull station similar to the MS-7 station, with the additional feature of including both English and Spanish instructions molded into the unit.

MS-7LR Dual-action Agent Release Station

The MS-7LR is designed for use with the Gamewell-FCI fire alarm control panels with releasing capabilities and Flex Series releasing systems. It features a set of single pole contacts and screw terminals used to connect to an initiating circuit.

MS-7LRA Agent Release Station with Abort

The MS-7LRA is designed for use with the Gamewell-FCI fire alarm control panels with releasing capabilities and Flex Series releasing systems where system abort capabilities are required. It consists of the following:

- An MS-7LR mounted on a plate with an abort switch
- LED indicators that signal system normal and system activated status

MS-7LOB Double Action Station (Listed for Outdoor Applications)

The MS-7LOB station must be mounted on a Model SB-I/O backbox. In retrofit applications, the pull station is UL Listed for use with the WP-10 backbox. It is intended for use with conventional control panels and has a set of single pole contacts and screw terminals.

Mounting

The MS-7 interior pull stations may be surface mounted or semi-flush mounted on a standard double-gang, or 4-inch (10.2 cm) square electrical box. An optional trim ring (BG12TR) may also be used for semi-flush mounting.

NYC-Plate

The NYC-Plate provides the backplate for the manual pull station. (See Figure 1).

Figure 1 NYC-Plate

Ordering Information

MS-7: Double action station

MS-7AF:** Velociti addressable double action station

MS-7ASF:** Velociti addressable single action station

MS-7S: Single action station, wire leads

MS-7SP: Double action station, English and Spanish instructions

MS-7LR: Agent release station, dual-action

MS-7LRA: Agent release station with abort switch, LED indicators, dual- action

MS-7LOB: Double action station, outdoor use (Includes SB-I/O - Indoor/outdoor use backbox)

SB-I/O: Indoor/outdoor use backbackbox

SB-10: Surface backbox

BG12TR: Trim ring for semi-flush mount, plastic

NY-PLATE: NYC backplate for manual pull station

**For use with the Gamewell-FCI analog addressable control panels only.

MS-7 Series Technical Specifications

SYSTEMS

Material: Lexan®
Contact Ratings: 0.25 amps. @ 30 VAC/VDC (resistive)
Dimensions: 5 5/8" H x 4 1/4" W x 1 1/4" D
(14 x 10.1 x 3.2 cm)
Operating Temperature:
(MS-7AF, MS-7ASF): 32° to 120° F (0° to 49° C)
(MS-7LOB): -30° to 150° F (-35° to 66° C)
Relative Humidity :
(MS-7AF, MS-7ASF): 10 to 93% (non-condensing)
(MS-7LOB): 85% ± 5% @ 86° ± 3.6° (30° ± 2° C)
Alarm Current: .0030 amp. 0.007 for LED
Supervisory Current:
(MS-7AF, MS-7ASF): .00030 amps.

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The MS-7 Series is designed to comply with the following standard:
UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.
UL: S2465
FM: 3023594
MEA FDNY: 67-02-E Vol. VII
CSFM:
7160-1703:0119
7160-1703:0170
7160-1703:0109
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information
Learn more about Gamewell-FCI's MS-7 Series and other products available by visiting www.Gamewell-FCI.com

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9020-0616 | F | 11/17

Honeywell

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7150-1703:0119

CATEGORY: 7150 -- FIRE ALARM PULL BOXES

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Pete Sennett (203) 484-6127 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: Model MS-7AF dual action fire alarm pull box. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, rating, and UL label.

APPROVAL: Listed as fire alarm pull boxes for use with separately listed compatible fire alarm control units. Refer to listee's Installation Instruction Manual for details.

* These manual pull boxes meet the requirements of UL Standard 38, 1999 Edition and California amendments.

NOTE: Formerly: 7150-0694:261

XLF: 7150-0028:0199

*Updated 09-08-2009 fm

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

Honeywell | Addressable Devices

Gamewell FCI

Velociti® Series ASD-PL2F, ASD-PTL2F and ASD-PL2FR

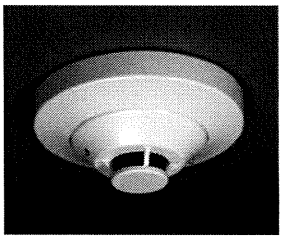
Analog, Addressable Photoelectronic Smoke Sensor

General

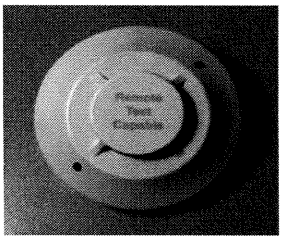
The Gamewell-FCI Velociti® Series, analog addressable plug-in smoke sensors with integral communication provide features that surpass conventional sensors. Sensitivity can be programmed in the control panel software, and is continuously monitored and reported to the panel. Point ID capability allows each sensor's address to be set, providing exact locations for selective maintenance when the chamber contamination reaches an unacceptable level.

The ASD-PL2F photoelectric sensor's unique optical sensing chamber is engineered to sense smoke produced by a wide range of combustion sources. Dual electronic thermistors add 135°F (57°C) fixed-temperature thermal sensing on the ASD-PTL2F model.

The Velociti® Series use a communication protocol that substantially increases the speed of communication between the sensors and certain Gamewell-FCI analog addressable fire alarm controls. These devices operate in a grouped fashion. If one of the devices in the group has a status change, the panel's microprocessor stops the group poll and concentrates on the single device. The net effect is a response speed up to five times greater than earlier designs.



ASD-PL2F/ASD-PTL2F



ASD-PL2FR

Installation

The ASD-PL2F plug-in sensors use a separate base to simplify installation, service, and maintenance. A special tool allows maintenance personnel to plug-in and remove sensors without using a ladder.

Mount the base on a box which is at least 1.5" (3.8 cm) deep. Suitable mounting base boxes include:

- 4.0" (10.2 cm) square box.
- 3.5" (8.9 cm) or 4.0" (10.2 cm) octagonal box.
- Single-gang box (except relay or isolator bases).

With B200S or B200SR base, mounted on a 4.0" (10.2 cm) octagonal or square box.

With B224RB or B224BI base, mounted on a 3.5" (8.9 cm) octagonal box, or a 4.0" (10.2 cm) octagonal or square box.

NOTE: Because of the inherent supervision provided by the SLC, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring.

Sensor Spacing

Gamewell-FCI recommends that the spacing sensors be used in compliance with NFPA 72.

FEATURES & BENEFITS

- Offers a sleek, low-profile design
- Includes visual rotary, decimal switch addressing (01-159)
- Has a built-in functional test switch activated by an external magnet
- Displays bi-color LEDs flash green whenever the sensor is addressed, and light steady red on alarm*
- Supports a low standby current
- Includes an optional relay, isolator, or sounder bases
- Contains an optional remote, single-gang LED Indicator (RA100Z)
- Designed with an analog addressable communication
- Provides a stable communication technique with noise immunity
- Compatible with Gamewell-FCI analog addressable panels

Note: *Only the red LED is operative in panels that do not operate in Velociti® mode.

Ordering Information

Bases and Options

B501: Plug-in sensor base without flange

Dimensions: : 4.1" (10.4 cm) diameter

B210LP: Flanged mounting base

Dimensions: : 6.1" (15.5 cm) diameter

B210LPBP: Flanged mounting base bulk pack

Dimensions: : 6.1" (15.5 cm) diameter

B224RB: Relay Base Plug-in sensor base with auxiliary relay, SPDT, rated 2 amps @ 30 VDC (resistive).

Screw terminals: Up to 14 AWG (2.0 mm2)

2 coil latching relay 1 Form C contact UL/CSA Rating:

0.9 A @ 125 VAC, inductive

0.9 A @ 110 VDC, inductive

3 A @ 30 VDC, resistive

Dimensions: : 6.1" (15.5 cm) diameter

Maximum: 25 devices between isolator bases.

B200S: Intelligent sensor sounder base

Dimensions: : 6.875" (17.5 cm) diameter

B200SR: Standard sounder base, UL 8649th Edition compliant, ULC Listed

Dimensions: : 6.875" (17.5 cm) diameter

RA100Z: Remote LED Annunciator

BCK-200: Black detector covers (box of 10)

DNR: Duct smoke housing

Velociti® Series ASD-PL2F, ASD-PTL2F and ASD-PL2FR Technical

SYSTEMS

ASD-PL2F, ASD-PTL2F, ASD-PL2FR:

Dimensions: 2.1" (5.1 cm) height

Diameter: 4.1" (10.4 cm) installed in the B501 base
6.1" (15.5 cm) installed in the B210LP base

Shipping Weight: 5.2 oz. (147 g)

Operating Temperature:

ASD-PL2F: 32° F to 120° F (0° C to 49° C)

ASD-PTL2F: 32° F to 100° F (0° C to 38° C)

UL®-Listed Velocity Range: 0-4000 ft./min. (1,219.2 m/min.), suitable for installation in ducts.

Relative Humidity: 10-93% (non-condensing)

Thermal Ratings: Fixed-temperature setpoint 135° F (57° C)

Electrical Specifications

Voltage Range: 15 – 32 volts DC peak

Standby Current: (max. avg.): .0003 A @ 24 VDC (One communication every 5 seconds with LED blink enabled)

Maximum Alarm-Current: .0065 A @ 24 VDC (LED) lit).

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

Standards

The Velociti Series, ASD-PL2F/PTL2F/PLSFR are designed to comply with the following standard:

UL Standard: 864 9th Edition

Agency Listings and Approvals

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL: S1913

FM: 3023594

MEA FDNY: COA-219-02-E Vol. VI

CSFM: 7272-1703-0121

ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's Velociti® Series ASD-PL2F, ASD-PTL2F and ASD-PL2FR and other products available by visiting www.Gamewell-FCI.com

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Honeywell | Addressable Devices

Gamewell FCI

Intelligent Bases

B501, B210LP, B224BI, B224RB and Mounting Kits and Accessories

General

The Intelligent Velociti® and CLIP™ mounting bases and kits provide a variety of ways to install Gamewell-FCI detectors in any application. These mounting bases are non-addressable and are available in both the Velociti and CLIP protocols. The intelligent detectors can be mounted in any of the following devices, depending on the junction box selection (see Table 1 - Junction Box Selection Guide).

- flanged bases
- flangeless bases
- plastic rings

Note: The E3 Series® and S3 Series panels support both the Velociti® and CLIP™ protocols, and the GWF-7075 panel supports only the Velociti protocol.

Relay, isolator, and sounder bases can be used to meet local code requirements. Relay bases provide one Form-C contact relay for the control of auxiliary functions such as door closure and elevator recall. Isolator bases allow loops to continue to operate under fault conditions and automatically restore when the fault is removed. Sounder bases are available in a combination temporal 3 and continuous tone model.

The Intelligent Bases provide a variety of mounting options to meet your installation challenges. The bases are available in flanged or flangeless versions, so that you can mount the bases to a variety of junction boxes. See Table 1 for the Junction Box Selection Guide. You can use the SMB600 surface mounting box to mount the following bases:

- B210LP relay base
- B224BI isolator base
- B224RB relay base

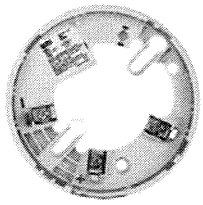

Figure 1 B501 Mounting Base

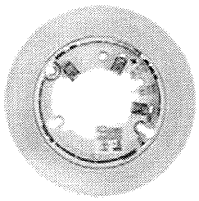

Figure 2 B210LP Mounting Base

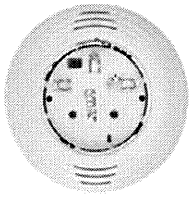

Figure 3 B224BI Mounting Base

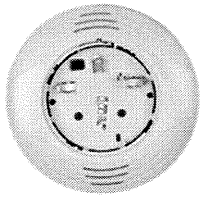

Figure 4 B224RB Mounting Base

FEATURES & BENEFITS

All sounder bases offer the following features.

