ADDENDUM

ADDENDUM: 01

DATE: JUNE 24, 2020

PROJECT: LIVERMORE PLEASANTON FIRE STATION NO. 3

PREPARED BY: Jeff Katz (jeff@jeffkatzarchitecture.com)
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This addendum is issued before the award of contract to inform the bidders of revisions to the bidding documents. It shall be the responsibility of the general contractor to inform any affected sub-bidder of the content of this addendum.

All requirements contained in the bidding documents shall apply to this addendum, and the general character of the work called for in this addendum shall be the same as originally set forth in the applicable portions of the bidding documents for similar work, unless otherwise specified under this addendum, and all incidental work necessitated by this addendum as required to complete the work shall be included in the bids, even though not particularly mentioned in this addendum.

This addendum is hereby made a part of the bidding documents and shall be signed and dated, submitted with bidder's proposal, and acknowledged as received on the contractor’s Bid Proposal form.

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Due to County of Alameda Health Department’s guidance that gatherings should be avoided to prevent the spread of Covid19, the opening of the bids for this project will take place virtually.

The contract documents are modified as follows:

Delivery of Bid Proposals:
Bids shall be received on Tuesday, June 30, 2020, no later than 2:00 p.m. Bids shall be clearly marked with the project name and deposited in the box outside the front door of the City of Pleasanton City Clerks Office at 123 Main Street, Pleasanton, CA 94566. The box will be available to deposit bids starting at 12:30 p.m. on Tuesday, June 30, 2020, and will be removed promptly at 2:00 pm. The box will be monitored by City staff to log bids and ensure contactless bid submission. Bid envelopes shall have an email address(s) clearly labeled on the exterior of the envelope which will be used to invite the bidder to a virtual “Zoom” meeting. Bids will be opened and read aloud at the virtual Zoom meeting which will start at 3:30 p.m. on Tuesday, June 30, 2020.
Anyone who desires to attend the virtual bid opening meeting is welcome – submission of a bid is not required to attend. In order to receive an invitation to the virtual meeting, please send an email with the subject line “LFPD Fire Station No. 3 Zoom Bid Opening” to ANelkie@cityofpleasantonca.gov prior to 2:00 pm on Tuesday, June 30, 2020.

All other items of work in the contract document remain unchanged. Acknowledgement and a signed copy of this Addendum shall be included in the Bid Proposal.

_______________________________
Stephen M. Kirkpatrick
City Engineer

ACKNOWLEDGED:

___________________________________________ Date:

Company

By: ____________________________ Title:

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DRAWINGS ISSUED WITH ADDENDUM:

(X) The following drawings are issued with addendum and form a part hereof.

SHEET C1.0, CIVIL CONSTRUCTION PLAN FOR TEMPORARY FACILITIES
SHEET P4.4, FUEL TANK DETAILS
SHEET E1.1, TEMPORARY FACILITIES GENERAL ELECTRICAL NOTES
SHEET E2.1, TEMPORARY FACILITIES ELECTRICAL PLAN

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QUESTIONS AND ANSWERS

1. Q: Among all the Bid Documents it appears we have two Spec. books. Could you please let us know which one is the correct one to follow? One of them has a bid opening date of April 30th and one is June 30th.
   A: The bid date for the project is June 30, 2020. Please omit pages 695-1388 of the pdf.

2. Q: PGE Engineering Drawings for temporary site have been mentioned. Would you kindly make these drawings available to us? It seems they are currently missing from the bid package.
   A: The drawings from PGE are not yet available. The bid shall be based on electrical work as indicated on the project plans.
3. Q: On the Temporary Facility drawings, Electrical Plan, E2.1, notes seem to be contradicting with the drawings. Please clarify if the correct transformer to be used should be pole mounted or pad mounted.
   A: It will be a pad mount transformer, and pedestal meter at the point of service.

4. Q: Please clarify if the Temporary Apparatus Bay stressed membrane structure will simply require an open end front wall or will we need to install roll-up doors on the front wall of this temp. facility building?
   A: No door is required on the front of the temporary apparatus bay. See Spec section 13312 for additional information.

5. Q: In Sheet T-2.1, Plans for Temporary Facilities, General Notes #21 states, “BUILDING NUMBERS SHALL BE EASILY VISIBLE AND LEGIBLE FROM THE STREET OR ROAD FRONTING THE PROPERTY,” however, no signs appear to be called out or specified in the Temporary Facilities drawings. Please clarify whether or not any signs are included in the Temporary Facilities work.
   A: Building address number only will be required.

6. Q: On Sheet T-3, Accessibility Details, Entrances and Doors Note #2 states, "ALL ACCESSIBLE ENTRANCES SHALL BE IDENTIFIED WITH AT LEAST ONE STANDARD INTERNATIONAL SYMBOL OF ACCESSIBILITY SIGN AND WITH ADDITIONAL DIRECTIONAL SIGNS AS REQUIRED, VISIBLE FROM APPROACHING PEDESTRIAN WAYS." With a dashed line, Sheet A1.1 identifies an accessible path of travel from the sidewalk to front door 129A, and from the van accessible parking space to the same door 129A; it also shows the accessible path of travel from the patio to the parking lane and the trash enclosure. Doors 110B and 111B access the patio but they do not show notations for the ISA sign (B2/T-8) designated by Construction Note 130 for provision at door 129A on Sheet A2.1. Is the single callout for the ISA sign for door 129A the complete specification for the project, or does Entrances and Doors Note #2 on Sheet T-3 require that the contractor make interpretations for provision and location(s) of an additional quantity of ISA signs?
   A: ISA signage is required on the front entrance door only.

7. Q: On Sheet A1.1 "Site Plan," Construction Note #177 for No Smoking Sign (C4/T-9) is shown on the drawing with an arrow pointing to the center of the driveway opening onto Santa Rita Road. Please confirm this is the correct location or clarify if it should be at a different location. Also, please clarify the post, the mounting configuration and the sign height.
   A: The No Smoking Sign shall be mounted on the building, at a location to be determined by the Architect. The note 177 callout location on the drawing is identifying a trench drain as indicated on the civil plans.

8. Q: At detail A1/A1.5, the note referring to the monument sign text reads, "1 1/2" STROKE, POWDER COATED ALUMINUM LETTERS IN RAILWAY FONT, MOUNTED WITH 3/4" STANDOFFS". The note's arrow points to the text, "LIVERMORE - PLEASANTON FIRE DEPARTMENT" on 2 lines. However, the text for the 3rd line below, "FIRE STATION NO.3," is dimensioned at 4" in height and the height of the letters in the two lines above, if depicted to scale, appears to be shorter than 4" in height (within the 1'-4" height dimensioned space); also, those letter heights of the two lines are not dimensioned. The stated 1-1/2" stroke
width does not appear to be feasible with a 4" or less letter height. Please confirm the correct letter height and standoff dimensions, and if appropriate, the stroke widths (although the latter should generally be a function of the font style).

A: The height of the top (2) lines of lettering are each 3", with the second line of lettering located 4" below the first line of lettering. The bottom line of lettering is confirmed to be 4" in height as shown in detail A1/A1.5. The lettering stroke size shall be per the font type and height in lieu of the 1-1/2" stroke called out for the detail. Standoff dimensions are also confirmed as noted in the detail.

9. Q: Sheet M2.1 shows the Plymovent STR Rails on what looks to be the left side of the vehicles as they exit the Station. All of the Pleasanton Fire Vehicles have tailpipes on the right side of the vehicles thus the Plymovent Systems are shown incorrectly. If the Systems were shown correctly there might be a conflict with the 20" and 26" duct coming from EF 1-8. Please clarify.

A: Travel through the station is west to east, entering off Santa Rita Road. The drops are shown correctly.

10. Q: The Finish Notes on sheet A6.1, note #12 - "Stainless Steel Finish at Mop Sink Walls" however A1/A5.4 notes FRP. Please confirm that the Finish Note is incorrect and FRP is required at the mop sinks.

A: FRP is required at the Mop Sink walls

11. Q: the plan for the Temp fire station show loose gravel around the building Plan Sheet C1.0 The Loose Gravel. What type and how this will we need to install. Will they require Geo fabric under the loose gravel if so what type.

A: Gravel shall be Class 2 Permeable with a 20 mil geo fabric.

12. Refer to legend on sheet L-1.00 IRRIGATION NOTES AND SCHEDULE:
   - Sleeve is labeled with number (6), but on L-1.01 IRRIGATION PLAN, all sleeves are labeled with number (4). Please clarify.

A: The (6) is used as a generic symbol in the legend. Contractor to refer to the numbers shown on the plan.

13. Quick coupler valve is not shown on plan. Please clarify.

A: (1) quick coupler will need to be provided – location will be determined in field.

14. Drip tubing model is Rain Bird XFD-06-18, while specification 02810/2.11 indicates its model to be: Rain Bird XF-SDI with “Copper Shield” technology. Please clarify.

A: Provide Rain Bird XFD-06-18 per drawings.

15. Controller model is conventional system. But in specification 02810/2.02 indicates "2-wire controller with rain shutoff switch as shown on Drawings". Please clarify.

A: Provide conventional controller as shown on drawings.

16. Refer to specification 02810/2.02 & 02810/3.04-O, it states that we must install Rain Shutoff Switch. Please provide the model & location of Rain Shutoff Switch.

A: Per irrigation specifications - Contractor to provide rain shut off device as manufactured by Control System manufacturer capable of shutting off all control valves. Locate in a location exposed to rain and hardwire to controller. Install switch in area not affected by irrigation or rain shadow. Final location to be approved in the field by the Architect. Provide wires in rigid conduit.
17. Refer to Planting Notes 1 on sheet L-2.00: PLANTING NOTES AND SCHEDULE, please provide the material for "imported amended soil in all other planting areas".
A: See attached “imported planting soil” specification.

18. Refer to Bioretention notes 1 in Detail 8, sheet C5.0 CONSTRUCTION DETAILS, bio soil mix shall meet requirements of BASMAA REGIONAL BIOTREATMENT SOIL SPECIFICATION, While specifications 02900/2.05 indicates that soil mix shall conform to its guidelines. Please clarify.
A: These are both similar guidelines. Plan notes say “All material shall be free of trash & debris, expansive clays or any other deleterious materials and shall be subject to the approval and acceptance of the Authority Having Jurisdiction.” BASMAA is an Authority Having Jurisdiction.

19. In the Spec section 3.03 E. it states After all utilities or other installations required under slab have been installed, place 4” of sand over compacted grade and then place vapor barrier over sand. On the plans S2.0 for the 8” concrete it states 12” AB compacted to a 95% do you require the 4” of sand over this?
On the plans S2.0 for the 5” concrete it states 5” concrete slab over 15 mil vapor barrier over 3” of ½” or ¾” crushed rock. Please clarify if this is correct or you require the 4” of sand somewhere.
A: The specs should be revised to read: 1) at Apparatus Bay: after all utilities or other installations required under slab have been installed, place class 2 aggregate base over compacted grade. 2) at all other interior slabs: after all utilities or other installations required under slab have been installed, place crushed gravel over compacted grade, then place vapor barrier over crushed gravel.