- Complies with UL® Standards 268 and 464
- Includes the following three types of bases that comply with local code requirements:
  - Relay
  - Isolator
  - Sounder

Relay Base Feature

- Relay bases provide one Form-C contact relay

Isolator Base Feature

- Isolator bases include data communications lines to operate under fault condition

Installation Features
The bases offer the following flexible installation characteristics:

- Offers multiple accessory options
- Includes an installation mounting kit and accessories for several types of model options
- Uses 12-24 AWG gauge wire ranges to provide the bases with flexible installation
- Contains bases that enable quick and secure detector plug-in
- Provides SEMS screws for easy wiring connections
- Available in temporal and non-temporal pattern versions

Ordering Information

NOTE: "WH" suffix indicates Bright White color model.
NOTE: "-IV" suffix indicates Ivory color model.
NOTE: "-BL" suffix indicates Black color model.

Intelligent Bases

B501-WHITE: Flangeless mounting base, bright white

Dimensions: 4" (10.2 cm) diameter x 0.74" (18.8 mm) height

B501-WHITE-BP: Flangeless mounting base bulk pack, bright white

B501-IV: Standard European flangeless mounting base, ivory

B501-BL: Standard European flangeless mounting base, black

B224BI-WH: Plug-in Isolator detector base, bright white

Dimensions: 6.85 (17.4 cm) diameter x 1.61" (4.1 cm) height

B224BI-IV: Plug-in Isolator detector base, ivory

B224RB-WH: Plug-in Relay detector base, bright white

Dimensions: 6.85" (17.4 cm) diameter x 1.61" (4.1 cm) height

B224RB-IV: Plug-in Relay detector base, ivory

B300-6 : Standard flanged low-profile mounting base, white

Dimensions: 6.1" (15.49 cm) diameter

B300-6-BP: Bulk pack of B200-6 package contains 10

B300-6-IV: Standard flanged low-profile mounting base, ivory

Ordering Information

Mounting Kits and Accessories:

BCK-200B: Detector kit, black

CK300: Detector color kit, white Pack of 10

CK300-IR: Detector color kit for use with MCS-COF Series Detectors, white. Pack of 10

CK300-IV: Detector color kit, ivory. Pack of 10.

CK300-IR-IV: Detector color kit for use with MCS-COF Series detectors, ivory. Pack of 10.

CK300-BL: Detector color kit, black. Pack of 10.

CK300-IR-Bl: Detector color kit for use with MCS-COF Series detectors, black. Pack of 10.

TR300: Accessory flange ring for B300-6, bright white

TR300-IV: Accessory flange ring for B300-6m ivory

M02-04-01: Detector test magnet.

M02-09-00: Test magnet with telescoping handle.

RA100Z: Remote LED annunciator. 3-32 VDC. Mounts to a U.S. single-gang electrical box. For use with B401 and B300-6.

SMB600: Surface mounting kit, flanged.

TR300: Replacement flange for B210LP base, white

TR300-IV: Replacement flange for B210LP base, ivory

WCK-200B: Detector kit, white

Mounting Kits and Accessories

Table 1 lists the mounting kits and accessories assigned to each model.

	SINGLE-GANG	3.5" OCTAGONAL	4.0" OCTAGONAL	4.0" SQUARE	4.0" SQUARE WITH 3.0" MUD RING	50 MM	60 MM	70 MM	75MM
B501	No	Yes	No	No	Yes	Yes	Yes	Yes	No
B210LP	Yes	Yes	Yes	Yes	Yes	No	No	No	No
B224BI	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
B224RB	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
NOTE: The box depth is contingent on the base and the wire size. For information on applicable local codes for appropriate recommendation, refer to the National Electrical Code.									

Table 1: Intelligent Bases Mounting Kits

Intelligent Bases Technical Specifications

SYSTEM

Temperature Range:

For B224RB, B224BI, and B210LP: 32°F to 120°F (0°C to 49° C)

For B210LP, B300-6, B501: -4° F to 150°F (-20°C to 66°C)

Humidity Range: 10% to 93% RH, non-condensing

Wire Gauge:

For B224BI, B224RB: 14 to 24 AWG

For B210LP, B300-6, B501: 12 to 24 AWG

Electrical Ratings:

For B501, B224RB, B224BI:

Operating Voltage: 15 to 32 VDC (powered by SLC)

Standby Ratings:

B501: 150 uA

B224BI: 450 uA maximum

B224RB: 170 uA

Set Time (B224RB only):

Short delay: 55-90 m seconds

Long delay: 6 to 9 seconds

Reset Time (B224RB only): 20 m seconds maximum

Relay Characteristics (B224RB only): Two-coil Latching Relay One Form-C Contact

Ratings (UL/CSA):

0.9 A @ 125 VAC (resistive)

0.9 A @ 110 VDC (inductive)

3.0 A @ 30 VDC (resistive)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The Intelligent Bases are designed to comply with the following standards:

UL Standards: UL 268

UL 464

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL: S911

FM: 3035027

CSFM: 7135-1653:0213

7300-1653:0109

7300-1653:0126

7300-1653:0238

ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's Intelligent Bases and other products available by visiting www.Gamewell-FCI.com

Honeywell Gamewell-FCI
12 Clintonville Road
Northford, CT 06472-1610
203.484.7161
www.honeywell.com

9021-60540 | J | 07/2018

Honeywell

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7272-1703:0121

CATEGORY: 7272 -- SMOKE DETECTOR-SYSTEM TYPE-PHOTOELECTRIC

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Brian Reynolds (203) 484-6127 Fax (203) 484-7309
Email: brian.reynolds@honeywell.com

DESIGN: Models ASD-PL2F, ASD-PL2FR*, ASD-FILTREXF, ASD-PTL2F, and MCS-ACCLIMATE2F photoelectric smoke detector. Models ASD-PL2F and MCS-ACCLIMATE2F employ a 135°F supplement integral heat sensor which only assists in a fire situation. This thermal circuitry is NOT approved for use in lieu of a required heat detector. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating, and UL label.

APPROVAL: Listed as photoelectric smoke detectors when used in conjunction with listee's separately listed compatible fire alarm control units and bases. All models are suitable for open areas and inside duct installations with air velocities between 0-4000 FPM. Models ASD-PL2F and ASD-PL2FR are also approved for installations inside System Sensor duct detector housing DNR (OSFM Listing No. 3242-1653:209) and DNRW (OSFM Listing No. 3242-1653:210)*.

NOTE: The photoelectric type detectors are generally more effective at detecting slow, smoldering fires which smolder for hours before bursting into flame. Sources of these fires may include cigarettes burning in couches or bedding. The ionization type detectors are generally more effective at detecting fast, flaming fires that consume combustible materials rapidly and spread quickly. Sources of these fires may include paper burning in a waste container or a grease fire in the kitchen.

FORMERLY: 7272-1209:160 and 7272-0694:263

XLF: 7272-1653:0123

*Rev. 01-28-2010 fm

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7300-1653:0109

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc.3825 Ohio Ave, St. Charles, IL 60174
Contact: Pete Sennett (630) 762-5362 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: Models B401, B401B, B401R, B401BR, B401BR-750, B401R-750, B402B, B404B, B404BT, B406B, B501, B501B, 14506587-002, B501BH, B501BHT, B401BH, B110LP, B110RLP, B110RLP750, B112LP, B114LP, B114LPBT, B116LP, B210LP, B501-BL, B501-IV, *B501-WHITE, B300-6, B300-6-IV, B300-6-IS detector bases. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, *model number, *electrical rating and UL label.

APPROVAL: Listed as detector bases for use with separately listed compatible detectors. *Refer to Manufacturers Installation Instruction Manual for details.

NOTE: Formerly 7300-1209:128

*Rev 04-03-18 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

Honeywell | Addressable Devices

Gamewell FCI

Veloticit® Series ATD-L2F, ATD-RL2F

Addressable Thermal Sensor

GENERAL

The Gamewell-FCI, Velociti® Series addressable plug-in thermal sensors with integral communication provide features that surpass conventional sensors. Point ID capability allows each sensor's address to be set, providing exact locations for pinpointing alarm locations and used for selective maintenance. ATD thermal sensors use an innovative thermistor sensing circuit to produce 135°F/57°C fixed-temperature (ATD-L2F). The ATD-RL2F provides a combination 15°/minute rate-of-rise with 135° fixed thermal detection that is included in a low-profile package. The ATD-HL2F provides fixed high-temperature detection at 190°F/88°C. These thermal sensors provide cost-effective, addressable property protection in a variety of applications.

ATD-L2F

The Velociti® Series uses a communication protocol that substantially increases the speed of communication between the sensors and Gamewell-FCI analog addressable fire alarm controls. These devices operate in a grouped fashion. If one of the devices in the group has a status change, the panel's microprocessor stops the group poll and identifies the single device with the status change. The net effect is response speed up to five times greater than earlier designs.

Installation

The ATD plug-in sensors use a separate base to simplify installation, service, and maintenance. A special tool allows maintenance personnel to plug-in and remove sensors without using a ladder.

Mount the base on a box which is at least 1.5" (3.8 cm) deep. Suitable mounting base boxes include:

- 4.0" (10.2 cm) square box
- 3.5" (8.9 cm) or 4.0" (10.2 cm) octagonal box
- Single-gang box (except relay or isolator base)

With B200S or B200SR base, mounted on a 4.0" (10.2 cm) octagonal or square box.

With B224RB or B224BI base, mounted on a 3.5" (8.9 cm) octagonal box, or a 4.0" (10.2 cm) octagonal or square box.

NOTE: Due to the inherent supervision provided by the SLC, the end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring.

Ordering Information

ATD-L2F: Addressable thermal sensor, fixed, 135° F

ATD-RL2F: Addressable thermal sensor, combination fixed,135° F and 15°/minute rate-of-rise

ATD-HL2F: Addressable thermal sensor, fixed, 190° F

FEATURES & BENEFITS

- Sleek, low-profile design
- Visual rotary switch addressing
- Built-in functional test switch activated by an external magnet
- Bi-color LEDs flash green whenever the sensor is addressed, and light steadily red on alarm*
- Optional relay, isolator, or sounder bases
- Low standby current
- Addressable communication
- Stable communication technique with noise immunity
- Optional remote, single-gang LED accessory (RA-100Z)
- Suitable for installation in ducts

Note: *Only the red LED is operative in panels that do not operate in Velociti® mode.

Veloticit® Series ATD-L2F, ATD-RL2F Technical Specifications

SYSTEMS

ATD-L2F/ATD-RL2F:
Dimensions: 2.1" (5.3 cm) Height
4.1" (10.4 cm) diameter installed in the B501 base
6.1" (15.5 cm) diameter installed in the B210LP base
Shipping Weight: 4.8 oz. (137 g)
Operating Temperature:
ATD-L2F or ATD-RL2F: –4° F to 100° F (–20° C to 38°C)
ATD-HL2: –4° F to 150°F (–20 C to 66°C)
Sensor Spacing:
UL® approved for 50 ft. (15.2 m) center to center
FM approved for 25 x 25 ft. (7.6 x 7.6 m) spacing
Relative Humidity: 10 – 93% (non-condensing)
ATD-L2F: Fixed-temperature setpoint 135°F (57°C)
ATD-RL2F: Combination 135° F fixed temperature and 15° F(8.3°c)/per minute rate-of-rise°
ATD-HL2F: Fixed-temperature setpoint 190°F (88°C)
Electrical Specifications
Voltage Range: 15 - 32 Volts DC peak
Standby Current:
200 mA @ 24 VDC (without communication) (max. avg.)
.0003 A @ 24 VDC (one communication every 5 seconds with LED blink enabled)
LED Current (max.) .0065 A @ 24 VDC (LED lit)
Bases and Options
B501: Plug-in sensor base without flange
Dimensions: 4.1" (10.4 cm) diameter
B210LP: Flanged mounting base
Dimensions: 6.1" (15.5 cm) diameter
B210LPBP: Flanged mounting base bulk pack
Dimensions: 6.1" (15.5 cm) diameter
B224RB: : Plug-in sensor base with auxiliary relay
SPDT 2 coil latching relay 1 Form C contact UL/CSA Rating: 0.9 A @ 125 VAC (inductive)
0.9 @ 110 VDC (inductive)
3.A @ 30 VDC (resistive)
Dimensions: 6.1" (15.5 cm) diameter
B224BI: Plug-in sensor isolator base for Style 7 operation
Dimensions: 6.1" (15.5 cm) diameter
Maximum 25 devices between isolator bases
B200S: Intelligent sensor sounder base
Dimensions: 6.875" (17.5 cm) diameter
B200SR: Standard sounder base, UL 864 9th Edition compliant, ULC Listed
Dimensions: 6.875" (17.5 cm) diameter
RA-100Z: Remote LED Annunciator
BCK-200: Black detector covers (box of 10)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The ATD-L2F/ATD-RL2F are designed to comply with the following standards:
UL Standard: UL 864 9th Edition

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.
UL: S2332
FM: 3023594
MEA FDNY: 219-02-E Vol. VI
CSFM: 7270-1703:0115
ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's Veloticit® Series ATD-L2F, ATD-RL2F and other products available by visiting www.Gamewell-FCI.com

Honeywell Gamewell-FCI
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9020-0620 | F | 11/17

Honeywell

Honeywell | Addressable Devices

Intelligent Bases

B501, B210LP, B224BI, B224RB and Mounting Kits and Accessories

General

The Intelligent Velociti® and CLIP™ mounting bases and kits provide a variety of ways to install Gamewell-FCI detectors in any application. These mounting bases are non-addressable and are available in both the Velociti and CLIP protocols. The intelligent detectors can be mounted in any of the following devices, depending on the junction box selection (see Table 1 - Junction Box Selection Guide).

- flanged bases
- flangeless bases
- plastic rings

Note: The E3 Series® and S3 Series panels support both the Velociti® and CLIP™ protocols, and the GWF-7075 panel supports only the Velociti protocol.

Relay, isolator, and sounder bases can be used to meet local code requirements. Relay bases provide one Form-C contact relay for the control of auxiliary functions such as door closure and elevator recall. Isolator bases allow loops to continue to operate under fault conditions and automatically restore when the fault is removed. Sounder bases are available in a combination temporal 3 and continuous tone model.

The Intelligent Bases provide a variety of mounting options to meet your installation challenges. The bases are available in flanged or flangeless versions, so that you can mount the bases to a variety of junction boxes. See Table 1 for the Junction Box Selection Guide. You can use the SMB600 surface mounting box to mount the following bases:

- B210LP relay base
- B224BI isolator base
- B224RB relay base

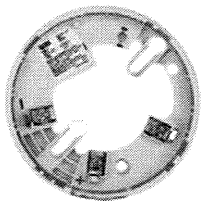

Figure 1 B501 Mounting Base

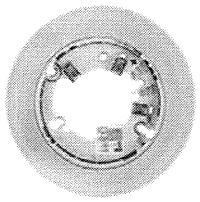

Figure 2 B210LP Mounting Base

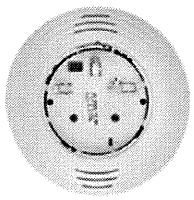

Figure 3 B224BI Mounting Base

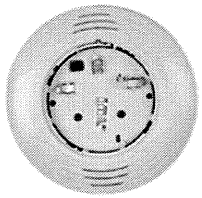

Figure 4 B224RB Mounting Base

FEATURES & BENEFITS

All sounder bases offer the following features.

- Complies with UL® Standards 268 and 464
- Includes the following three types of bases that comply with local code requirements:
  - Relay
  - Isolator
  - Sounder

Relay Base Feature

- Relay bases provide one Form-C contact relay

Isolator Base Feature

- Isolator bases include data communications lines to operate under fault condition

Installation Features
The bases offer the following flexible installation characteristics:

- Offers multiple accessory options
- Includes an installation mounting kit and accessories for several types of model options
- Uses 12-24 AWG gauge wire ranges to provide the bases with flexible installation
- Contains bases that enable quick and secure detector plug-in
- Provides SEMS screws for easy wiring connections
- Available in temporal and non-temporal pattern versions

Ordering Information

NOTE: "WH" suffix indicates Bright White color model.
NOTE: "-IV" suffix indicates Ivory color model.
NOTE: "-BL" suffix indicates Black color model.

Intelligent Bases

B501-WHITE: Flangeless mounting base, bright white

Dimensions: 4" (10.2 cm) diameter x 0.74" (18.8 mm) height

B501-WHITE-BP: Flangeless mounting base bulk pack, bright white

B501-IV: Standard European flangeless mounting base, ivory

B501-BL: Standard European flangeless mounting base, black

B224BI-WH: Plug-in Isolator detector base, bright white

Dimensions: 6.85 (17.4 cm) diameter x 1.61" (4.1 cm) height

B224BI-IV: Plug-in Isolator detector base, ivory

B224RB-WH: Plug-in Relay detector base, bright white

Dimensions: 6.85" (17.4 cm) diameter x 1.61" (4.1 cm) height

B224RB-IV: Plug-in Relay detector base, ivory

B300-6 : Standard flanged low-profile mounting base, white

Dimensions: 6.1" (15.49 cm) diameter

B300-6-BP: Bulk pack of B200-6 package contains 10

B300-6-IV: Standard flanged low-profile mounting base, ivory

Ordering Information

Mounting Kits and Accessories:

BCK-200B: Detector kit, black

CK300: Detector color kit, white Pack of 10

CK300-IR: Detector color kit for use with MCS-COF Series Detectors, white. Pack of 10

CK300-IV: Detector color kit, ivory. Pack of 10.

CK300-IR-IV: Detector color kit for use with MCS-COF Series detectors, ivory. Pack of 10.

CK300-BL: Detector color kit, black. Pack of 10.

CK300-IR-Bl: Detector color kit for use with MCS-COF Series detectors, black. Pack of 10.

TR300: Accessory flange ring for B300-6, bright white

TR300-IV: Accessory flange ring for B300-6m ivory

M02-04-01: Detector test magnet.

M02-09-00: Test magnet with telescoping handle.

RA100Z: Remote LED annunciator. 3-32 VDC. Mounts to a U.S. single-gang electrical box. For use with B401 and B300-6.

SMB600: Surface mounting kit, flanged.

TR300: Replacement flange for B210LP base, white

TR300-IV: Replacement flange for B210LP base, ivory

WCK-200B: Detector kit, white

Mounting Kits and Accessories

Table 1 lists the mounting kits and accessories assigned to each model.

	SINGLE-GANG	3.5" OCTAGONAL	4.0" OCTAGONAL	4.0" SQUARE	4.0" SQUARE WITH 3.0" MUD RING	50 MM	60 MM	70 MM	75MM
B501	No	Yes	No	No	Yes	Yes	Yes	Yes	No
B210LP	Yes	Yes	Yes	Yes	Yes	No	No	No	No
B224BI	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
B224RB	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
NOTE: The box depth is contingent on the base and the wire size. For information on applicable local codes for appropriate recommendation, refer to the National Electrical Code.									

Table 1: Intelligent Bases Mounting Kits

Intelligent Bases Technical Specifications

SYSTEM

Temperature Range:

For B224RB, B224BI, and B210LP: 32°F to 120°F (0°C to 49° C)

For B210LP, B300-6, B501: -4° F to 150°F (-20°C to 66°C)

Humidity Range: 10% to 93% RH, non-condensing

Wire Gauge:

For B224BI, B224RB: 14 to 24 AWG

For B210LP, B300-6, B501: 12 to 24 AWG

Electrical Ratings:

For B501, B224RB, B224BI:

Operating Voltage: 15 to 32 VDC (powered by SLC)

Standby Ratings:

B501: 150 uA

B224BI: 450 uA maximum

B224RB: 170 uA

Set Time (B224RB only):

Short delay: 55-90 m seconds

Long delay: 6 to 9 seconds

Reset Time (B224RB only): 20 m seconds maximum

Relay Characteristics (B224RB only): Two-coil Latching Relay One Form-C Contact

Ratings (UL/CSA):

0.9 A @ 125 VAC (resistive)

0.9 A @ 110 VDC (inductive)

3.0 A @ 30 VDC (resistive)

TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

STANDARDS

The Intelligent Bases are designed to comply with the following standards:

UL Standards: UL 268

UL 464

AGENCY LISTINGS AND APPROVALS

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

UL: S911

FM: 3035027

CSFM: 7135-1653:0213

7300-1653:0109

7300-1653:0126

7300-1653:0238

ISO 9001 Certification

For a complete listing of all compliance approvals and certifications, please visit: http://www.gamewell-fci.com/en-US/documentation/Pages/Listings.aspx

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice.

For more information

Learn more about Gamewell-FCI's Intelligent Bases and other products available by visiting www.Gamewell-FCI.com

Honeywell Gamewell-FCI

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9021-60540 | J | 07/2018

Honeywell

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7270-1703:0115

CATEGORY: 7270 -- HEAT DETECTOR

LISTEE: GAMEWELL-FCI12 Clintonville Road, Northford, CT 06472
Contact: Pete Sennett (203) 484-6127 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: Models ATD-L2, *ATD-L2F, ATD-HL2 AND *ATD-HL2F (fixed temperature) and ATD-RL2, *ATD-RL2F (fixed temperature with Rate-of-Rise) electronic heat detectors. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: ATD-L2, *-L2F, ATD-RL2, -*RL2F = 135°F fixed temperature
ATD-HL2, *-HL2F = 190°F fixed temperature

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical ratings, and UL Label.

APPROVAL: Listed as heat detectors for use with separately listed compatible fire alarm control units. Refer to listee's Installation Instruction Manual for details.

NOTE: FORMERLY: 7270-0694:256

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7300-1653:0109

CATEGORY: 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc.3825 Ohio Ave, St. Charles, IL 60174
Contact: Pete Sennett (630) 762-5362 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: Models B401, B401B, B401R, B401BR, B401BR-750, B401R-750, B402B, B404B, B404BT, B406B, B501, B501B, 14506587-002, B501BH, B501BHT, B401BH, B110LP, B110RLP, B110RLP750, B112LP, B114LP, B114LPBT, B116LP, B210LP, B501-BL, B501-IV, *B501-WHITE, B300-6, B300-6-IV, B300-6-IS detector bases. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, *model number, *electrical rating and UL label.

APPROVAL: Listed as detector bases for use with separately listed compatible detectors. *Refer to Manufacturers Installation Instruction Manual for details.

NOTE: Formerly 7300-1209:128

*Rev 04-03-18 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

SYSTEM SENSOR®

Indoor Selectable-Output Horns, Strobes, and Horn Strobes for Wall Applications

System Sensor L-Series audible visible notification products are rich with features guaranteed to cut installation times and maximize profits with lower current draw and modern aesthetics.