20. Section 02751, Section 2.9 specifies slip resistant additives. Is this needed and where does it occur?
A: Omit Section 2.9. Slip resistant additives are not required.

21. A1.1.1 - Site Plan and Details - Temporary Facilities, note 004 states "Demo portion of existing public sidewalk for new driveway curb cut - see Civil dwg." However when you refer to C1.0 - Civil construction plan, there is no notes and/or details for the demolition or new driveway. Please provide a details for this driveway.
A: See attached revised Drawing C1.0 for Temporary Facilities

22. Sheet A1.1.1 - Site Plan and Details - Temporary Facilities refers to landscaping drawing however there are no landscaping drawing included within this set of plans. If there is a landscape drawing, please provide.
A: No landscaping is required. Omit note reference.

23. Item No. 2 on the bid form note "Temporary Fire Station removal and site restoration." However, there are no drawing as to how the site is to be restore. Please confirm scope of restoration of existing site.
A: The site shall be returned to pre condition of private property. Remove driveway apron, fencing and other improvements. Leave wet utilities stubbed to property line in a water meter box. Remove dry utilities back to meter section.

24. Specification 072550 - Weather Barrier notes a base layer of "Tyvek StuccoWrap by DuPont." The Tyvek StuccoWrap is a product that is typically used under
stucco locations and not the simulated wood (Resysta). Super Jumbo Tex paper is typically the weather barrier used at Resysta rain screen systems. Please confirm that the intention is to use the "Tyvek StuccoWrap" at areas where stucco is being installed and "Super Jumbo Tex 60 Minute by Fortifiber" is to be applied at Resysta locations.
A: Revise base layer to be “Tyvek Commercialwrap” Outer layer shall remain as specified.

25. On sheet A4.6 notes a "Waterproofing Membrane" at grade beams and below the slab. Specification 03310 - Concrete Work notes a vapor barrier. Please confirm this is considered the "waterproofing membrane" noted within the architectural drawings.
A: Correct – reference is to vapor barrier.

26. Please verify which of the two beam sizes are required for the brace frames shown on drawing S3.2. W14x38 beams are noted throughout but detail 2 on S5.1 calls for W18x61 beams.
A: W14x38’s. The detail on S5.1 will be revised to reflect this.

27. Q: Looks like all Telecom cable is be installed in conduit homerun from the station to the IDF? If so is it acceptable to use non plenum cable?
A: Non-plenum rated cable is acceptable if installed in conduit.

28. Q: Spec’s call out Cat6 cable but drawing E9.1 detail 8 General note A says to use Cat6E. Please clarify what type of cable is required?
A: Cat6E shall be used.

29. Q: Is it acceptable to use a Berk Tek/Leviton or Belden Manufacturer cabling solution?
A: Berk Tek or Belden shall be acceptable alternate manufactures for network cabling.

30. Q: Site plan E3.2 sheet keynote 10 does say anything about installing a data drop for this location. Does this location need a data drop?
A: Per keynote 10, 11, and 7, this is the location of the traffic control equipment. Comm, and power are shown. Electrical contractor shall coordinate with traffic signal vendor for specific requirements prior to installation.

31. Q: I only see one WAP location on the drawings. Are there other WAP locations? No WAP location shown on 2nd floor either.
A: Provide WAP In middle of second floor corridor. If WAPS are POE, 120V power can be omitted.

32. Q: Drawing E5.1 shows (2) voice/data locations on gridline 5.C but on the Signal drawing E6.1 it does not show these locations. Do we include these (2) locations in bid?
A: Provide all signal devices shown on E5.1 and E6.1.

33. Q: Drawing E6.1 detail 2 shows IDF room being wrapped with ladder rack or cable tray. Is this much ladder rack or cable tray needed for just (1) rack?
A: Cable tray intended for future flexibility, and connections between wall mounted and rack mounted equipment.

34. Q: Is vertical wire managers required at each side of equipment rack?
A: Yes
35. Q: Drawing E9.1 detail 7 and 8 System Riser Diagrams, General note C says to provide and install (3) cables to each location. Please clarify how many cables per each specific location?
   A: Provide (2) Cat6E cables per network location.

36. Q: Specification section 16830, 2.6 calls out to provide an HP Procurve 410g1 network switch. Tried googling this and could not find this particular part number. Please clarify if contractor is to provide network switch and if so please provide correct part number?
   A: HP Procurve series has been replaced by the HPE Aruba series. Provide HPE Aruba 3810M 48G or approved equal.

37. Q: Specification section 16830, 2.7 calls out to provide a rack mounted power strip APC NET9RM. Do we need to provide these? Also call out an APC UPS SU22OR3X106 which cannot find Goggling this part #. Please provide part number if contractor is to provide UPS.
   A: Provide power strip for rack mounted equipment. Provide 2200va APC rack mounted ups with minimum receptacles as listed in 2.7 A.3

SPECIFICATIONS

A. SECTION 02110
   • See attached specification for plant protection.
   • See added language for imported Planting Soil

B. SECTION 07540
   • PVC Roofing Membrane: Listed acceptable manufacturer’s shall also include Versico, GAF or approved equal.

C. SECTION 08540
   • Composite Windows: Acceptable manufacturers shall also include: Sierra Pacific Windows, or approved equal.

D. SECTION 13312 TENSIONED FABRIC STRUCTURES
   • See attached Specification

E. SECTION 15410
   • See attached Specification

F. SECTION 16720
   • See attached specification

G. SECTION 16840
   • See attached revised specification

H. SECTION 16413
   • Paragraph 2.1, revise to read as follows
     i. Square D; a brand of Schneider Electric, Eaton, Siemens or approved equal

I. SECTION 16416
   • Paragraph 2.2, revise to read as follows
     i. Square D; a brand of Schneider Electric, Eaton, Siemens or approved equal
J. SECTION 16720 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM
   • See attached Specification
K. SECTION 16870
   • Omit this section from the specifications

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DRAWINGS

A. SHEET C1.0, CIVIL CONSTRUCTION PLAN FOR TEMPORARY FACILITIES
   • See revised Sheet C1.0
B. SHEET P4.4, FUEL TANK DETAILS
   • See revised Sheet P4.4
C. SHEET E1.1, TEMPORARY FACILITIES GENERAL ELECTRICAL NOTES
   • See revised Sheet E1.1
D. SHEET E2.1, TEMPORARY FACILITIES ELECTRICAL PLAN
   • See Revised Sheet E2.1

END OF ADDENDUM

All bidders shall acknowledge receipt and acceptance of this Addendum No. 01 by signing in the space provided above and submitting the signed Addendum No. 01 with the bid. Failure to include this addendum may be cause for the rejection of the bid.
SECTION 02110
PLANT PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Preserve and protect existing trees, shrubs and other plant materials to remain, including protecting plants on adjoining properties during site preparation work and construction.

B. Provide tree and shrub pruning and removal in accordance with these Specifications if required by the Contract Documents.

C. Layout and review of utility and irrigation trenches that occur in the Tree Protection Root Zone.

D. Related requirements specified elsewhere include:
   Section 02810, IRRIGATION
   Section 02900, PLANTING

1.02 QUALITY ASSURANCE

A. Reference Standards:
   1. Ordinances and Regulations: All local, municipal and state laws, codes and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications shall not be construed to conflict with any of the above codes, regulations or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship or construction of a better quality, higher standard than is required by the above mentioned codes and regulations, the provisions of these Specifications and Drawings shall take precedence. Furnish without extra charge additional materials and labor required to comply with above rules and regulations.


B. Pre-installation Conference:
   1. Conduct conference at the project site. Contractor shall review and identify with the Owner’s Representative the limits of Work and extent of plant materials and other improvements to be protected. Notify Owner's Representative of discrepancies between existing conditions and Drawings before proceeding with Work.

   2. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

      a. Tree-service firm's personnel, and equipment needed
b. Arborist's responsibilities.

c. Quality-control program.

d. Coordination of Work and equipment movement with the locations of protection zones.

e. Trenching by hand or with air spade within protection zones.

3. At the Owner’s discretion, an Arborist may represent the Owner to review the work of the Contractor in regards to plant protection. Arborist Qualifications: ISA Certified Arborist licensed to work in the State of California.

4. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed temporary tree and plant protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work

1.03 PROJECT CONDITIONS

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

2. Nuisances: Keep dirt, dust, noise and other objectionable nuisance to a minimum. Use temporary enclosures, coverings and sprinkling, and combinations thereof, as necessary to limit dust to lowest practicable level, except do not use water to the extent that it causes flooding or contaminated run-off.

3. Traffic: Conduct work to ensure minimum interference with vehicular and pedestrian traffic, and to permit unencumbered access to site and adjacent properties.

   a. Do not close or obstruct streets, sidewalks, alleys or other public passageways without permission from authorities having jurisdiction.

   b. If required by governing authorities, provide alternate routes around closed and obstructed traffic ways.

4. The following practices are prohibited within protection zones:

   a. Revise subparagraphs below to suit Project.

   b. Storage of construction materials, debris, or excavated material.

   c. Moving or parking vehicles or equipment.

   d. Foot traffic.

   e. Erection of sheds or structures.

   f. Impoundment of water.

   g. Excavation or other digging unless otherwise indicated.

   h. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
5. Do not direct vehicle or equipment exhaust toward protection zones.

6. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

1.04 DEFINITIONS

1. Diameter breast height (DBH): diameter of a trunk as measured at a height 54 inches above the ground line.

2. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

3. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and as identified on the drawings or otherwise by a certified arborist.

4. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

5. Structural Root Zone: A circular area with the tree trunk at the center and a radius equal to 3 times the diameter of the tree trunk measured at breast height (4.5 feet above ground line). This zone, where most of the structural roots exist, is based upon tree failure research conducted by E.T. Smiley at the Bartlett Tree Research Laboratory. Any structural (buttress) root, which has been severed or is rotten within this zone, can no longer provide adequate support to the tree and must be considered missing.

6. Dripline: The area of the ground directly beneath the vertical projection (shadow) of the trees foliage canopy.

1.05 SUBMITTALS

1. Product Data: For each type of product.

2. Soil Analysis Report:

3. Provide soil analysis report for any top soil to be removed and stockpiled for reuse as planting soil. Soils analysis report to be performed by Wallace Laboratories LLC (310-615-0116), a certified soil analysis laboratory, and include agricultural suitability analysis and recommendations for amending the soil. Subsoil will not be approved as planting soil.

4. Samples: For each type of the following:

5. Organic Mulch: 1-quart of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.

6. Planting Soil: 1-quart of soil; in sealed plastic bags; for soils to be used within the protection zones.

7. Shop Drawings:

   a. Include plans and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones. Indicate extent of trenching by hand or with air spade within protection zones.

   b. Protection-Zone Signage
8. Qualification Data: For arborist and tree service firm.

9. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

10. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

11. Survey of Existing Conditions: Provide to Owner a Survey of Existing Conditions. Record existing conditions, including underground utilities, etc. on As Built Drawings by use of field measurements and preconstruction photographs. Make permanent record of measurements, materials, and construction details required to make exact reproduction.

12. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
   a. Revise subparagraphs below to suit Project.
   b. Species and size of tree.
   c. Location on site plan. Include unique identifier for each.
   d. Reason for pruning.
   e. Description of pruning to be performed.
   f. Description of maintenance following pruning.

PART 2 - PRODUCTS

1.01 MATERIALS

1. Backfill Soil: Approved planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

2. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
   a. Type: Wood and bark chips
   b. Size Range: ½'-2”

3. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements:
   a. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch- diameter wire chain-link fabric; with 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; with tie wires, hog ring ties, and other accessories for a complete fence system.

Height: 72 inches
Gates: Swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones.

4. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
   b. Lettering: 3-inch- high minimum, black characters on white background.

5. Tree Branch & Truck Protection: for branches trunks exposed to, or at risk of exposure to impact by construction equipment.
   a. 2x lumber
   b. 1/2”-wide steel straps

PART 3 - EXECUTION

1.01 EXAMINATION
1. Examine areas in which work is to be performed. Report in writing to the Owner’s Representative all prevailing conditions that will adversely affect the existing plant materials to remain. Do not proceed with work until a solution acceptable to the Owner’s Representative has been arrived at.

2. Survey of Existing Conditions: Record existing conditions, including underground utilities, etc. by use of measured drawings and preconstruction photographs.

3. Starting work constitutes acceptance of the existing conditions and the Contractor shall then, at his expense, be responsible for correcting all unsatisfactory and defective work encountered.

1.02 PREPARATION
1. Locate and clearly identify trees, shrubs, and other vegetation to remain an/or relocated. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.

2. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.
   a. Apply 4-inch uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches of tree trunks.
4. Install and maintain temporary fencing and other required protective devices and exclude construction activities from tree/shrub zones except as supervised by the Arborist / Owner’s Representative.

5. If tree/plant protection zones cannot be protected with fencing, a four inch layer of mulch with minimum 1.25 inch thick, metal strap linked plywood shielding shall be maintained in the tree/shrub zone where heavy equipment will be operated.

1.03 PROTECTION ZONES

1. Protect trees and shrubs against cutting, breaking, skinning and bruising of bark; permit no traffic or stockpiling within drip line.

2. Do not change earth surface within drip line of trees and shrubs except as approved in writing by the Owner.

3. Do not park vehicles or store materials, supplies and construction equipment within Tree Protection Zone.

4. Verify details of protection-zone fencing before retaining last option in "Protection-Zone Fencing" Paragraph below.

5. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

   a. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer’s written instructions.

   b. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect. Post may be steel driven type, or self-supporting type.

   c. Access Gates: Install where required; adjust 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.

6. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 feet on protection-zone fencing, with signs each facing a different direction.

7. Where tree branches & trunks are exposed to, or at risk of exposure to impact by construction equipment, secure 2x lumber radially around tree branches and/or trunk to prevent damage. Secure lumber with steel strapping.

8. Maintain protection zones free of weeds and trash.
9. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
   a. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
   b. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

1.04 EXCAVATION & TRENCHING

1. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

2. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

3. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches (75 mm) back from new construction and as required for root pruning.

4. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

1.05 ROOT PRUNING

1. Prune tree roots that are affected by temporary and permanent construction. Prune roots as approved by certified arborist.
   a. Generally cutting of roots two inches or greater shall be avoided. Roots one inch and greater in diameter that must be cut shall be cut cleanly and obliquely with the cut surface facing down.
   b. Exposed and pruned roots shall be covered with light well-drained soil backfill and mulch over. The area shall be kept moist. Retain applicable subparagraphs below.
   c. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
   d. Cut Ends: Do not paint cut root ends
   e. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
f. Cover exposed roots with burlap and water regularly.

g. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."

2. Root Pruning at Edge of Protection Zone: Prune tree roots 6 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

3. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

1.06 AIR SPADING:

1. Air spading, or hand removal of soil or tunneling is required for excavation in the Tree Protection Zone of any trees for the installation of infrastructure where roots 2 inches in diameter and larger are encountered. The "critical root zone" is defined as any area around a tree in which a two inch diameter root is encountered. The Arborist / Owner’s Representative shall define the critical root zone and the Contractor shall excavate using a pneumatic excavator (AIR-SPADE or equivalent) as follows:

2. Trenching for utility lines or other infrastructure may be done mechanically outside the Tree Protection Zone. As the equipment operator approaches the canopy radius, or for certain species up to 1.5 times the canopy radius out from the base of the tree (Oaks, Poplars, Redwoods, etc.) the operator shall be assisted by a spotter who shall inspect the excavation for roots. If a root of two inches diameter is encountered the spotter shall halt mechanical excavation and pneumatic excavation shall proceed. If no other two inch or greater diameter root is encountered in an excavation of two feet forward and two feet deep, the single two inch root may be cleanly cut proximal to (on the tree side of) any fracture or torn bark. Mechanical excavation may continue until a two inch diameter root is encountered, and the pneumatic excavation, exploration is then repeated.

3. The Contractor shall control dust and the spread of soils excavated. The air-spade operator shall moisten the soil to field capacity and to a minimum probe depth of 2.5 feet with a watering needle (hydro-spear) 48 hours prior to pneumatic excavation. The spread of excavated soil shall be contained to the area adjacent to the trench path with upright plywood sheeting.

4. These specifications shall not be considered operating instructions or a requirement to use a specific pneumatic excavation product. It is the responsibility of the Contractor to read and understand the pneumatic excavator operation instructions and safety procedures (including the proper and safe use of air compressor, hoses, excavation tools, etc.) prior to operations.

1.07 TREE PRUNING

1. Obtain specific instruction from Arborist / Owner's Representative for pruning of trees, shrubs, roots or disturbance of soil within spread of tree branches. The Contractor shall utilize protection measures as outlined by Arborist / Owner's Representative, which may include directional drilling, or hand clearing to expose the roots.
2. Provide periodic watering for all planting within Contract limit and any adjacent areas affected by the work. Maintain moisture to a minimum 6" depth, minimum.

3. Using an approved pruning saw, provide selective tree limb pruning as accepted by the Landscape Architect if branches interfere with new construction. Limb diameter shall be limited to 5" diameter and shall be pruned just outside the branch collar in accordance with American National Standards Institute, (ANSI 300) and International Society of Arboriculture, (ISA) standards.
4. Approved branches to be shortened must be cut just above a fork with another living branch which is plus or minus 1/2 the diameter of the removed branch as shown in the pruning figure herein. Branches to be removed which exceed 2" in diameter shall be severed with a 3-step cut to prevent bark peeling. Final cuts must not injure the branch collar or branch bark ridge of the remaining branches and trunk.

5. Prune branches that are affected by temporary and permanent construction.
   a. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
   b. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
   c. Pruning Standards: Prune trees according to ANSI A300 (Part 1)

6. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

7. Cut branches with sharp pruning instruments; do not break or chop.

8. Do not paint or apply sealants to wounds.

9. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

10. Chip removed branches and stockpile in areas approved by Architect

1.08 REGRADING

1. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

2. Lowering Grade within Protection Zone: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
   a. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots as required for root pruning.

3. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

4. Minor Fill within Protection Zone: Where existing grade is 6inches or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

1.09 FIELD QUALITY CONTROL

1. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.
1.10 TREE & PLANT REMOVAL & REPLACEMENT

1. Field Verification: Before removing non-designated trees, shrubs, stumps, bushes, vines, rubbish, undergrowth and deadwood as shown on the Drawings and as specified, obtain verification from Owner's Representative.

2. Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
   a. Submit details of proposed pruning and repairs.
   b. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
   c. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

3. Backfill and compact areas excavated and open pits and holes resulting from removal operations. Comply with requirements herein and as specified in Earthwork, Section 02300 for backfill materials, compaction and installation methods.

4. Remove all stumps and roots in their entirety. Tree trunks shall be removed minimum depth of 2 1/2 feet below existing grade or finish grade, whichever is deeper. Stump grinding is an acceptable method of removal of roots and stumps of trees and shrubs; however, the chip contaminated soil shall be replace with approved clean planting soil in planting areas and with approved clean fill soil in all other areas.

5. Backfill and compact voids excavated and open pits and holes resulting from removal operations. Comply with Earthwork Specification for backfill materials, compaction and installation methods. Unless required otherwise, in planting areas backfill holes with clean approved planting soil compacted to 90% relative compaction to a minus 12 inches below finish grade and 85% relative compaction for the top 12 inches, except as required elsewhere to a greater degree by Civil or Structural Engineer. In non-planting areas backfill holes with approved fill soil compacted to 95% relative compaction.

6. Remove and replace trees indicated to remain that are more than 25% dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

7. Plant Replacement: Contractor shall replace trees cut or severely damaged due to the Contractor’s work as follows:
   a. An ISA Certified Arborist may be retained by the Owner to determine the condition of trees in question as to their ability to survive in a healthy condition and in their original shape, or a pruned aesthetically pleasing shape acceptable to the Owner. Comply with recommendations to rehabilitate as recommended by the Arborist, or to replace in accordance with the requirements below.
   b. Trees size shall be determined by Diameter at Breast Height (DBH). Replacement of trees and shrubs shall also include providing acceptable plant installation, automatic irrigation system and a minimum maintenance period of 120 days. If plant(s) is not acceptably maintained and is not healthy and thriving at the end of the 120 day maintenance period,
the Contractor shall continue the maintenance work until such time that healthy tree(s) and/or shrub(s) is achieved.

8. Replace any damaged planting in kind using "specimen" plants as follows and at no cost to Owner:
   a. Trees up to 3" DBH: Replace with 36" box size.
   b. Trees 3" to 6" DBH: Replace with 72" box size.
   c. Trees 6" to 12" DBH: Replace with 84" box size.
   d. Trees 12" DBH and larger: Tree value shall be determined by Arborist using Council of Tree and Landscape Appraisers (CTLA) method. Replace damaged tree with largest available nursery boxed tree and cash difference between value of damaged tree and nursery stock replacement cost.
   e. Shrubs: Replace with 15-gallon can size.

9. Plant and maintain new trees as specified

10. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 3-inch uniform thickness to remain.

11. Soil Aeration: Where directed by arborist, aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch- diameter holes a minimum of 12 inches (300 mm) deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

1.11 CLEANUP AND DISPOSAL, per Section 01 70 00.

1. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

2. Clean excess soil may be distributed on site as accepted by Owner's Representative, if it does not adversely affect specified finish grades or percolation of water into planting soil.

3. Upon completion of work under this Section, remove all tools, equipment and temporary protections, enclosures and structures.

END OF SECTION
IMPORTED PLANTING SOIL

1.1 IMPORTED PLANTING SOIL (ON-GRADE):

A. Imported planting soil shall be screened and shall be free of subsoil, heavy or stiff clay, rocks, gravel, brush, roots, weeds, noxious seeds, sticks, trash, and other deleterious substances.

B. Imported Planting Soils are to conform with the following target levels. Elements are expressed as mg/kg dry soil or mg/l for saturation extract.