Features

- Updated Modern Aesthetics
- Small profile devices for Horns and Horn Strobes
- Plug-in design with minimal intrusion into the back box
- Tamper-resistant construction
- Automatic selection of 12- or 24-volt operation at 15 and 30 candela
- Field-selectable candela settings on wall units: 15, 30, 75, 95, 110, 135, and 185
- Horn rated at 88+ dBA at 16 volts
- Rotary switch for horn tone and two volume selections
- Mounting plate for all standard and all compact wall units
- Mounting plate shorting spring checks wiring continuity before device installation
- Electrically compatible with legacy SpectrAlert and SpectrAlert Advance devices
- Compatible with MDL3 sync module
- Strobes and Horn Strobes listed for wall mounting only
- Horns listed for wall or ceiling use

Agency Listings

SIGNALING UL LISTED
S5512
S4011

FM APPROVED
FM approved except for ALERT models 3057383, 3057072

7125-1653:0504
7135-1653:0503

The System Sensor L-Series offers the most versatile and easy-to-use line of horns, strobes, and horn strobes in the industry with lower current draws and modern aesthetics. With white and red plastic housings, standard and compact devices, and plain, FIRE, and FUEGO-printed devices, System Sensor L-Series can meet virtually any application requirement.

The L-Series line of wall-mount horns, strobes, and horn strobes include a variety of features that increase their application versatility while simplifying installation. All devices feature plug-in designs with minimal intrusion into the back box, making installations fast and foolproof while virtually eliminating costly and time-consuming ground faults.

To further simplify installation and protect devices from construction damage, the L-Series utilizes a universal mounting plate for all models with an onboard shorting spring, so installers can test wiring continuity before the device is installed.

Installers can also easily adapt devices to a suit a wide range of application requirements using field-selectable candela settings, automatic selection of 12- or 24-volt operation, and a rotary switch for horn tones with two volume selections.

L-Series Specifications

Architect/Engineer Specifications

General

L-Series standard horns, strobes, and horn strobes shall mount to a standard 2 x 4 x 1⁷/₈-inch back box, 4 × 4 × 1½-inch back box, 4-inch octagon back box, or double-gang back box. L-Series compact products shall mount to a single-gang 2 × 4 × 1⁷/₈-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products for all standard models and a separate universal mounting plate shall be used for mounting wall compact models. The notification appliance circuit wiring shall terminate at the universal mounting plate. Also, L-Series products, when used with the Sync•Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync•Circuit Module, 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 and 33 volts. Indoor L-Series products shall operate between 32 and 120 degrees Fahrenheit from a regulated DC or full-wave rectified unfiltered power supply. Strobes and horn strobes shall have field-selectable candela settings including 15, 30, 75, 95, 110, 135, and 185.

Strobe

The strobe shall be a System Sensor L-Series Model _____ listed to UL 1971 and shall be approved for fire protective service. The strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

Horn Strobe Combination

The horn strobe shall be a System Sensor L-Series Model _____ listed to UL 1971 and UL 464 and shall be approved for fire protective service. The horn strobe shall be wired as a primary-signaling notification appliance and comply with the Americans with Disabilities Act requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. The horn shall have two audibility options and an option to switch between a temporal three pattern and a non-temporal (continuous) pattern. These options are set by a multiple position switch. The horn on horn strobe models shall operate on a coded or non-coded power supply.

Synchronization Module

The module shall be a System Sensor Sync•Circuit model MDL3 listed to UL 464 and shall be approved for fire protective service. The module shall synchronize Strobes at 1 Hz and horns at temporal three. Also, while operating the strobes, the module shall silence the horns on horn strobe models over a single pair of wires. The module shall mount to a 4¹¹/₁₆ × 4¹¹/₁₆ × 2¹/₈-inch back box. The module shall also control two Style Y (class B) circuits or one Style Z (class A) circuit. The module shall synchronize multiple zones. Daisy chaining two or more synchronization modules together will synchronize all the zones they control. The module shall not operate on a coded power supply.

Physical/Electrical Specifications

Standard Operating Temperature	32°F to 120°F (0°C to 49°C)
Humidity Range	10 to 93% non-condensing
Strobe Flash Rate	1 flash per second
Nominal Voltage	Regulated 12 DC or regulated 24 DC/FWR[1]
Operating Voltage Range[2]	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
Operating Voltage Range MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33 V (24 V nominal)
Input Terminal Wire Gauge	12 to 18 AWG
Wall-Mount Dimensions (including lens)	5.6″L x 4.7″W x 1.91″D (143 mm L x 119 mm W x 49 mm D)
Compact Wall-Mount Dimensions (including lens)	5.26" L x 3.46" W x 1.91" D (133 mm L x 88 mm W x 49 mm D)
Horn Dimensions	5.6″L x 4.7″W x 1.25″D (143 mm L x 119 mm W x 32 mm D)
Compact Horn Dimensions	5.25" L x 3.45" W x 1.25" D (133 mm L x 88 mm W x 32 mm D)

1. Full Wave Rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some power supply and panel outputs.
2. Strobe products will operate at 12 V nominal only for 15 cd and 30 cd.

UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)

		8–17.5 Volts	16–33 Volts	
	Candela	DC	DC	FWR
Candela Range	15	88	43	60
	30	143	63	83
	75	N/A	107	136
	95	N/A	121	155
	110	N/A	148	179
	135	N/A	172	209
	185	N/A	222	257

UL Max. Horn Current Draw (mA RMS)

		8–17.5 Volts	16–33 Volts	
Sound Pattern	dB	DC	DC	FWR
Temporal	High	39	44	54
Temporal	Low	28	32	54
Non-Temporal	High	43	47	54
Non-Temporal	Low	29	32	54
3.1 KHz Temporal	High	39	41	54
3.1 KHz Temporal	Low	29	32	54
3.1 KHz Non-Temporal	High	42	43	54
3.1 KHz Non-Temporal	Low	28	29	54
Coded	High	43	47	54
3.1 KHz Coded	High	42	43	54

UL Max. Current Draw (mA RMS), Wall Horn Strobe, Candela Range (15–185 cd)

	8–17.5 Volts		16–33 Volts						
DC Input	15cd	30cd	15cd	30cd	75cd	95cd	110cd	135cd	185cd
Temporal High	98	158	54	74	121	142	162	196	245
Temporal Low	93	154	44	65	111	133	157	184	235
Non-Temporal High	106	166	73	94	139	160	182	211	262
Non-Temportal Low	93	156	51	71	119	139	162	190	239
3.1K Temporal High	93	156	53	73	119	140	164	190	242
3.1K Temporal Low	91	154	45	66	112	133	160	185	235
3.1K Non-Temporal High	99	162	69	90	135	157	175	208	261
3.1K Non-Temporal Low	93	156	52	72	119	138	162	192	242

	16–33 Volts						
FWR Input	15cd	30cd	75cd	95cd	110cd	135cd	185cd
Temporal High	83	107	156	177	198	234	287
Temporal Low	68	91	145	165	185	223	271
Non-Temporal High	111	135	185	207	230	264	316
Non-Temportal Low	79	104	157	175	197	235	283
3.1K Temporal High	81	105	155	177	196	234	284
3.1K Temporal Low	68	90	145	166	186	222	276
3.1K Non-Temporal High	104	131	177	204	230	264	326
3.1K Non-Temporal Low	77	102	156	177	199	234	291

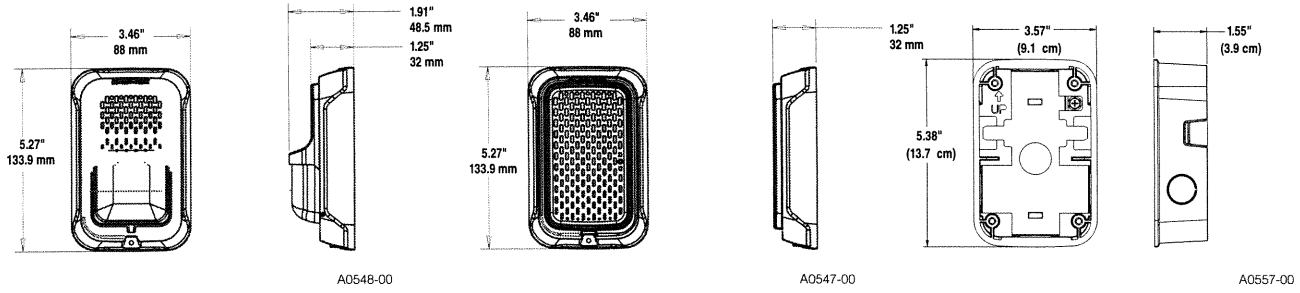
Horn Tones and Sound Output Data

Horn and Horn Strobe Output (dBA)

			8–17.5 Volts	16–33 Volts	
Switch Position	Sound Pattern	dB	DC	DC	FWR
1	Temporal	High	84	89	89
2	Temporal	Low	75	83	83
3	Non-Temporal	High	85	90	90
4	Non-Temporal	Low	76	84	84
5	3.1 KHz Temporal	High	83	88	88
6	3.1 KHz Temporal	Low	76	82	82
7	3.1 KHz Non-Temporal	High	84	89	89
8	3.1 KHz Non-Temporal	Low	77	83	83
9*	Coded	High	85	90	90
10*	3.1 KHz Coded	High	84	89	89

* Settings 9 and 10 are not available on 2-wire horn strobes. Temporal coding must be provided by the NAC. If the NAC voltage is held constant, the horn output remains constantly on.

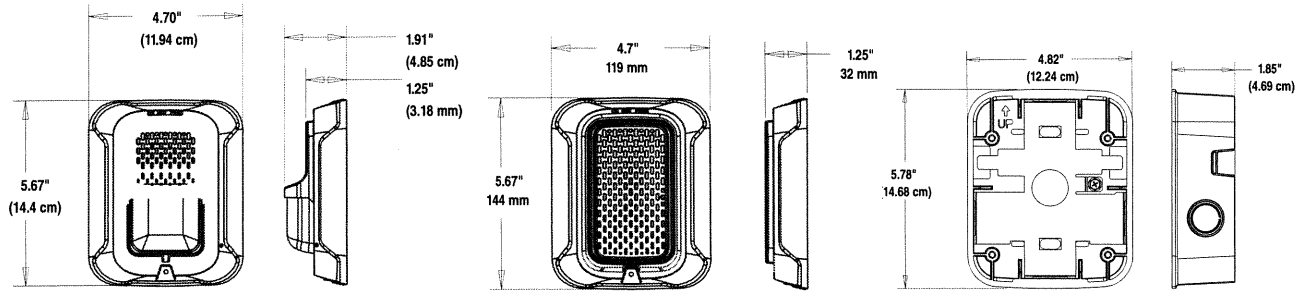
L-Series Dimensions



Compact Strobe, Horn Strobe

Compact Horn

Compact Wall Surface Mount Back Box
SBBGRL, SBBGWL



Strobe, Horn Strobe

Horn

Wall Surface Mount Back Box
SBBRL/SBBWL

L-Series Ordering Information

Model	Description
Wall Horn Strobes	
P2RL	2-Wire, Horn Strobe, Red
P2WL	2-Wire, Horn Strobe, White
P2GRL	2-Wire, Compact Horn Strobe, Red
P2GWL	2-Wire, Comp 2 fils act Horn Strobe, White
P2RL-P	2-Wire, Horn Strobe, Red, Plain
P2WL-P	2-Wire, Horn Strobe, White, Plain
P2RL-SP	2-Wire, Horn Strobe, Red, FUEGO
P2WL-SP	2-Wire, Horn Strobe, White, FUEGO
P4RL	4-Wire, Horn Strobe, Red
P4WL	4-Wire, Horn Strobe, White
Wall Strobes	
SRL	Strobe, Red
SWL	Strobe, White
SGRL	Compact Strobe, Red
SGWL	Compact Strobe, White
SRL-P	Strobe, Red, Plain
SWL-P	Strobe, White, Plain
SRL-SP	Strobe, Red, FUEGO
SWL-CLR-ALERT	Strobe, White, ALERT

Model	Description
Horns*	
HRL*	Horn, Red
HWL*	Horn, White
HGRL*	Compact Horn, Red
HGWL*	Compact Horn, White
Accessories	
TR-2	Universal Wall Trim Ring Red
TR-2W	Universal Wall Trim Ring White
SBBRL	Wall Surface Mount Back Box, Red
SBBWL	Wall Surface Mount Back Box, White
SBBGRL	Compact Wall Surface Mount Back Box, Red
SBBGWL	Compact Wall Surface Mount Back Box, White

Notes:
All -P models have a plain housing (no "FIRE" marking on cover).
All -SP models have "FUEGO" marking on cover.
All -ALERT models have "ALERT" marking on cover.
*Horn-only models are listed for wall or ceiling use.

SYSTEM SENSOR®
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Phone: 800-SENSOR2 • Fax: 630-377-6495
www.systemsensor.com

AVDS865-05 • 2/22/2018

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7125-1653:0504

CATEGORY: 7125 -- FIRE ALARM DEVICES FOR THE HEARING IMPAIRED

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc.3825 Ohio Ave, St. Charles, IL 60174
Contact: Pete Sennett (630) 762-5362 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: System Sensor Indoor 2-wire Models:
SRL, SWL, SGRL, SGWL, SRL-P SWL-P, SRL-SP, SWL-CLR-ALERT and SWL-ALERT Wall Strobes;
SCRL, SCWL and SCWL-CLR-ALERT Ceiling Strobes.

Wall Bezel Parts:
BZR-F, BZR-AL, BZR-AG, BZR-EV, BZR-P, BZR-SP, BZR-PG,
BZW-F, BZW-AL, BZW-AG, BZW-EV, BZW-P, BZW-SP, BZW-PG,
BZGR-F, BZGR-AL, BZGR-AG, BZGR-EV, BZGR-P, BZGR-SP, BZGR-PG,
BZGW-F, BZGW-AL, BZGW-AG, BZGW-EV, BZGW-P, BZGW-SP and BZGW-PG,

Ceiling Bezel Parts:
BZRC-F, BZRC-AL, BZRC-AG, BZRC-EV, BZRC-P, BZRC-SP, BZRC-PG,
BZWC-F, BZWC-AL, BZWC-AG, BZWC-EV, BZWC-P, BZWC-SP and BZWC-PG.

Color Lens:
LENS-A2, LENS-B2, LENS-G2, LENS-R2, LENS-AC2, LENS-BC2, LENS-GC2 and LENS-RC2.

WallTrim Rings:
TR2 and TR2W

CeilingTrim Rings:
TRC2 and TRC2W.

Wall Surface Mounted Back Boxes:
SBBRL, SBBGRL, SBBWL and SBBGWL,

Ceiling Surface Mounted Back Boxes:
SBBCRL and SBBCWL

Refer to listee's data sheet for detailed product description and operational considerations.

02-14-17 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

RATING: Regulated 12 VDC setting: 8-17.5 VDC
Regulated 24 VDC/fwr setting: 16-33 VDC

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating, and UL label.

APPROVAL: Listed as two wire strobe units used for synchronous application when used with separately listed compatible fire alarm control units. Suitable for indoor use, vertical wall or horizontal ceiling mounted. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

02-14-17 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

Indoor Selectable-Output Speaker Strobes and Dual Voltage Evacuation Speakers for Wall Applications

System Sensor L-Series selectable output speaker strobes and dual-voltage evacuation speakers can reduce ground faults and enable faster installation with lower current draw and modern aesthetics.

Features

- Plug-in design and protective cover reduce ground faults
- Universal mounting plate with an onboard shorting spring tests wiring continuity before installation
- No extension ring required
- Field selectable candela settings on wall units: 15, 30, 75, 95, 110, 135, 185
- Automatic selection of 12- or 24-volt operation at 15 and 30 candela
- Rotary switch simplifies field selection of speaker voltage (25 and 70.7 Vrms) and power settings (¼, ½, 1 and 2 watts)
- Speakers offer high fidelity and high volume sound output
- 520 Hz +/- 10% square wave tone capable with compatible FACP
- Compatible with System Sensor synchronization protocol
- Electrical compatibility with existing SpectrAlert and SpectrAlert Advance products
- Tamper-resistant construction
- Updated modern aesthetics

Agency Listings

SIGNALING UL LISTED S4048

FM APPROVED FM approved except for ALERT models 3057493

7320-1653:0505

The System Sensor L-Series of speakers and speaker strobes reduce costly ground faults using a plug-in design and universal mounting plate that allow the installer to pre-wire mounting plates, dress the wires, and confirm wiring continuity before plugging in the speakers. In addition, a protective plastic cover prevents nicked wires by covering exposed speaker components.

These devices also enable faster installations by providing instant feedback to ensure that wiring is properly connected, rotary switches to select voltage and power settings, and 7 field-selectable candela settings for wall speaker strobes.

The low total harmonic distortion of the speaker offers high fidelity sound output while still offering high volume sound output for use in high ambient noise applications.

System Sensor L-Series makes installation easy

- Attach a universal mounting plate to a 4 × 4 × 2 1/8 inch back box. Flush-mount applications do not require an extension ring.
- Connect the notification appliance circuit or speaker wiring to the terminals on the mounting plate.
- Attach the speaker or speaker strobe to the mounting plate by inserting the product tabs into the mounting plate grooves. Hinge the device into position to lock the product pins into the mounting plate terminals. The device will temporarily hold in place with a catch until it is secured with a captured mounting screw.

L-Series Speaker and Speaker Strobe Specifications

Architectural/Engineering Specifications

General

L-Series speaker and speaker strobes shall mount to a 4 × 4 × 2 1/8-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, L-Series speaker strobes, when used with the Sync•Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync•Circuit Module, 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 and 33 volts. Indoor L-Series products shall operate between 32°F and 120°F from a regulated DC, or full-wave rectified, unfiltered power supply. Wall-mount speaker strobes shall have field-selectable candela settings including 15, 30, 75, 95, 110, 135, 185.

Speaker

The speaker shall be aSp System Sensor L-Series model _____ dual-voltage transformer speaker capable of operating at 25.0 or 70.7 nominal Vrms. It should be listed to UL 1480 and shall be approved for fire protective service. 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. The speaker shall have power taps and voltage that are selected by rotary switches.

Speaker Strobe combination

The speaker strobe shall be a System Sensor L-Series model _____ listed to UL1480 and UL 1971 and be approved for fire protective signaling systems. The speaker shall be capable of operating at 25.0 or 70.7 nominal Vrms selected via rotary switch, and shall have a frequency range of 400 to 4,000 Hz. The speaker shall have power taps that are selected by rotary switch. The strobe shall comply with the NFPA 72 requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

Synchronization Module

The module shall be a System Sensor Sync•Circuit model MDL3 listed to UL 464 and shall be approved for fire protective service. The module shall synchronize strobes at 1 Hz. The module shall mount to a 4 11/16 × 4 11/16 × 2 1/8-inch back box. The module shall also control two Style Y (class B) circuits or one Style Z (class A) circuit. The module shall synchronize multiple zones. Daisy chaining two or more synchronization modules together will synchronize all the zones they control. The module shall not operate on a coded power supply.

Physical Specifications

Operating Temperature	32°F to 120°F (0°C to 49°C)		
Humidity Range	10 to 93% non-condensing		
Dimensions, Wall-Mount	**Length**	**Width**	**Depth**
SPL Speaker	6.5 in, 165 mm	5 in, 127 mm	0.97 in,23 mm
With Surface Mount Back Box	6.6 in, 168 mm	5.1 in, 130 mm	3.2 in, 82 mm
SPSL Speaker/Strobe (including lens and speaker)	6.5 in, 165 mm	5.0 in, 127 mm	2.3 in, 58 mm
With Surface Mount Back Box	6.6 in, 168 mm	5.1 in, 130 mm	4.5 in, 116 mm

*When using 12AWG, 14 AWG, or adding extra wires in the box, a deeper box or extension ring is recommended.

Electrical/Operating Specifications

Nominal Voltage (speakers)	25 Volts or 70.7 Volts (nominal)
Maximum Supervisory Voltage (speakers)	50 VDC
Strobe Flash Rate	1 flash per second
Nominal Voltage (strobes)	Regulated 12 VDC or regulated 24 DC/FWR[1,2]
Operating Voltage Range (includes fire alarm panels with built in sync)	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
Operating Voltage with MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33 V (24 V nominal)
Frequency Range	400 to 4000 Hz[3]
Power	¼, ½, 1, 2 watts

1. Full Wave Rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some power supply and panel outputs.
2. Strobe products will operate at 12 V nominal only for 15 and 30 cd
3. 520 Hz +/- 10% square wave tone capable with compatible FACP.

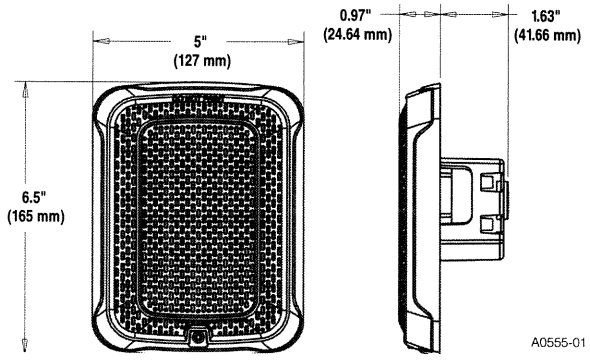
UL Current Draw Data

UL Max Strobe Current Draw (mA RMS)			
	8 to 17.5 Volts	16 to 33 Volts	
Candela	DC	DC	FWR
15	88	43	60
30	143	63	83
75	N/A	107	136
95	N/A	121	155
110	N/A	148	179
135	N/A	172	209
185	N/A	222	257

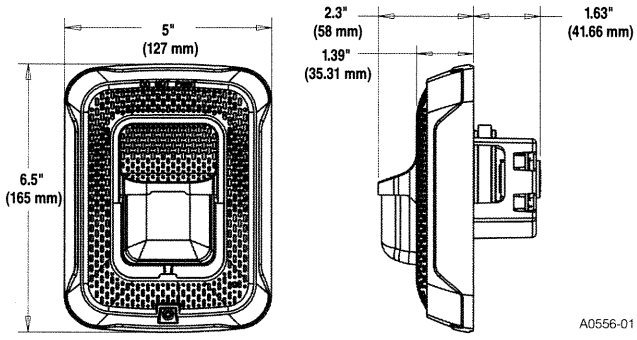
Sound Output Speaker Strobe				
	¼ W	½ W	1 W	2 W
UL Reverberant (dBA @10 ft)	77	80	83	86
UL Anechoic (dBA @10 ft)	77	80	83	86

Sound Output Speaker				
	¼ W	½ W	1 W	2 W
UL Reverberant (dBA @10 ft)	79	82	85	88
UL Anechoic (dBA @10 ft)	79	82	85	88