<table>
<thead>
<tr>
<th>Element</th>
<th>Target Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH value</td>
<td>6.5-7.9,</td>
</tr>
<tr>
<td>lime</td>
<td>none present</td>
</tr>
<tr>
<td>salinity (ECe)</td>
<td>0.5-3 milli-mho/cm</td>
</tr>
<tr>
<td>chloride</td>
<td>&lt;150 ppm</td>
</tr>
<tr>
<td>nitrate</td>
<td>20-30 ppm</td>
</tr>
<tr>
<td>SAR</td>
<td>&lt;3</td>
</tr>
<tr>
<td>phosphorus</td>
<td>8-20 mg/kg</td>
</tr>
<tr>
<td>potassium</td>
<td>60-180 mg/kg</td>
</tr>
<tr>
<td>iron</td>
<td>4-15 mg/kg</td>
</tr>
<tr>
<td>manganese</td>
<td>0.6-3.0 mg/kg</td>
</tr>
<tr>
<td>zinc</td>
<td>1-3 mg/kg</td>
</tr>
<tr>
<td>copper</td>
<td>0.2-3.0 mg/kg</td>
</tr>
<tr>
<td>boron</td>
<td>0.2-0.5 mg/kg</td>
</tr>
<tr>
<td>magnesium</td>
<td>25-100 mg/kg</td>
</tr>
<tr>
<td>sodium</td>
<td>&lt;200 mg/kg</td>
</tr>
<tr>
<td>sulfur</td>
<td>25-100 mg/kg</td>
</tr>
</tbody>
</table>

C. The silt and clay content of Imported Planting Soil shall not exceed that of the existing soil it is to be placed over. Except where otherwise required, it shall be a "Sandy Loam" as classified in accordance with USDA Standards with a combined total of between 25% to 40% Clay and Silt.

D. Submit soil analysis report from an approved soils laboratory for approval by the Landscape Architect. Refer to Part 1 for soil testing requirements.

E. Following approval of the sample, provide a one-half cubic yard sample, which shall be stored at the site of work for comparison with sample and subsequent loads of soil. The comparison sample shall be protected by a cover until the installation of all soil has been completed and accepted.

F. Planting soil for stormwater treatment shall be used in landscape areas designed for infiltration and the filtration of stormwater runoff before entering the storm drain system as specified below and as shown in drawings.

G. Planting soil mixes for stormwater treatment are available from TMT Enterprises in San Jose, CA, (408-432-9040); American Soil and Stone in Richmond, CA (510-292-3000) and San Rafael, CA (415-456-1381); and Lyngso Garden Materials in Redwood City, CA, (650-364-1730); or approved equal.

H. Planting soil for stormwater treatment shall conform to the following:
   1. All material shall be free of trash and debris, expansive clays or any other deleterious materials
   2. Material shall be free of seeds.
   3. The mineral component shall be classified as USDA sand or loamy sand and shall conform to the following particle size and characteristics.

<table>
<thead>
<tr>
<th>US Sieve</th>
<th>Size (mm)</th>
<th>Class</th>
<th>% wt. retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>#10</td>
<td>2.0</td>
<td>Gravel</td>
<td>0-10</td>
</tr>
<tr>
<td>#35</td>
<td>2.0-0.5</td>
<td>coarse sand</td>
<td>20-35</td>
</tr>
<tr>
<td>#270</td>
<td>&lt;0.05</td>
<td>Silt &amp; Clay</td>
<td>6-12</td>
</tr>
</tbody>
</table>
4. Percolation Rate must fall in the range of 10 inches per hour Initial Rate and 5 inches Sustained Rate as determined by SPL method A06-2, unless otherwise specified by civil engineer.

5. Chemistry Suitability Considerations
   - Salinity: Saturation Extract Conductivity (ECe) Less than 3.0 dS/m @ 25°C
   - Sodium: Sodium Adsorption Ratio (SAR) Less than 6.0
   - Boron: Saturation Extract Concentration Less than 1.0 ppm
   - Reaction: pH of Saturated Paste: 5.5 – 7.8 without high lime content.

   Top 6” should be amended with the approved organic composted yard waste. See Part 3 for amendment procedures.

I. Submit Soil analysis report(s) for approval by the Landscape Architect and Civil Engineer. Refer to Part 1 for soil testing requirements.

   1. **Submit soil analysis report** (including infiltration rate) for planting soil mix for stormwater treatment from an approved soils laboratory.
   
   2. **Submit subsoil analysis report** (including infiltration rate) for subsoils if planting area is designed to allow stormwater to infiltrate into native subsoils.

1.2 PREPARATION OF IMPORTED PLANTING SOIL (ON-GRADE)

   A. Uniformly distribute and spread Subsoil or select fill in planting areas to achieve rough grading and compact to a maximum of 85% relative compaction.

   B. Except within tree driplines, rip all planting areas in two directions full depth to a minimum of [12"] into undisturbed native subsoil prior to backfilling. Scarification of any planting area which cannot be accomplished with a tractor shall be accomplished by an alternative method approved by the Owner’s Representative to the specified depth to ensure proper percolation/drainage.

   C. Thoroughly water-settle subsoil to required subgrade prior to installing Top Soil.

   D. Prior to placing planting soil secure the Owner’s Representatives acceptance of the planting areas subgrade condition. Test depth of loose soil with hand shovel in presence of Owner’s Representative in several locations as directed.

   E. After acceptance of the planting areas subgrade condition, uniformly distribute and spread planting soil backfill over scarified subgrade in planting areas as specified.

   F. Mix and amend soil with required fertilizers, nutrients, etc. per specifications herein and recommendations given in soils reports.
SECTION 13312
TENSIONED FABRIC STRUCTURES

PART 1 – GENERAL

1.01 SUBMITTALS

A. Supply Engineered drawings and calculations performed by the Structure Supplier, stamped by an engineer certified in the State of California.

1.02 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the site in undamaged condition, stored in fully covered, well ventilated areas, and protected from the elements. Store materials above the ground upon platforms, pallets, skids or other supports. Keep materials free from dirt, grease and other foreign matter, and protect from corrosion. Material showing evidence of damage will be rejected. Immediately remove rejected materials from the work.

1.03 PERFORMANCE REQUIREMENTS

A. All exterior architectural membrane on the structure shall come complete with a protective exterior polyurethane top coat, and a 15 year pro-rata guarantee. The membrane will possess the following minimum quality and fire rating specifications as shown below.

<table>
<thead>
<tr>
<th>POLYURETHANE MEMBRANE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Fabric Type (Scrim)</td>
<td>Polyester</td>
</tr>
<tr>
<td>Adhesion ASTM D4431</td>
<td>20lbs (lbs/2in)</td>
</tr>
<tr>
<td>Finish Weight Method ASTM D3776</td>
<td>22oz/sq/yd +/-5%</td>
</tr>
<tr>
<td>Surface Protection</td>
<td>Acrylic Top Coat (Rain Kleen)</td>
</tr>
<tr>
<td>Tongue Tear (lbs) Method ASTM D2261</td>
<td>W175/F155lbs</td>
</tr>
<tr>
<td>Grab Tensile Method ASTM D5034</td>
<td>W450 F345lbs/in</td>
</tr>
<tr>
<td>Strip Tensile 1” FED-STD-191A Method 5102</td>
<td>W325 F245 lbs/in</td>
</tr>
<tr>
<td>Hydrostatic Resistance Burst ASTM D751/A</td>
<td>R600+ F600-</td>
</tr>
<tr>
<td>Cold Crack FED-STD-191A Method 5874</td>
<td>Pass -40° F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FIRE RATINGS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NFPA 701 Flame Spread Index &lt;25Smoke</td>
<td></td>
</tr>
<tr>
<td>2. ASTM E84 Development rating &lt;450</td>
<td></td>
</tr>
<tr>
<td>3. California State Fire Marshall</td>
<td></td>
</tr>
<tr>
<td>4. CAN/ULC-S-109</td>
<td></td>
</tr>
<tr>
<td>5. CAN/ULC-S-102</td>
<td></td>
</tr>
</tbody>
</table>
B. The individual architectural membrane panels on the center modules shall be one continuous section from one side, over the peak and down to the base at the other side and manufactured in such a way that no eave will exist.

C. In order to provide the introduction of natural light for daytime use, a continuous section of highly translucent white architectural membrane (daylight panel) shall be incorporated into the membrane along the peak of the structure. To minimize internal solar gain in the structure, the balance of the exterior architectural membrane shall be gray in color and complete with a blackout layer.

D. The structure shall be designed so that any section of architectural membrane may be removed or replaced within four hours using a maximum of four workmen.

E. The structure shall be modular in design consisting of individual membrane panels which do not exceed 15’ in width on the main center modules.

F. The architectural membrane, when assembled and tensioned, shall be absolutely wrinkle free, and shall remain so indefinitely in hot and cold temperatures.

G. The structure shall be designed to meet the wind loads as outlined IBC 2018, 115mph, exposure ‘C’, Seismic Occupancy Category IV.

H. The stressed membrane structure must be designed to shed all snow off the roof. (In accordance with the Alternative Design Section of the building code.)

I. The main structural support beams shall be continuous from the ground seal to the peak and manufactured in such a way that no eave will exist.

J. The entire roof slope of the structure, including the peak, shall have a minimum slope of 26 degrees.

K. No exterior guy ropes or cables shall be used for anchoring the structure.

L. There will be no exposed exterior horizontal purlins.

M. The structure shall be completely clear-span with no interior supports of any description.

N. Any required miscellaneous steel components such as anchor bolts, cable bracing, base assemblies or attachment brackets must be zinc plated or galvanized.

O. All bolts used shall be zinc plated or galvanized with a minimum of Grade 5 specification.

P. All personnel doors, especially fire exits, must come complete with a protective all-weather hood system to shed snow and rain away from the front of doors.

Q. All main structural arches and connecting purlins shall be 100% ALUMINUM utilizing a single I beam configuration and not to exceed 10” inches in depth.

R. The architectural membrane must not rest upon any part of the substructure and shall be installed in the aluminum frame and tensioned both vertically and horizontally to prevent wear and abrasion. Horizontal tension shall be maintained mechanically with horizontal purlins/spreaders that require no ongoing maintenance. The membrane shall be tensioned to a predetermined level of 20 pounds per lineal inch (pli) in the horizontal direction and 10 pounds per lineal inch (pli) in the vertical direction creating a tension field within the membrane.
S. All personnel doors and windows must be installed in such a way that the vertical and horizontal tension on the architectural membrane is maintained, at all times.

T. All structural aluminum components must have the following minimum structural and mechanical properties:

<table>
<thead>
<tr>
<th>Tension</th>
<th>Shear</th>
<th>Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultimate KSI</td>
<td>Yield KSI</td>
<td>Elongation %</td>
</tr>
<tr>
<td>38</td>
<td>35</td>
<td>10</td>
</tr>
</tbody>
</table>

1.04 WARRANTY

A. All aluminum used in the structure shall carry a pro-rata guarantee of not less than 50 years.

1.05 QUALITY ASSURANCE

A. Structure Supplier must be an established manufacturer with at least 10 years of experience in the design fabrication and delivery of structures with the same basic specifications as above. Structure supplier is to provide 10 examples of similar structures that have been erected. Contact names and numbers as well as physical address of the 10 sites must be submitted. (Exact same size of the structure not required; however, structure must have the same basic accessories, such as insulation system, if specified above.)