L-Series Dimensions

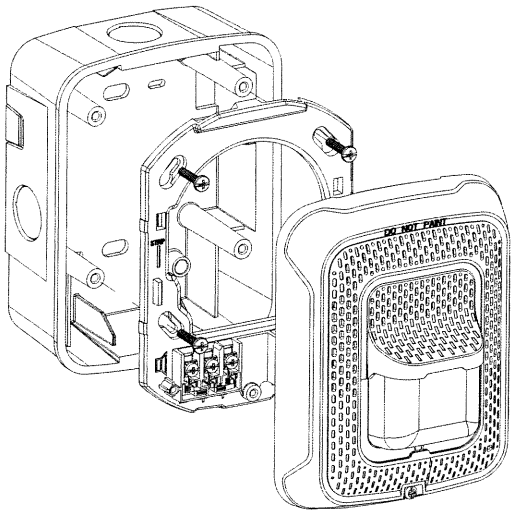


Wall-Mount Speaker



Wall-Mount Speaker Strobe

Surface Mounting



A0523-01

Wall-Mount Speaker Strobe
with SBBSPRL/ SBBSPWL Surface Mount Back Box

L-Series Ordering Information

Wall Mount		
White	**Red**	**Description**
SPWL	SPRL	Speaker only
SPSWL	SPSRL	Speaker Strobe
SPSWL-P	SPSRL-P	Plain Speaker Strobe
SPSWL-ALERT	—	Speaker Strobe, Amber Lens
SPSWL-CLR-ALERT	—	Speaker Strobe Clear Lens
—	SPSRL-SP	Speaker Strobe, Fuego

Accessories		
White	**Red**	**Description**
RFPW	RFP	7 in × 9.5 in Retrofit Plate
SBBSPWL	SBBSPRL	Surface Mount Back Box for Speakers and Speaker Strobes
TR-2W	TR-2	Wall Mount Trim Ring

Notes:
All -P models have a plain housing (no "FIRE" marking on the cover)

SYSTEM SENSOR®

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AVDS867-02 • 03/23/2018

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7320-1653:0505

CATEGORY: 7320 -- SPEAKERS

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc.3825 Ohio Ave, St. Charles, IL 60174
Contact: Pete Sennett (630) 762-5362 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: System Sensor Indoor Models:
SPRL and SPWL Wall Speakers;
SPCRL and SPCWL Ceiling Speakers;
SPSRL, SPSWL, SPSRL-P, SPSRL-SP, SPSWL-P, SPSWL-ALERT and SPSWL-CLR-ALERT Wall Speaker Stobes;
SPSCRL, SPSCWL, SPSCWL-P, SPSCWL-SP and SPSCWL-CLR-ALERT Ceiling Speaker Strobes.

Wall Bezel Parts:
BZSPR-P, BZSPR-AL, BZSPR-EV, BZSPR-AG, BZSPR-PG, BZSPR-F and BZSPR-SP, BZSPW-P, BZSPW-AL, BZSPW-EV, BZSPW-AG, BZSPW-PG, BZSPW-F and BZSPW-SP,

Ceiling Bezel Parts:
BZSPRC-P, BZSPRC-AL, BZSPRC-EV, BZSPRC-AG, BZSPRC-PG, BZSPRC-F and BZSPRC-SP,
BZSPWC-P, BZSPWC-AL, BZSPWC-EV, BZSPWC-AG, BZSPWC-PG, BZSPWC-F and BZSPWC-SP,

WallTrim Rings for Speaker Strobes:
TR2 and TR2W

CeilingTrim Rings for Speaker Strobes:
TRC2 and TRC2W.

Wall Surface Mounted Back Boxes:
SBBSPRL and SBBSPWL,

Ceiling Surface Mounted Back Boxes:
SBBCRL and SBBCWL

Refer to listee's data sheet for detailed product description and operational considerations.

02-27-17 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

RATING: 25 or 70.7 VAC, 1/4, 1/2, 1, 2 Watt outputs.
Regulated 12 VDC and 24 VDC/FWR is for 2-wire strobe portion.

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating, and UL label.

APPROVAL: Listed as speakers and speaker-strobes when used with separately listed compatible fire alarm control units. Suitable for indoor use, dry and damp environments. Authority having jurisdiction should be consulted prior to installation. Refer to listee's Installation Instruction Manual for details.

02-27-17 gt

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*

Fire Engineering Division

SYSTEM SENSOR®

Outdoor, Selectable-Output Speaker Strobes and Dual-Voltage Evacuation Speakers for Wall Applications

SpectrAlert® Advance outdoor, selectable-output speaker strobes and dual-voltage evacuation speakers meet virtually any outdoor application requirement.

SPECTRAlert ADVANCE from System Sensor

Features

- Weatherproof per NEMA 4X, IP56
- Rated from -40°F to 151°F
- Plug-in design reduces ground faults
- Universal mounting plate with onboard shorting spring that tests wiring continuity before devices are installed
- Field-selectable candela settings: 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, and 185
- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Rotary switch for speaker voltage (25 and 70.7 Vrms) and power settings (1/4, 1/2, 1 and 2 watts)
- Compatible with System Sensor synchronization protocol and legacy SpectrAlert products
- Tamper-resistant construction
- Listed for ceiling or wall mounting

Agency Listings

SIGNALING UL LISTED 75S0

7320-1653:201

MEA approved 10-08-E

SpectrAlert Advance offers the broadest line of outdoor speakers and speaker strobes in the industry. From metal and plastic outdoor back boxes, to white and red plastic housings, to wall and ceiling mounting options, SpectrAlert Advance can meet virtually any application requirement.

Wall-mount outdoor speakers and speaker strobes can be used indoors or outdoors in wet or dry applications, and can provide reliable operation from –40°F to 151°F. These speakers provide a broad frequency response range, low harmonic distortion and maintain a high sound pressure level at all tap settings to provide accurate and intelligible broadcast of evacuation messages.

Like the entire SpectrAlert Advance line, wall-mount outdoor speakers and speaker strobes include a variety of features that increase application flexibility and simplify installation. First, field-selectable settings, including candela, speaker voltage and power settings, and automatic selection of 12- or 24-volt operation enable installers to easily adapt devices to meet requirements.

Next, these devices use a universal mounting plate with an onboard shorting spring that ensures wiring continuity before devices are installed, so installers can verify proper wiring without mounting the devices and exposing them to potential construction damage. Once the plates are mounted, all SpectrAlert Advance devices utilize a plug-in design with a single captured screw to speed installation and virtually eliminate costly ground faults.

Outdoor devices ship with weatherproof plastic back boxes (metal back boxes are available separately) that accommodate in-and-out wiring for daisy chaining devices. Plastic back boxes feature removable side flanges and improved resistance to saltwater corrosion. Knock-outs located on the back eliminate the need to drill holes for screw-in mounting. Plastic and metal weatherproof back boxes come with ¾-inch top and bottom conduit entries and ¾-inch knock-outs at the back. A screw-in NPT plug with an O-ring gasket for a watertight seal is included with each back box.

SpectrAlert® Advance Outdoor Speaker and Speaker Strobe Specifications

Architectural/Engineering Specifications

General

SpectrAlert Advance outdoor speakers and speaker strobes shall mount to a weatherproof back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes, when used with the Sync•Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync•Circuit Module, 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 and 33 volts. Outdoor SpectrAlert Advance products shall operate between –40°F and 151°F from a regulated DC, or full-wave rectified, unfiltered power supply.

Speaker

Speaker shall be a System Sensor SpectrAlert Advance Model _____ dual-voltage transformer speaker capable of operating at 25.0 or 70.7 nominal Vrms. Speaker shall be listed to Underwriters Laboratories Standard S4048 for outdoor fire protective signaling systems. Speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature from –40°F to 150.8°F. Speaker shall have power taps and wattage settings that are selected by rotary switches. The speaker must be installed with its weatherproof back box in order to remain outdoor approved per UL listing S4048. The speaker shall be suitable for use in air handling spaces and wet environments.

Speaker Strobe Combination

The speaker strobe shall be a System Sensor Model _____ listed to UL 1638 and UL 1480 and be approved for fire protective signaling systems. Speaker shall be capable of operating at 25.0 or 70.7 nominal Vrms and shall have a frequency range of 400 to 4,000 Hz. Speaker shall have power taps that are selected by rotary switch. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12 or 24 volts. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12 volts and 15, 15/75, 30, 75, 110, 115, 135, 150, 177 or 185 candela when operating on 24 volts. The strobe shall comply with the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The speaker strobe must be installed with its weatherproof back box in order to remain outdoor approved per UL. The speaker strobe shall be suitable for use in wet environments.

Physical Specifications	
Operating Temperature	–40°F to 151°F (–40°C to 66°C)
Dimensions, Wall-Mount	
SPS Speaker Strobe	6.0″L × 5.0″W × 4.7″D (including lens and speaker)
SP Speaker	6.0″L × 5.0″W × 2.9″D
Dimensions, Wall-Mount Weatherproof Back Box	6.5″L × 5.5″H × 2.9″D
Electrical/Operating Specifications	
Nominal Voltage (speakers)	25 V or 70.7 V (nominal)
Maximum Supervisory Voltage (speakers)	50 VDC
Strobe Flash Rate	1 flash per second
Nominal Voltage (strobes)	Regulated 12 VDC/FWR or regulated 24 DC/FWR
Operating Voltage Range (includes fire alarm panels with built in sync)	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
Operating Voltage with MDL3 Sync Module	8.5 to 17.5 V (12 V nominal) or 16.5 to 33 V (24 V nominal)
Frequency Range	400 to 4,000 Hz
Power	¼, ½, 1, 2 watts

UL Current Draw Data

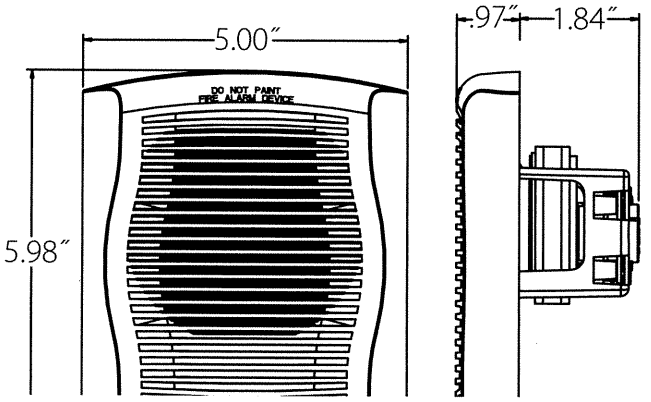
UL Max. Strobe Current Draw (mA RMS)					
		8 to 17.5 Volts		16 to 33 Volts	
	Candela	DC	FWR	DC	FWR
Standard Candela Range	15	123	128	66	71
	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	95	NA	NA	181	176
	110	NA	NA	202	195
	115	NA	NA	210	205
High Candela Range	135	NA	NA	228	207
	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258
Sound Output					
UL Reverberant (dBA @ 10 ft.)		2W	1W	½ W	¼ W
Outdoor Speaker		90	87	84	81
Outdoor Speaker/Strobe		89	86	83	80

Candela Derating

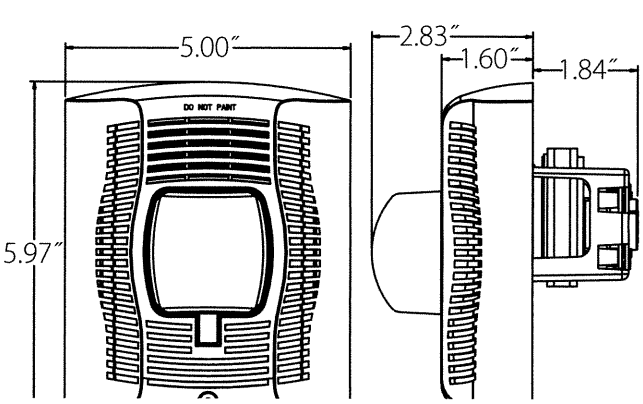
For K series products used at low temperatures, listed candela ratings must be reduced in accordance with this table.

Strobe Output (cd)	
Listed Candela	Candela rating at –40°F
15	Do not use below 32°F
15/75	
30	
75	44
95	70
110	110
115	115
135	135
150	150
177	177
185	185

Dimensions

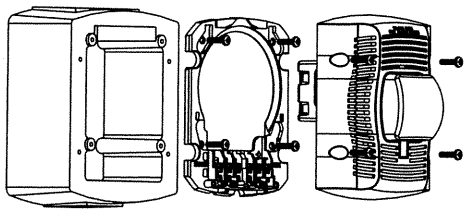


Wall-Mount Outdoor Speaker

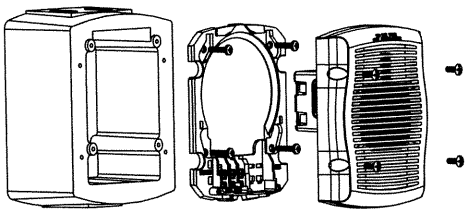


Wall-Mount Outdoor Speaker Strobe

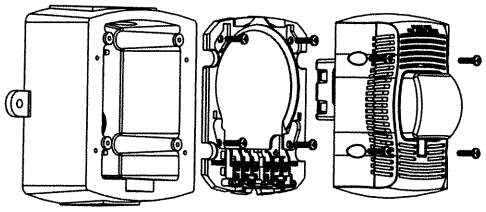
Surface Mounting



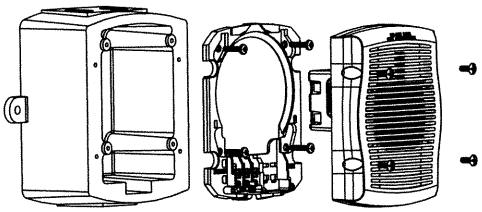
Wall-Mount Speaker Strobe with Plastic Weatherproof Back Box



Wall-Mount Speaker with Plastic Weatherproof Back Box



Wall-Mount Speaker Strobe with Metal Weatherproof Back Box



Wall-Mount Speaker with Metal Weatherproof Back Box

Ordering Information for SpectrAlert® Advance Outdoor Speakers and Speaker Strobes

Wall Mount		
White	**Red**	**Description**
SPWK	SPRK	Outdoor Speaker (includes plastic weatherproof back box)
SPWK-R	SPRK-R	Outdoor Speaker (does not include plastic weatherproof back box)
SPSWK	SPSRK	Outdoor Speaker Strobe, Standard cd (includes plastic weatherproof back box)
SPSWK-P	SPSRK-P	Plain Outdoor Speaker Strobe, Standard cd(includes plastic weatherproof back box)
SPSWK-R	SPSRK-R	Outdoor Speaker Strobe, Standard cd(does not include weatherproof back box)
SPSWK-CLR-ALERT	—	Outdoor Speaker Strobe, Standard cd, Clear Lens, ALERT Printed (includes plastic weatherproof back box)
—	SPSRHK	Outdoor Speaker Strobe, High cd (135,150,177,185) (includes plastic weatherproof back box)
Accessories		
White	**Red**	**Description**
MWBBW	MWBB	Wall, Metal Weatherproof Back Box

Notes:

All -P models have a plain housing (no "FIRE" marking on cover)

"Standard cd" refers to strobes that include 15, 15/75, 30, 75, 95, 110, and 115 candela settings. "High cd" refers to strobes that include 135, 150, 177, and 185 candela settings. **When replacing standard outdoor units, both the device and back box must be replaced.**

SYSTEM SENSOR®

3825 Ohio Avenue • St. Charles, IL 60174
Phone: 800-SENSOR2 • Fax: 630-377-6495

AVDS11301 • 09/12

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7320-1653:0201

CATEGORY: 7320 -- SPEAKERS

LISTEE: System Sensor, Unincorporated Div of Honeywell Int'l Inc.3825 Ohio Ave, St. Charles, IL 60174
Contact: Pete Sennett (630) 762-5362 Fax (203) 484-7309
Email: pete.sennett@honeywell.com

DESIGN: Models SPR,SPW,SPRV, and SPWV SpectrAlert Speakers - Rectangular enclosure. Models SPCW, SPCR, SPCWV, and SPCRV SpectrAlert Speakers with round enclosure. Models SPSR, SPSRH, SPSW, SPSW-ALERT, SPSW-CLR-ALERT, *SPSWK-CLR-ALERT, SPSWH, SPSRV, and SPSWV SpectrAlert Speaker/Strobe with rectangular enclosure. Models SPSCR, SPSCRH, SPSCW, *SPSCWK-CLR-ALERT, SPSCWH, SPSCRV, SPSCRVH, SPSCWV, and SPSCWVH SpectrAlert Speaker/Strobe with round enclosure. Model SPSCW-CLR-ALERT Speaker/Strobe. Model SPSW-ALERT has amber lens and is intended for non-fire use.
All models identified are intended for indoor use mounted on the wall or ceiling. Models with a "K" in the suffix are suitable for indoor or outdoor use with an operating temperature rating of -40°C to +66°C (-40°F to +151°F) and have a NEMA 4X enclosure rating when used with models PWBB, PWBBW (wall) or the model PWBBCW (ceiling) plastic weatherproof back boxes or with Model MWBBW (Wall), MWBB (Wall) or MWBBCW (Ceiling) metal weatherproof back boxes. Models with a "- P" in the suffix have plain housings with no lettering on the enclosure. Models not containing "- P", in the suffix have English lettering reading "FIRE" on the housing. Refer to listee's data sheet for additional detailed product description and operational considerations.

RATING: Nominal Voltage: 25 Vrms or 70 Vrms
Power Settings: ¼, ½, 1, 2 Watts
Frequency Range: 400 - 4000 Hz

INSTALLATION: In accordance with listee's printed installation instructions, NFPA 72, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, model number, electrical rating and UL label.

APPROVAL: Listed as speaker/strobes when used with separately listed compatible fire alarm control units. Suitable for wall or ceiling mount.
These speaker/strobes do not generate a distinctive three-pulse temporal code pattern (for total evacuation) as required per NFPA 72, 2010 edition. If required, the appliances must be used with a fire alarm control unit that can generate the temporal pattern signal.

*Corrected 02-06-12 bh

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

Detailed Specification & Technical Data

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971

Aquaseal
Water Resistant Cables

AP225

16/2 Unshielded AQUASEAL Direct Burial CL3/FPL Rated
Audio, Control, Alarm Direct Burial

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	16
• Conductor Stranding	19x29
• Conductor Type	Bare copper
• Nominal DCR	4.2 Ohm/1000ft
INSULATION PARAMETER	-
• Insulation Type	PVC-Nylon
• Insulation Thickness	0.02 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Aquaseal Water Blocking Tape
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	28 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	UV Resistant PVC
Jacket Thickness	0.04 in
Nominal Cable O.D.	0.295 in
Plenum	No
NEC UL Rating	CL3, FPL, PLTC
RoHS Compliant	Yes
TIA Test	TIA455-82 Water Penetration Test
Pull Tension	55 lbs
Bend Radius	2.655 in
Cable Weight	48 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1685
Operating Range	-20 to 90 Deg C
UL Voltage Rating	300

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
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AQ225

16/2 Unshielded AQUASEAL Direct Burial CL3/FPL Rated
Audio, Control, Alarm Direct Burial

Related Products

RELATED PRODUCTS	
Plenum Number	25225B
Non Plenum Number	225
Aquaseal Number	AQC225
4 Pole SpeakOn	CN-NL4FC
SpeakOn Panel Mount	CN-NL4MP

Detailed Specification & Technical Data

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
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Aquaseal
Water Resistant Cables

A0227

12/2 Unshielded AQUASEAL Direct Burial CL3/FPL Rated
Audio, Control, Alarm Direct Burial

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	12
• Conductor Stranding	19x25
• Conductor Type	Bare copper
• Nominal DCR	1.7 Ohm/1000ft
INSULATION PARAMETER	-
• Insulation Type	PVC-Nylon
• Insulation Thickness	0.02 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Aquaseal Water Blocking Tape
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	32 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	UV Resistant PVC
Jacket Thickness	0.04 in
Nominal Cable O.D.	0.34 in
Plenum	No
NEC UL Rating	CL3, FPL, PLTC
RoHS Compliant	Yes
TIA Test	TIA455-82 Water Penetration Test
Pull Tension	146 lbs
Bend Radius	3.06 in
Cable Weight	78 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1685
Operating Range	-20 to 90 Deg C

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971

AQ227

12/2 Unshielded AQUASEAL Direct Burial CL3/FPL Rated

Audio, Control, Alarm Direct Burial

Related Products

RELATED PRODUCTS	-
Plenum Number	25227B
Non Plenum Number	227
4 Pole SpeakOn	CN-NL4FC
SpeakOn Panel Mount	CN-NL4MP

Detailed Specification & Technical Data

WEST PENN WIRE
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Aquaseal
Water Resistant Cables

AQ294

16/2 Shielded Indoor/Outdoor Direct Burial CL3/FPL Rated
Audio, Control, Alarm Direct Burial

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	16
• Conductor Stranding	7x24
• Conductor Type	Bare copper
• Nominal DCR	4.2 Ohm/1000ft
INSULATION PARAMETER	-
• Insulation Type	PVC-Nylon
• Insulation Thickness	0.02 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Overall 100% Aluminum Foil
• Shield Type 2	Aquaseal Water Blocking Tape
• Drain Wire Type	Tinned Copper
• Drain Wire AWG	24 AWG
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	37 pF/ft
• Nom. Cap. Conductor to Shield	67 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	UV Resistant PVC
Jacket Thickness	0.04 in
Nominal Cable O.D.	0.328 in
Plenum	No
NEC UL Rating	CL3, FPL, PLTC
RoHS Compliant	Yes
TIA Test	TIA455-82 Water Penetration Test
Pull Tension	69 lbs
Bend Radius	2.952 in
Cable Weight	58 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1685
Operating Range	-20 to 90 Deg C

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971

AQ294

16/2 Shielded Indoor/Outdoor Direct Burial CL3/FPL Rated
Audio, Control, Alarm Direct Burial

Related Products

RELATED PRODUCTS	-
Plenum Number	25294B
Non Plenum Number	294
Aquaseal Number	AQC294
3 Pin XLR Male	CN-NC3MX
3 Pin XLR Female	CN-NC3FX
3.5mm Stereo Mini	CN-NYS231

Detailed Specification & Technical Data

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
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Aquaseal
Water Resistant Cables

AQ296

12/2 Shielded Indoor/Outdoor Direct Burial CL3/FPL Rated
Audio, Control, Alarm Direct Burial

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	12
• Conductor Stranding	19x25
• Conductor Type	Bare copper
• Nominal DCR	1.7 Ohm/1000ft
INSULATION PARAMETER	-
• Insulation Type	PVC-Nylon
• Insulation Thickness	0.02 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Overall 100% Aluminum Foil
• Shield Type 2	Aquaseal Water Blocking Tape
• Drain Wire Type	Tinned Copper
• Drain Wire AWG	24 AWG
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	54 pF/ft
• Nom. Cap. Conductor to Shield	97 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	UV Resistant PVC
Jacket Thickness	0.04 in
Nominal Cable O.D.	0.375 in
Plenum	No
NEC UL Rating	CL3, FPL, PLTC
RoHS Compliant	Yes
TIA Test	TIA455-82 Water Penetration Test
Pull Tension	161 lbs
Bend Radius	3.375 in
Cable Weight	89 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1685
Operating Range	-20 to 90 Deg C