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. Basis of design manufacturer for Tensioned Fabric Structure:

1. Sprung Structures
2. Or approved equal.

2.02 MATERIALS

A. The structure must be a Stressed Membrane Structure measuring 40ft wide by 60ft long, measured maximum width by maximum length. Detailed list of required accessories as follows:

1. 1 - Bay of Additional Cable Bracing
2. 1 - Cable Tensioned Flat End Panel
3. 1 - City of Pleasanton Fire Department Graphic Logo at Entrance
4. 1 - Double Personnel Door c/w Hood (6'0"X7'0")
5. 1 - Electric Exhaust Fan 5000 CFM, Whisper Quiet - Direct Drive (110 Volt/60 Hz)
6. 1 - Engineered Flat End, c/w 1 bay of cable bracing
7. 1 - Turbo Ventilator - 24"
8. 2 - Penetration Kits (HiTemp) for non-insulated structures (Medium) 3" to 6"
9.  3 - Air Pressure Release Vents c/w Louvre and Bird Screen  
10. 6 - LED High Bay 100W, 120/277v, 50 or 60 Hz  
11. 12 - Earth Anchors  
12. 12 - Interior Suspension Eyenuts Maximum Load 75 LBS  
13. - Conduit Holes Set as per diagram provided by Sprung  
14. - Engineered Stamped Drawings

2.03 FABRICATION

A. Verify dimensions on site prior to shop fabrication.

PART 3 – EXECUTION

3.01 PREPARATION

A. Obtain Architect approval prior to installation.

3.02 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Structure Supplier is to supply all specialized hand tools required for erection of the structure to be returned to Structure Supplier upon completion of erection.

C. Structure Supplier must supply a Technical Consultant on site for the full duration of the erection of the structure to provide information about structure assembly and erection to ensure structure is erected in accordance with its engineered design. All costs for the consultants’ time, travel, meals and accommodation are to be included in the price submission.

3.03 RETURN

A. Contractor is responsible for return freight of the Structure to the Structure Supplier at the end of lease. A technical consultant will be required onsite during dismantle of structure.

END OF SECTION
SECTION 15410

ABOVEGROUND FUEL OIL STORAGE TANK AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Provide an integrated fuel system. The specification requires the detailed system design, equipment, installation, startup, and training to be the responsibility of a single specialized fuel system supplier. The specification section includes responsibility for mechanical, electrical, and control systems.

B. Provide complete, in place fuel storage system as indicated on the Drawings and specified herein, including, but not necessarily limited to:

1. Fuel distribution pipe, valves and fittings.
2. Protected class bulk storage tank.
3. Fuel transfer and control – supply and return transfer system with associated PLC controls.
4. Leak monitoring.
5. Fuel system control wiring.
6. Startup of equipment by factory certified technicians.
7. All required permits, certifications, and inspection.

1.02 Related Documents

A. Division 01 – General Requirements
B. Division 03 – Concrete
C. Division 15 - Mechanical
D. Division 16 - Electrical

1.03 SUBMITTALS

A. Provide manufacturer’s published data and product characteristics as indicated on the Drawings and as specified.

B. Submit with shop Drawings a list that indicates use, operating range, total range and location.

C. Product Data: Submit manufacturer’s product literature including, material specifications and other information required demonstrating compliance with specified requirements for following items:
1. Bulk storage tank, UL 2085 listed.
2. UL 508 PLC based control panel.
3. Leak Detectors.
4. Ball valves, check valves.
5. Flow restrictors.
8. Supply pump.
9. Pre-assembled Modular vertical mount Return pump.

D. Shop Drawings: Submit AutoCAD tank shop Drawings for approval showing locations of all fittings, valves, devices, accessories, electrical diagrams and critical dimensions. Provide a piping and instrument diagram for the system including a complete bill of material/ equipment list.

E. Signage Plan: Submit a signage plan indicating locations and sizes of all signage to comply with code and satisfy the local Fire Marshal.

F. Shop Drawings: Indicate system layout, pipe sizes, location of supports, elevations, and equipment mounting details. For fuel tank, indicate dimensions, vent sizes and location of all accessories including fill pipe, manways, tank supports, inventory sensor, and leak sensors.

G. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalog information for all equipment.

H. Electrical System Design: Provide Drawings and specifications that include the proposed conduit layout and wiring diagrams for equipment covered in this section that requires electrical connections. Indicate conduit size and material, number and size of wires, location of wiring in classified areas and location of intrinsically safe circuits and conduits.

I. Control System Design: Provide control system designs including electrical schematics, panel physical, and field wiring diagrams.

J. Structural Design: Provide Drawings for support and anchorage of remote fill panel and remote fill control panel. Piping shall be seismically supported. Provide a PE stamped seismic support design.

K. Calculations: Provide calculations for pump selection, pipe sizes, and pipe support requirements.

L. Permit Applications: Provide copies of all permit applications.

M. Factory Installer Certifications: Provide copies of factory-trained installer certificates for all products, controls, leak detection, piping, tanks, boots.
1.04 PROJECT RECORD DOCUMENTS

A. Record and submit actual location of piping system, wiring, conduit runs and system components. Include as-built wiring details and copies of programs residing in any control panels.

1.05 OPERATION AND MAINTENANCE

A. Operation Data: Include installation instructions and exploded assembly views.

B. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.06 Regulatory Requirements

A. Equipment and installation necessary to accomplish the work specified herein shall comply with the latest revisions of the applicable federal, state, and local codes and regulations concerning underground or aboveground fuel storage and dispensing systems including but not limited to the following:


2. National Electric Code (NEC), Article 513

3. ASME B31.9 Building Services Piping

4. API 2000 Venting atmospheric and Low Pressure Storage Tanks

5. NFPA 30 Flammable and Combustible Liquids Code

6. NFPA 70 National Electric Code


8. Uniform Fire Code: Article 52, Article 79 and Appendix II-F

9. California Fire Code

10. Local Requirements

B. All work specified herein shall conform to or exceed the requirements of the above referenced with the requirements, codes, regulations and standards specified herein. Whenever the provisions of said publications are in conflict, the more stringent requirement shall apply.

1.07 Quality Assurance

A. Materials, Installation and Workmanship:
1. Except as modified by governing codes, comply with the applicable provisions of the following:


   c. Comply with NFPA-70 “National Electric Code” for equipment, wiring, and conduit installed under this section. Bulk tank shall be grounded.

   d. All control panels on the project shall bear the UL 508 label.

   e. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.

   f. Contractors must be licensed to install tank systems. Contractor must have a record of at least 5 installations of similar size, scope and technical complexity. Fuel Oil Systems is a pre-approved contractor meeting all of these requirements.

   g. Contractor must provide evidence (certificate of insurance) of $2 million pollution liability policy. The nature of this specialized trade drives the requirement for this policy.

   h. Contractor must be a factory trained and certified installer for each product or piece of equipment. The contractor must submit the factory training certifications with the fuel system submittal.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Contractor personnel must be factory certified by each of the manufacturer’s products being applied to the project. These product certifications are to be included in the submittals.

PART 2 - PRODUCTS

2.01 Acceptable Manufacturers

   A. Bulk storage tank, UL 2085 listed: Tiger Tanks, Modern Welding, Mission Critical Controls

   B. UL 508 listed PLC controls: Mission Critical Controls (MCC), Fuel Oil Systems

   C. Supply pump: Mission Critical Controls (MCC), Viking, Tuthill

   D. Pre-assembled Modular Vertical Return Pump: Mission Critical Controls (MCC), Fuel Oil Systems
E. Leak detectors: Mission Critical Controls, Gems, Fuel Oil Systems
F. Ball and Check Valves: Jomar, Nibco, Watts
G. Pressure Relief Valves: McDaniel, Watts
H. Float Switches: Mission Critical Controls, Fuel Oil Systems
I. Sight Flow Gauges: McMaster Carr, OPW, Mission Critical Controls
J. Vent Caps: Fuel Oil Systems, Mission Critical Controls, Morrison Brothers
K. Double Contained Piping: Brugg Flexwell with stainless steel secondary pipe
L. UL 508 listed control panel: Mission Critical Controls (MCC), Fuel Oil Systems
M. Flow restrictor: WA Kates

2.02 ABOVEGROUND BULK FUEL STORAGE TANK

A. General:

1. Provide and install an aboveground fuel tank system complete with tank, piping, gauges, and other accessories specified herein to be part of a fully assembled system.

B. Storage Tank:

C. Manufacturers: Tiger Tanks, Modern Welding, Containment Solutions

1. Tank Characteristics:
   a. Double Wall
   b. UL 142 listed.
   c. UL 2085 listed.

2. Product Storage:
   a. Tank shall be capable of storing petroleum with specific gravity up to 1.1.
   b. Tank shall be individually vented to atmospheric pressure. The tank is not designed as a pressure vessel.
   c. Tank shall be capable of storing gasoline or diesel fuel at temperatures not to exceed 150 degrees F.

3. Tank Design Criteria:
a. Tanks shall be welded steel and epoxy painted meeting the requirements of UL 142 and UL 2085. Tanks shall be protected class tanks under the Uniform Fire Code. Tanks shall have the thermal insulation capabilities specified under UL 2085. Tank shall be compliant with all OSHPD requirements and stamped calculations shall be submitted to demonstrate compliance.

b. Tanks shall be designed to pass an on-site pressure test of 5 psi in accordance with UL standards.

c. Tanks shall be capable of supporting:

1). Tank shall support accessory equipment according to tank manufacturer’s recommendations and limitations.

2). Chemical Resistance: Manufacture tank with materials chemically inert to petroleum products and capable of storing petroleum products with specific gravity up to 1.1. EPA approved fuels at ambient temperatures limited to gasoline, gasohol, 100 percent ethanol or ethanol/gasoline blends, 100 percent methanol or methanol/gasoline blends, MTBE additive with gasoline, jet fuel, AV-gas, kerosene, diesel fuel, 85 percent sodium hypochlorite, oil with or without tank water bottoms, or #6 fuel oil F.90.5 percent gasoline and 9.5 percent Oxinol-50 (4.75 percent methanol and 4.75 percent GTBA mixture); Dupont EPA waiver (gasoline with 5 percent methanol and minimum of 2.5 percent cosolvent - which may contain a maximum concentration of up to 3.7 weight percent oxygen in final fuel blend); MTBE (methyl tertiary butyl ether) - gasoline with up to 20 percent by volume of MTBE; at temperatures not to exceed 180 degrees F.

d. Support of Accessory Equipment: Construct tank to support specified accessory equipment such as heating coils; drop tubes, submersible pumps, and ladders.

e. Annular Space: Provide space between primary and secondary tank shell walls to allow for free flow and containment of any leaked product from primary tank. Include monitoring fitting and space between tank shell walls to allow insertion of product monitoring device.

f. Manways (where applicable): Flanged, 22-inch I.D. complete with gaskets, bolts, and covers.

g. Anti-slosh baffles shall be part of the assembly.

h. Tank top sumps. Furnish tank with secondary containment sumps. Seal pipe and conduit entries with UV resistant flexible entry boots.

i. Tanks top sumps shall be leak detected.

j. Furnish aluminum “shoe box” style sump lids for ease of maintenance.

k. Gauge Plates: Install steel plates installed under each service fitting and manway opening.
l. Furnish at least 4 spare fittings beyond those required for the base installation. Provide and install blind flanges as required.

m. Fitting Size: 4-inch diameter, NPT, half couplings at tank openings with reducers for smaller sizes where required.

n. Monitor Fittings: Provide one fitting on secondary tank near one end of tank.

o. Emergency vent caps. Furnish tank with emergency vent caps sized as per the tank manufacturer.