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
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AQ296

12/2 Shielded Indoor/Outdoor Direct Burial CL3/FPL Rated
Audio, Control, Alarm Direct Burial

Related Products

RELATED PRODUCTS	
3 Pin XLR Male	CN-NC3MX
3 Pin XLR Female	CN-NC3FX
3.5mm Stereo Mini	CN-NYS231

Detailed Specification & Technical Data

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
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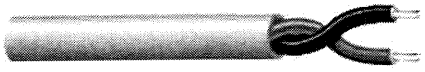


0890

16/2 Unshielded Low Capacitance FPLR Rated
Addressable Fire Alam SLC Circuits

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	16
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	4.1 Ohm/1000ft
INSULATION PARAMETER	-
• Insulation Type	Polypropylene - PP
• Insulation Thickness	0.015 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	None
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	17 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	PVC
Jacket Thickness	0.030 in
Nominal Cable O.D.	0.223 in
Plenum	No
NEC UL Rating	FPLR
RoHS Compliant	Yes
Pull Tension	62 lbs
Bend Radius	2.007 in
Cable Weight	29 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1666 Vertical Shaft
Operating Range	-20 to 60 Deg C
UL Voltage Rating	300

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971

D990

16/2 Unshielded Low Capacitance FPLR Rated
Addressable Fire Alam SLC Circuits

Related Products

RELATED PRODUCTS	
Plenum Number	D60991

Detailed Specification & Technical Data

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971

990
16/2 Solid Unshielded FPLR
Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	16
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	4.1 Ohm/1000ft
• Cabling Lay Length	2.75 in
• Twists/Foot	4.4 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Polypropylene - PP
• Insulation Thickness	0.008 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	None
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	23 pF/ft

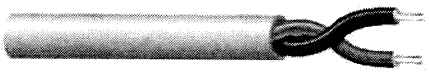
Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	PVC
Jacket Thickness	0.022 in
Nominal Cable O.D.	0.168 in
Plenum	No
NEC UL Rating	FPLR
RoHS Compliant	Yes
Pull Tension	62 lbs
Bend Radius	1.512 in
Cable Weight	25 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1666 Vertical Shaft
Operating Range	-20 to 60 Deg C
UL Voltage Rating	300

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971



990

16/2 Solid Unshielded FPLR
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	
Plenum Number	60991B
Aquaseal Number	AQC225
Aquaseal Direct Burial Number	AQ225

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971

591
16/2 Solid Sshielded FPLR
Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	16
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	4.1 Ohm/1000ft
• Cabling Lay Length	2.5 in
• Twists/Foot	4.8 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Polypropylene - PP
• Insulation Thickness	0.008 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Overall 100% Aluminum Foil
• Drain Wire Type	Tinned Copper
• Drain Wire AWG	24 AWG
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	43 pF/ft
• Nom. Cap. Conductor to Shield	78 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	PVC
Jacket Thickness	0.017 in
Nominal Cable O.D.	0.172 in
Plenum	No
NEC UL Rating	FPLR
RoHS Compliant	Yes
Pull Tension	75 lbs
Bend Radius	1.55 in
Cable Weight	26 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1666 Vertical Shaft
Operating Range	-20 to 60 Deg C
UL Voltage Rating	300

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971

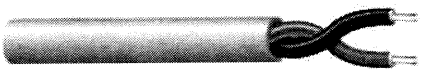
991

16/2 Solid Sshielded FPLR
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	-
Plenum Number	60990B
Aquaseal Number	AQC294
Aquaseal Direct Burial Number	AQ294

WEST PENN WIRE
AV, SECURITY & NETWORKING SOLUTIONS
Since 1971



998

12/2 Solid Unshielded FPLR
Fire Alarm Signaling

Construction & Dimensions

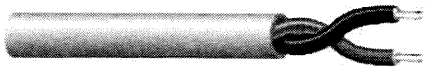
CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	12
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	1.8 Ohm/1000ft
• Cabling Lay Length	4.25 in
• Twists/Foot	2.8 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Polypropylene - PP
• Insulation Thickness	0.01 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	None
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	23 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	PVC
Jacket Thickness	0.022 in
Nominal Cable O.D.	0.244 in
Plenum	No
NEC UL Rating	FPLR
RoHS Compliant	Yes
Pull Tension	158 lbs
Bend Radius	2.195 in
Cable Weight	57 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1666 Vertical Shaft
Operating Range	-20 to 60 Deg C
UL Voltage Rating	300



998

12/2 Solid Unshielded FPLR
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	
Plenum Number	60995B
Aquaseal Direct Burial Number	AQ227

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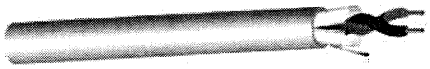

999

12/2 Solid Shielded FPLR

Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	12
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	1.8 Ohm/1000ft
• Cabling Lay Length	3.25 in
• Twists/Foot	3.7 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Polypropylene - PP
• Insulation Thickness	0.008 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Overall 100% Aluminum Foil
• Drain Wire Type	Tinned Copper
• Drain Wire AWG	24 AWG
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	44 pF/ft
• Nom. Cap. Conductor to Shield	77 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	PVC
Jacket Thickness	0.017 in
Nominal Cable O.D.	0.248 in
Plenum	No
NEC UL Rating	FPLR
RoHS Compliant	Yes
Pull Tension	172 lbs
Bend Radius	2.232 in
Cable Weight	66 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	UL1666 Vertical Shaft
Operating Range	-20 to 60 Deg C
UL Voltage Rating	300

999

12/2 Solid Shielded FPLR

Fire Alarm Signaling

Related Products

RELATED PRODUCTS	-
Plenum Number	60994B
Aquaseal Number	AQC296
Aquaseal Direct Burial Number	AQ296

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609908

16/2 Solid Shielded FPLP

Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	16
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	4.1 Ohm/1000ft
• Cabling Lay Length	2 in
• Twists/Foot	6 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Plenum PVC
• Insulation Thickness	0.008 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Overall 100% Aluminum Foil
• Drain Wire Type	Tinned Copper
• Drain Wire AWG	24 AWG
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	77 pF/ft
• Nom. Cap. Conductor to Shield	139 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	Flexible Plenum
Jacket Thickness	0.015 in
Nominal Cable O.D.	0.168 in
Plenum	Yes
NEC UL Rating	FPLP
RoHS Compliant	Yes
Pull Tension	76 lbs
Bend Radius	1.512 in
Cable Weight	29 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	NFPA 262 Plenum
Operating Range	-0 to 60 Deg C
UL Voltage Rating	300

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60990B

16/2 Solid Shielded FPLP
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	
Non Plenum Number	991
Aquaseal Number	AQC294
Aquaseal Direct Burial Number	AQ294

Detailed Specification & Technical Data

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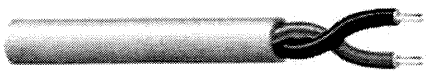

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16/2 Solid Unshielded FPLP
Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	16
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	4.1 Ohm/1000ft
• Cabling Lay Length	2.75 in
• Twists/Foot	4.4 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Plenum PVC
• Insulation Thickness	0.008 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	None
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	33 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	Flexible Plenum
Jacket Thickness	0.015 in
Nominal Cable O.D.	0.164 in
Plenum	Yes
NEC UL Rating	FPLP
RoHS Compliant	Yes
Pull Tension	62 lbs
Bend Radius	1.476 in
Cable Weight	26 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	NFPA 262 Plenum
Operating Range	-0 to 60 Deg C
UL Voltage Rating	300

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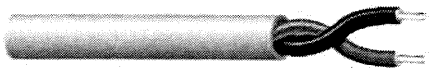

60991B

16/2 Solid Unshielded FPLP
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	-
Non Plenum Number	990
Aquaseal Number	AQC225
Aquaseal Direct Burial Number	AQ225

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[redacted]
12/2 Solid Shielded FPLP
Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	12
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	1.8 Ohm/1000ft
• Cabling Lay Length	4 in
• Twists/Foot	3 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Plenum PVC
• Insulation Thickness	0.009 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	Overall 100% Aluminum Foil
• Drain Wire Type	Tinned Copper
• Drain Wire AWG	24 AWG
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	84 pF/ft
• Nom. Cap. Conductor to Shield	151 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	Flexible Plenum
Jacket Thickness	0.015 in
Nominal Cable O.D.	0.243 in
Plenum	Yes
NEC UL Rating	FPLP
RoHS Compliant	Yes
Pull Tension	166 lbs
Bend Radius	2.187 in
Cable Weight	54 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	NFPA 262 Plenum
Operating Range	-0 to 60 Deg C
UL Voltage Rating	300

60994B

12/2 Solid Shielded FPLP
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	-
Non Plenum Number	999
Aquaseal Number	AQC296
Aquaseal Direct Burial Number	AQ296

Detailed Specification & Technical Data

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60958

12/2Solid Unshielded FPLP
Fire Alarm Signaling

Construction & Dimensions

CONSTRUCTION & DIMENSIONS	-
CONDUCTOR PARAMETER	-
• Number of Conductors	2
• AWG Size	12
• Conductor Stranding	Solid
• Conductor Type	Bare Copper
• Nominal DCR	1.8 Ohm/1000ft
• Cabling Lay Length	4 in
• Twists/Foot	3 twist/ft
INSULATION PARAMETER	-
• Insulation Type	Plenum PVC
• Insulation Thickness	0.09 in
• Insulation Color Code	1. Black 2.Red
SHIELDING PARAMETER	-
• Shield Type	None
ELECTRICAL CHARACTERISTICS	-
• Nom. Cap. Between Conductors	40 pF/ft

Overall Construction

OVERALL CONSTRUCTION PARAMETERS	-
Jacket Type	Flexible Plenum
Jacket Thickness	0.015 in
Nominal Cable O.D.	0.239 in
Plenum	Yes
NEC UL Rating	FPLP
RoHS Compliant	Yes
Pull Tension	159 lbs
Bend Radius	2.151 in
Cable Weight	55 lbs

Overall Electrical & Optical Characteristics

OVERALL ELECTRICAL/OPTICAL CHARACTERISTICS	-
UL Flammability	NFPA 262 Plenum
Operating Range	-0 to 60 Deg C
UL Voltage Rating	300

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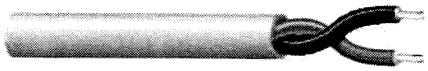

60995B

12/2Solid Unshielded FPLP
Fire Alarm Signaling

Related Products

RELATED PRODUCTS	-
Non Plenum Number	998
Aquaseal Direct Burial Number	AQ227

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION
OFFICE OF THE STATE FIRE MARSHAL
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM

LISTING SERVICE

LISTING No. 7161-0859:0101

CATEGORY: 7161 -- CABLES-FIRE PROTECTIVE SIGNALING

LISTEE: West Penn Wire2833 W Chestnut St, Washington, PA 15301
Contact: Mark Sams (724) 222-7060 Fax (724) 229-1151
Email: mark.sams@westpenn-cdt.com

DESIGN: Types FPL and FPLP power limited fire protective signaling cable. Refer to listee's data sheet for detailed product description and operational considerations.

INSTALLATION: In accordance with listee's printed installation instructions, NEC Article 760, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

MARKING: Listee's name, type, NEC rating and UL label.

APPROVAL: Listed as power-limited fire protective signaling cable.

*Rev. 05-23-2005

Date Issued: **July 01, 2018** *Listing Expires* **June 30, 2019**

Authorized By: ***DAVID CASTILLO**, Program Coordinator*
Fire Engineering Division

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