D. Tank Identification:

1. Provide stencil, label or plate on exterior of tank which includes the following:
   a. Name of manufacturer
   b. Description of standard of design by which tank was manufactured
   c. Year in which tank was manufactured
   d. Unique manufacturer’s identification number
   e. Dimensions, model number of tank, design and working capacity
   f. Venting capacities

E. Factory Testing Requirements (to confirm tank tightness and strength):

1. Internal Load: Test primary and secondary tanks to withstand 5 psi maximum air pressure.

2. Test: Every tank shall be pressure tested by the tank manufacturer to assure structural integrity. Tank shall be tested to meet minimum requirements of U.L. Standard, U.L.-142.

F. Suction and Return Tubes: Schedule 40 black steel and field installed by Contractor to within 6 inches of tank bottom; fit into flange with location as shown on Drawing.

G. Environmental Protection:

1. Gauge plates shall be installed under each tank fitting.

2. Tank shall have one monitor fitting penetrating outer wall.

3. Tanks shall have a space between the primary and secondary shell walls to allow for the free flow and containment of leaked product from the primary tank.

2.03 ABOVEGROUND STORAGE TANK ACCESSORY EQUIPMENT
A. Product Label: NFPA required stickers and "no smoking signs" for product being stored.

B. Overfill prevention valve: Provide as specified, complete with spill bucket or remote fill panel.

C. Atmospheric Vent:
   1. Diesel or Fuel Oil:
      a. Provide an upward flow vent cap with a flame retardant 40-mesh screen. Vent should be installed a minimum 12 feet above grade as shown on project Drawings – mushroom style by Mission Critical Controls or equal.
      b. Provide emergency vent caps as per tank manufacturer recommendation.

2.04 FUEL DISTRIBUTION PIPE AND PIPE FITTINGS, ABOVEGROUND

A. General:
   1. Provide and install Brugg double contained 316L stainless steel piping aboveground as indicated on the Drawings

B. Design Criteria:
   1. Double Contained Stainless Steel Fuel Pipe: 316L stainless primary within 316L stainless steel secondary with scuff guard.
   2. Fittings: Brugg Stainless Steel, closed end style.
   4. Unions: Malleable iron threaded unions. Threaded joints are to be kept to a minimum and shall be applied only where there is secondary containment.
   5. Ball Valves: Bronze three-piece or one piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle and balancing stops, threaded or flanged end.

2.05 SUPPLY AND RETURN TRANSFER PUMP CONTROL PANEL

A. Provide and install an UL 508 listed PLC control panel, programming and testing.

B. The PLC shall monitor leak detectors in addition to providing automatic control of the supply and return pumps. Hard wired high limit contacts shall be wired to stop the return pump upon a bulk tank high level. Hard wired high limit contacts shall be wired to stop the supply pump upon a high level in the belly tank.

C. Provide (ship loose and field install), single float switch for bulk tank high level safety.

D. Integral to the control panel, furnish status lights as shown on drawings.
E. Control panel shall be furnished with HOA switches for the supply pump and return pump. HOA switch positions shall be monitored by the PLC and alarm when not in the auto position. Control panel shall be furnished with motor starters with adjustable thermal overloads. HOA switch positions shall be monitored and alarm when in the off position.

F. Control Panel Design Criteria:

   a. Enclosure: Nema 4, welded steel enclosure with a liquid tight base. Cabinet interior shall be primed and finished in a chemical resistant enamel. Cabinet exterior shall be primed and finished in durable chemical resistant, textured gray enamel, suitable for industrial environments. Black phenolic labels with engraved white lettering shall identify all cabinet front devices.

   b. Programmable Logic Controller: PLC shall be modular in nature and shall be capable of expansion through expansion cards or modules.

   c. Control panel shall have a control power on/off light and power on/off switch. Control panel shall have an explosion proof horn mounted on its side.

   d. Electronics: All cabinet wiring shall be run in NEMA approved covered wireways (2 inch wide minimum) and terminate at a numbered terminal strip to facilitate field connections to remote equipment. All wires shall be tagged with Brady shrink wire number labels. No fuses shall be allowed. All control circuits shall have micro, manually reset, circuit breakers (1, 3, 5 amp). Fuel oil pump motor starters with overload protection shall be multi-pole, 120-volt coil, NEMA sized to match the pump motors. Three pole circuit breakers shall have a 10,000-ampere interrupting capacity.

   e. System Functions:

      1). Leak Monitoring: Leak detection sensors shall be provided for installation in each containment area and as indicated on Drawings. The sensor shall set off an audible and visual alarm on the control panel and the control panel shall alarm to the BMS via Modbus or dry contact. Leak detectors shall be installed as shown on the Drawings.

      2). Pump/Level Control: The system will automatically control the belly tank level. Level control shall be decoupled from generator operation.

   f. Quality Assurance:

      1). Installation shall be in strict accordance with manufacturer's instructions. Manufacturer shall supply factory start up and calibration to be executed as needed during installation for the complete Fuel Oil Handling System, and after installation to train Owner's personnel. The Installing Contractor shall not waive this requirement.

      2). Electrical components shall be functionally tested with all Tank functions and controls. A certificate of factory testing, together with a copy of the wiring diagram shall be placed in the control cabinet prior to shipment.
2.06 ACCESSORIES

A. Description:

1. Spill Bucket: 4-inch size fill box and spill container with 5 gallon liquid capacity, quick opening cover, high speed internal drain, inner cap and thread-on riser connection (Model 1C-2100). Tanks with integral containment sump with at least 5 gallon capacity and lid may not require a spill bucket.

2. Foot Valve: line size single poppet type with cast iron body, replaceable bronze seats and 20 mesh screen.

3. Vent Head: 2-inch size, vertical type aluminum body with brass screen.

4. Overfill Prevention Valve: Shut-off valve with lower drop tubes (Model #61fstop).

5. Dispenser pump: Fill-Rite FR702V

B. Antisiphon Valve: Magnatrol line size solenoid or OPW 199ASV.

2.07 SPILL KIT

A. Provide a spill kit contained in 1 barrel.

B. Barrel one of the spill kit shall contain a 20 pound bag of particulate absorbent, 2 packages of absorbent "socks" 12 feet long and 100 absorbent pads. Barrel shall be plainly labeled and shall be easily accessible.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions (by Installer): Examine conditions under which work is to be installed and notify Prime Contractor in writing of any conditions detrimental to proper and timely installation. Do not proceed with installation until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PREPARATION

A. Regulatory Approvals:

   1. Documents submitted to jurisdictional authorities.

   2. This Contractor is responsible for obtaining permit for construction and for paying all fees and costs for all permits.

3.03 INSTALLATION

A. Provide labor and materials for a complete installation as shown on Drawings.
B. Coordinate with Owner's Representative and local authority having jurisdiction to allow witnessing of all aspects of installation and testing.

C. Comply with manufacturer’s printed instructions and recommendations for tank installation in addition to requirements listed in “Quality Assurance” article in Part 1 above.

3.04 FUEL CONTROL SYSTEM

A. Provide and install control panel.

B. Route wiring and cables in conduit.

C. Provide fuel system control wiring from tank monitoring panel, including wiring between panel and remote sensors and alarm panel. All wiring shall be installed in conduit. Wiring shall be continuous with no splices and shall be labeled.

D. Install separate conduits for line and low voltage wiring.

E. Provide permanently mounted fill instructions inside the door of the remote fill panel.

3.05 PIPING INSTALLATION

A. Install in accordance with the manufacturer’s instructions and PEI/RP200.

B. Inspect all materials for signs of damage and confirm compliance with specifications.

C. Avoid damage to piping materials or coatings during handling, installation and testing.

D. Provide non-conducting dielectric connections wherever joining dissimilar metals. Install to NACE RP-01-69.

E. Slope fuel oil and diesel oil piping no less than 1-inch per ten feet.

F. Provide adequate support for piping on 10 foot centers minimum.

G. Group piping whenever practical at common elevations.

H. Install piping to allow for expansion and contraction so that pipe, joints, or connected equipment will not be stressed.

I. Provide clearance for access to valves and fittings.

J. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of the completed system.

K. Install unions, couplings, valves, and flexible connectors in accordance with manufacturer’s recommendations.

L. Provide spill pans and spill pan calculations where required by the fire department.
M. Where required by the Local Authority Having Jurisdiction, provide an SPCC plan.

N. Pressure test all piping as per NFPA 30.

O. Label all piping for fuel oil service. Provide and install NFPA diamond on bulk storage tank.

P. Provide and install “no smoking” and “diesel fuel” signs on tank and generator doors.

3.06 ELECTRICAL SYSTEM

A. Indicate required power from branch circuit panel board and feeder from main distribution panel. Control Panel to be equipped with means of disconnecting all fueling system circuits per NFPA 70-514.

B. Design branch circuit conduit and wiring for equipment installed in this section. All wiring shall be designed and installed in strict accordance with NFPA 70. Division 16 contractor shall furnish line voltage power.

C. Provide detailed AutoCAD as-built diagrams of the fuel system control wiring, including wire colors and numbers to aid in future troubleshooting of the system.

3.07 FIELD QUALITY CONTROL

A. Test fuel distribution system according to NFPA 30.

B. Replace leaking joints and connections with new materials.

C. Ensure all test reports are in form satisfactory to local governing authorities.

D. Final Installation Inspection:
   1. Contact local governing authorities of installation completion and make arrangements for final inspection by local governing authorities consisting of following:
      a. Testing alarm systems for proper functions.
   2. Perform all corrections identified by local governing authorities during final inspection and notify local governing authorities when any corrective work is scheduled to be completed to allow re-inspection by local governing authorities to confirm corrective work and complete installation is satisfactory.

E. Test and adjust fuel management and leak monitoring systems controls and devices. Replace damaged and malfunctioning controls and devices.

F. Submit reports of test and procedures in writing to the Engineer.

3.08 DEMONSTRATION
A. Train Owner’s maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance. Training for 2 shifts, 2 hours each shall be provided.

B. Representatives of equipment suppliers for the leak monitoring system shall provide necessary training and technical support to the Owner, so that the Owner may properly operate and maintain the systems.

C. Provide a hardcopy training binder for each participant.

END OF SECTION
SECTION 16720
DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
7. Magnetic door holders.
10. Digital alarm communicator transmitter.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product, including furnished options and accessories.

B. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery-size calculations.
7. Include input/output matrix.
8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.

   a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
   b. Show field wiring required for HVAC unit shutdown on alarm.
   c. Locate detectors according to manufacturer's written recommendations.
12. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
   a. Trained and certified by manufacturer in fire-alarm system design.
   b. NICET-certified, fire-alarm technician; Level III minimum.
   c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For notification appliances and smoke and heat detectors, in addition to submittals listed above, indicate compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each notification appliance and smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the device.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72. Calculate spacing and intensities for strobe signals and sound-pressure levels for audible appliances.
3. Indicate audible appliances required to produce square wave signal per NFPA 72.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

C. Field quality-control reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
   a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
   b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
   c. Complete wiring diagrams showing connections between all devices and equipment.
d. Riser diagram.
e. Record copy of site-specific software.
f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

g. Manufacturer's required maintenance related to system warranty requirements.
h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.

C. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

E. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FM Global-approved alarm company.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.

1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
2. Warranty Period: Five years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation.

C. Automatic sensitivity control of certain smoke detectors.

D. All components provided shall be listed for use with the selected system.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. All electrical components, devices and accessories part of the listed and labeled system shall be of the same manufacturer.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Carbon monoxide detectors.
6. Automatic sprinkler system water flow.
7. Fire-extinguishing system operation.
8. Fire standpipe system.
9. Dry system pressure flow switch.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
8. Activate preaction system.
9. Recall elevators to primary or alternate recall floors.
10. Activate elevator power shunt trip.
11. Activate emergency lighting control.
13. Record events in the system memory.
C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
3. Elevator shunt-trip supervision.
4. Loss of communication with any panel on the network.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of communication with any addressable sensor, input module, relay, control module, or remote annunciator.
4. Loss of primary power at fire-alarm control unit.
5. Ground or a single break in internal circuits of fire-alarm control unit.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Supervisory Signal Actions:

1. Initiate notification appliances.
2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
3. After a time delay of 200 seconds, transmit a trouble or supervisory signal to the remote alarm receiving station.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 FIRE-ALARM CONTROL UNIT

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Fire-Lite Alarms, Inc.; a Honeywell International company.
2. GE UTC Fire & Security; A United Technologies Company.
4. SimplexGrinnell LP.

B. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.

3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.

C. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

   1. Annunciator and Display: Liquid-crystal type, 80 characters, minimum.
   2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

D. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

   1. Pathway Class Designations: NFPA 72, Class B.
   2. Pathway Survivability: Level 0.

E. Notification-Appliance Circuit:

   1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
   2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
   3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.

F. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke-barrier walls shall be connected to fire-alarm system.

G. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory.

H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

I. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters and digital alarm radio transmitters shall be powered by 24-V dc source.

   1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

J. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
2.5 MANUAL FIRE-ALARM BOXES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Fire-Lite Alarms, Inc.; a Honeywell International company.
2. GE UTC Fire & Security; A United Technologies Company.
4. SimplexGrinnell LP.


1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Fire-Lite Alarms, Inc.; a Honeywell International company.
2. GE UTC Fire & Security; A United Technologies Company.
4. SimplexGrinnell LP.

B. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type, indicating detector has operated.
7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

   a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
   b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
   c. Multiple levels of detection sensitivity for each sensor.
   d. Sensitivity levels based on time of day.

C. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

D. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

E. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.

4. Each sensor shall have multiple levels of detection sensitivity.

5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.


2.7 CARBON MONOXIDE DETECTORS

A. General: Carbon monoxide detector listed for connection to fire-alarm system.

1. Mounting: Adapter plate for outlet box mounting.

2. Testable by introducing test carbon monoxide into the sensing cell.

3. Detector shall provide alarm contacts and trouble contacts.
4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
5. Detector shall have low power LED visual indicator for normal and alarm conditions.
6. Comply with UL 2075.
7. Locate, mount, and wire according to manufacturer's written instructions.
8. Provide means for addressable connection to fire-alarm system.
9. Test button simulates an alarm condition.

2.8 NONSYSTEM SMOKE DETECTORS

A. General Requirements for Nonsystem Smoke Detectors:

1. Nonsystem smoke detectors shall be listed as compatible with the fire-alarm equipment installed or shall have a contact closure interface listed for the connected load.
2. Nonsystem smoke detectors shall meet the monitoring for integrity requirements in NFPA 72.

B. Single-Station Smoke Detectors:

1. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
2. Auxiliary Relays: One Form C, rated at 0.5 A.
3. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at 10 feet (3 m) according to UL 464.
5. Heat sensor, 135 deg F (57 deg C) fixed temperature.
6. Test Switch: Push to test; simulates smoke at rated obscuration.
7. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
8. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
9. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
10. Integral Visual-Indicating Light: LED type, indicating detector has operated.

C. Single-Station Duct Smoke Detectors:

1. Comply with UL 268A; operating at 120-V ac.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.
   a. Detector Sensitivity: Smoke obscuration between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) when tested according to UL 268A.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. The fixed base shall be designed for mounting directly to air duct. Provide terminals in the fixed base for connection to building wiring.
   a. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; listed for use with the supplied detector.
4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.9 HEAT DETECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Fire-Lite Alarms, Inc.; a Honeywell International company.
   2. GE UTC Fire & Security; A United Technologies Company.
   4. SimplexGrinnell LP.

B. General Requirements for Heat Detectors: Comply with UL 521.
   1. Temperature sensors shall test for and communicate the sensitivity range of the device.

C. Heat Detector, Combination Type: Actuated by either a fixed temperature or a rate of rise.
   1. Mounting: Adapter plate for outlet box mounting or Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature.
   1. Mounting: Adapter plate for outlet box mounting or Twist-lock base interchangeable with smoke-detector bases.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.10 NOTIFICATION APPLIANCES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   2. GE UTC Fire & Security; A United Technologies Company.
   4. SimplexGrinnell LP.

B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
   1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

C. Chimes: Vibrating type.
D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.

E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

   1. Mounting: Wall mounted unless otherwise indicated.
   2. Flashing shall be in a temporal pattern, synchronized with other units.

2.11 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

   1. Electromagnets: Require no more than 3 W to develop 25-lbf (111-N) holding force.
   2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
   3. Rating: 24-V ac or dc.
   4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.12 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

   1. Mounting: Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.13 ADDRESSABLE INTERFACE DEVICE

A. General:

   1. Include address-setting means on the module.
   2. Store an internal identifying code for control panel use to identify the module type.
   3. Listed for controlling HVAC fan motor controllers.

B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.

C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall where applicable and to circuit-breaker shunt trip for power shutdown.

   1. Allow the control panel to switch the relay contacts on command.
2. Have a minimum of two normally open and two normally closed contacts available for field wiring.

D. Control Module:

1. Operate notification devices.
2. Operate solenoids for use in sprinkler service.

2.14 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply.
5. Loss of power.
6. Low battery.
7. Abnormal test signal.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.
PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

C. Equipment Mounting: Install fire-alarm control unit on finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

D. Install wall-mounted equipment, with tops of cabinets not more than 78 inches (1980 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in the normal path of egress within 60 inches (1520 mm) of the exit doorway.
3. The operable part of manual fire-alarm box shall be between 42 inches (1060 mm) and 48 inches (1220 mm) above floor level. All devices shall be mounted at the same height unless otherwise indicated.

F. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.

G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches (9100 mm) long shall be supported at both ends.

H. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

I. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

J. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling. Install all devices at the same height unless otherwise indicated.
L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 PATHWAYS
A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.
   1. Exposed pathways located less than 96 inches (2440 mm) above the floor shall be installed in EMT.
B. Pathways shall be installed in EMT.
C. Exposed EMT shall be painted red enamel.

3.3 CONNECTIONS
A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
   1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches (910 mm) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
   1. Smoke dampers in air ducts of designated HVAC duct systems.
   2. Magnetically held-open doors.
   3. Electronically locked doors and access gates.
   4. Alarm-initiating connection to elevator recall system and components.
   5. Alarm-initiating connection to activate emergency lighting control.
   6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
   7. Supervisory connections at valve supervisory switches.
   8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
  10. Supervisory connections at fire-extinguisher locations.

3.4 IDENTIFICATION
A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING
A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Visual Inspection: Conduct visual inspection prior to testing.
   a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter.
   b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.


3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

4. Test audible appliances for the private operating mode according to manufacturer's written instructions.

5. Test visible appliances for the public operating mode according to manufacturer's written instructions.

6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.8 DEMONSTRATION

A. Train Owner’s maintenance personnel to adjust, operate, and maintain fire-alarm system.
SECTION 16840
ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Card readers, credential cards, and keypads
   2. Biometric identity-verification equipment
   3. Cables
   4. Transformers
   5. Master Control Panel
   6. Access Control Panel

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Diagrams for cable management system.
   2. System labeling schedules, including electronic copy of labeling schedules that are part of the cable and asset identification system of the software specified in Parts 2 and 3.
   3. Wiring Diagrams. For power, signal, and control wiring. Show typical wiring schematics including the following:
      a. Workstation outlets, jacks, and jack assemblies.
      b. Patch cords.
      c. Patch panels.
   5. Battery and charger calculations for central station, workstations, and controllers.

C. Product Schedules.

D. Samples: For workstation outlets, jacks, jack assemblies, and faceplates. For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.
1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Credential card blanks, ready for printing. Include enough credential cards for all personnel to be enrolled at the site plus an extra 50 percent for future use.
2. Fuses of all kinds, power and electronic, equal to 10 percent of amount installed for each size used, but no fewer than three units.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Cable installer must have on staff an RCDD certified by Building Industry Consulting Service International.

B. Source Limitations: Obtain central station, workstations, controllers, Identifier readers, and all software through one source from single manufacturer.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
2. Indoor, Controlled Environment: NEMA 250, Type 1 enclosure. System components, except the central-station control unit, installed in temperature-controlled indoor environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
3. Indoor, Uncontrolled Environment: NEMA 250, Type 3R enclosures. System components installed in non-temperature-controlled indoor environments shall be rated for continuous operation in ambient conditions of 0 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.
4. Outdoor Environment: NEMA 250, NEMA 250, Type 4X enclosures. System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of minus 30 to plus 122 deg F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 85 mph.
5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
6. Corrosive Environment: For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250, Type 4X enclosures.
PART 2 - PRODUCTS

2.1 OPERATION
A. Security access system hardware shall use a single database for access-control and credential-creation functions.

2.2 PERFORMANCE REQUIREMENTS
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with NFPA 70, "National Electrical Code."
C. Comply with SIA DC-01 and SIA DC-03 and SIA DC-07.
D. Comply with City of Pleasanton Security Standard.
   1. DSC (Kantech/Tyco) Network compatible system.

2.3 MASTER CONTROL UNIT
A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Digital Security Controls Ltd.
      a. MAXSYS PC4020 with network card.

2.4 ACCESS CONTROL PANELS
A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Digital Security Controls Ltd.
      a. MAXSYS PC4820 with network card.

2.5 CARD READERS, CREDENTIAL CARDS, AND KEYPADS
A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include:
   1. Digital Security Controls Ltd.
B. Card Readers:
   1. Card-Reader Power: Powered from its associated controller, including its standby power source, and shall not dissipate more than 5 W.
   2. Response Time: Card reader shall respond to passage requests by generating a signal that is sent to the controller. Response time shall be 800 ms or less, from the time the card reader finishes reading the credential card until a response signal is generated.
3. **Enclosure:** Suitable for surface, semi-flush, pedestal, or weatherproof mounting. Mounting types shall additionally be suitable for installation in the following locations:

   a. Indoors, controlled environment.
   b. Indoors, uncontrolled environment.
   c. Outdoors, with built-in heaters or other cold-weather equipment to extend the operating temperature range as needed for operation at the site.

4. **Display:** Digital visual indicator shall provide visible and audible status indications and user prompts. Indicate power on or off, whether user passage requests have been accepted or rejected, and whether the door is locked or unlocked.

5. **Touch-Plate and Proximity Readers:**

   a. Active-detection proximity card readers shall provide power to compatible credential cards through magnetic induction, and shall receive and decode a unique identification code number transmitted from the credential card.
   b. Passive-detection proximity card readers shall use a swept-frequency, RF field generator to read the resonant frequencies of tuned circuits laminated into compatible credential cards. The resonant frequencies read shall constitute a unique identification code number.
   c. The card reader shall read proximity cards in a range from direct contact to at least 6 inches from the reader.

C. **Keypads:**

   1. Entry-control keypads shall use a unique combination of alphanumeric and other symbols as an Identifier.
   2. Keypads shall contain an integral alphanumeric/special symbols keyboard with symbols arranged in ascending ASCII-code ordinal sequence.
   3. Communication protocol shall be compatible with the local processor.
   4. **Keypad Display:**

      a. Keypads shall include a digital visual indicator and shall provide visible and audible status indications and user prompts.

         1) Display shall indicate power on or off and whether user passage requests have been accepted or rejected.

      b. Design of the keypad display or keypad enclosure shall limit viewing angles of the keypad as follows:

         1) Maximum Horizontal Viewing Angle: Plus or minus 5 degrees or less off a vertical plane perpendicular to the plane of the face of the keypad display.
         2) Maximum Vertical Viewing Angle: Plus or minus 15 degrees or less off a horizontal plane perpendicular to the plane of the face of the keypad display.

   5. **Keypad Response Time:**

      a. The keypad shall respond to passage requests by generating a signal to the local processor. The response time shall be 800 ms or less from the time the last alphanumeric symbol is entered until a response signal is generated.

   6. **Keypad Power:**
a. The keypad shall be powered from the source as shown and shall not dissipate more than 150 W.

7. Keypad Mounting Method:
   a. Keypads shall be suitable for surface, semi-flush, pedestal, or weatherproof mounting as required.

8. Keypad Duress Codes:
   a. Keypads shall provide a means for users to indicate a duress situation by entering a special code.

D. Credential Cards:
   1. Modification: Entry-control cards shall be able to be modified by lamination direct print process during the enrollment process without reduction of readability. The design of the credential cards shall allow for the addition of at least one slot or hole to accommodate the attachment of a clip for affixing the credential card to the badge holder used at the site.
   2. Card Size and Dimensional Stability: Credential cards shall be 2-1/8 by 3-3/8 inches. The credential card material shall be dimensionally stable so that an undamaged card with deformations resulting from normal use shall be readable by the card reader.
   4. Card Construction:
      a. Core and laminate or monolithic construction.
      b. Lettering, logos, and other markings shall be hot stamped into the credential material or direct printed.
      c. Incorporate holographic images as a security enhancement.
      d. Furnish equipment for on-site assembly and lamination of credential cards.

2.6 PUSH-BUTTON SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. DSC (Kantech/Tyco).

B. Push-Button Switches: Momentary-contact back-lighted push buttons with stainless steel switch enclosures.

C. Electrical Ratings:
   1. Minimum continuous current rating of 10 A at 120-V ac or 5 A at 240-V ac.
   2. Contacts that will make 720 VA at 60 A and that will break at 720 VA at 10 A.

D. Enclosures: Flush or surface mounting. Push buttons shall be suitable for flush mounting in the switch enclosures.

E. Enclosures shall additionally be suitable for installation in the following locations:
   1. Indoors, controlled environment.
2. Indoors, uncontrolled environment.
3. Outdoors.

F. Power: Push-button switches shall be powered from their associated controller, using dc control.

2.7 CABLES

A. General Cable Requirements: Comply with requirements in Section 26519 "Low-Voltage Electrical Power Conductors and Cables" and as recommended by system manufacturer for integration requirement.

B. PVC-Jacketed, TIA 232-F.
   1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
   2. Polypropylene insulation.
   3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
   4. PVC jacket.
   5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.

C. Plenum-Rated TIA 232-F Cables:
   1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
   2. PE insulation.
   3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
   4. Fluorinated ethylene propylene jacket.
   5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.

D. PVC-Jacketed, TIA 485-A Cables:
   1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
   2. PVC insulation.
   3. Unshielded.
   4. PVC jacket.
   5. NFPA 70 Type: Type CM or Type CMG.

E. Plenum-Rated TIA 485-A Cables:
   1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
   2. Fluorinated ethylene propylene insulation.
   3. Unshielded.
   4. Fluorinated ethylene propylene jacket.
   5. NFPA 70 Type: Type CMP

F. Multiconductor, PVC, Reader and Keypad Cables:
   1. No. 22 AWG, paired and twisted multiple conductors, stranded (7x30) tinned copper conductors, semirigid PVC insulation, overall aluminum-foil/polyester-tape shield with 100
percent shield coverage, plus tinned copper braid shield with 65 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CMG.
4. For TIA 232-F applications.

G. Paired, PVC, Reader and Keypad Cables:
1. Three pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors, polypropylene insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.

H. Paired, PVC, Reader and Keypad Cables:
1. Three pairs, twisted, No. 20 AWG, stranded (7x28) tinned copper conductors, polyethylene (polyolefin) insulation, individual aluminum-foil/polyester-tape shielded pairs each with No. 22 AWG, stranded (19x34) tinned copper drain wire, 100 percent shield coverage, and PVC jacket.
2. NFPA 70, Type CM.

I. Paired, Plenum-Type, Reader:
1. Three pairs, No. 22 AWG, stranded (7x30) tinned copper conductors, plastic insulation, individual aluminum-foil/polypropylene-tape shielded pairs each with No. 22 AWG, stranded tinned copper drain wire, 100 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.

J. Multiconductor, Plenum-Type, Reader:
1. Six conductors, No. 20 AWG, stranded (7x28) tinned copper conductors, fluorinated-ethylene-propylene insulation, overall aluminum-foil/polyester-tape shield with 100 percent shield coverage plus tinned copper braid shield with 85 percent shield coverage, and fluorinated-ethylene-propylene jacket.
2. NFPA 70, Type CMP.

K. LAN Cabling:
1. Comply with requirements in Section 271513 “Communications Copper Horizontal Cabling.”

2.8 TRANSFORMERS

A. NFPA 70, Class II control transformers, NRTL listed. Transformers for security access-control system shall not be shared with any other system.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with recommendations in SIA CP-01.

B. Comply with TIA 606-B, "Administration Standard for Commercial Telecommunications Infrastructure."

C. Product Schedules: Obtain detailed product schedules from manufacturer of access-control system or develop product schedules to suit Project. Fill in all data available from Project plans and specifications and publish as Product Schedules for review and approval.

D. In meetings with Architect and Owner, present Product Schedules and review, adjust, and prepare final setup documents. Use approved, final Product Schedules to set up system software.

3.2 CABLING

A. Comply with NECA 1, "Good Workmanship in Electrical Construction."

B. Install cables and wiring according to requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters. Conceal raceway and wiring except in unfinished spaces.

D. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental airspaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.

E. Install LAN cables using techniques, practices, and methods that are consistent with Category 5e rating of components and optical fiber rating of components, and that ensure Category 6 and optical fiber performance of completed and linked signal paths, end to end.

F. Boxes and enclosures containing security-system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.

G. Install end-of-line resistors at the field device location and not at the controller or panel location.

3.3 CABLE APPLICATION

A. Comply with TIA 569-D, "Commercial Building Standard for Telecommunications Pathways and Spaces."

B. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.
C. TIA 232-F Cabling: Install at a maximum distance of 50 ft. between terminations.

D. TIA 485-A Cabling: Install at a maximum distance of 4000 ft. between terminations.

E. Card Readers and Keypads:
   1. Install number of conductor pairs recommended by manufacturer for the functions specified.
   2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from controller to the reader is 250 ft., and install No. 20 AWG wire if maximum distance is 500 ft..
   3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the controller.
   4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.

F. Install minimum No. 16 AWG cable from controller to electrically powered locks. Do not exceed 250 ft. between terminations.

G. Install minimum No. 18 AWG ac power wire from transformer to controller, with a maximum distance of 25 ft. between terminations.

3.4 GROUNDING

A. Comply with Section 270526 "Grounding and Bonding for Communications Systems."

B. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.

E. Signal Ground:
   1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
   2. Bus: Mount on wall of main equipment room with standoff insulators.
   3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.5 IDENTIFICATION

A. In addition to requirements in this article, comply with applicable requirements in Section 270553 "Identification for Communications Systems" and with TIA 606-B.

3.6 SYSTEM SOFTWARE AND HARDWARE

A. Develop, install, and test software and hardware, and perform database tests for the complete and proper operation of systems involved. Assign software license to Owner.
3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use tester approved for type and kind of installed cable. Test for faulty connectors, splices, and terminations. Test according to TIA 568-C.1, "Commercial Building Telecommunications Cabling Standards - Part 1: General Requirements." Link performance for balanced twisted-pair cables must comply with minimum criteria in TIA 568-C.1.

2. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power-supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.

3. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

C. Devices and circuits will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Engage a factory-authorized service representative to supervise and assist with startup service.

1. Complete installation and startup checks according to approved procedures that were developed in "Preparation" Article and with manufacturer's written instructions.

2. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

END OF SECTION 16840
As indicated on the electrical plan:

- Approximate location existing PG&E electrical vault. Coordinate exact point of location with PG&E engineering drawings prior to connection.
- Provide (1) 4" C.O. underground primary from PG&E electrical vault to PG&E pad mount transformer.
- Approximate location of pad mount transformer & meter cabinet. Coordinate additional requirements with PG&E engineering drawings.
- Provide temporary (1) 4" C.O. underground from PG&E electrical vault to PG&E pad mount transformer.
- Provide temporary overhead pole with riser. Provide additional poles as required.
- Provide temporary overhead secondary conductor triplexed #600KCMIL supported on messenger wire from service disconnect to panel "P1".
- Provide temporary NEMA 3R electrical panel "P1" with weatherhead.
- Provide NEMA 3R 100A/2P fused disconnect switch for pre-fab trailers. Provide grounding per manufacturer recommendations.
- Provide weatherproof toggle switch for disconnecting means of gate motor. Coordinate additional requirements with manufacturer prior to installation.
- Provide weatherproof push button and 1/2" C.O. to gate motor.
- Provide weatherproof push buttons for disconnecting means of gate motor.
- Coordinate additional requirements with manufacturer prior to installation.