PART VII
TECHNICAL SPECIFICATIONS

Twain Harte
Community Services District

TECHNICAL SPECIFICATIONS FOR

TWAIN HARTE MEADOWS PARK

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TWAIN HARTE
COMMUNITY SERVICES DISTRICT

TWAIN HARTE MEADOWS PARK
TECHNICAL SPECIFICATIONS
DIVISIONS AND SECTIONS

SECTION 01 10 00
SUMMARY

PART 1 – GENERAL

1.01 SPECIFICATION FORMAT

A. The following specifications are organized into Divisions and Sections using the 48-division format and the Construction Specification Institute's (CSI's) "MasterFormat 2018" numbering system.

1.02 SECTION INCLUDES

A. Project Description.

B. Definition of Parties.

C. Site Conditions.

D. General Construction Responsibilities and Procedures.

E. Other Requirements.

F. Final site cleanup.

1.03 PROJECT DESCRIPTION

A. The work described in the following specifications is part of the improvements to the Twain Harte Meadows Park. The purpose of the Twain Harte Meadows Park project is to transform a vacant lot into a functional recreation area as well as a stormwater education/demonstration site.

B. The biddable Work for the Twain Harte Meadows Park project includes the following general components:

1. General site work (e.g., tree protection, temporary fencing if deemed necessary for security, cleanup, and storm drain protection).
2. Demolition, removal, and legal disposal of asphalt, a portion of the pool, abandoned pipes, and other unusable debris located on site.
3. Earthwork, including excavation for Tank-3 and removal of all rocks greater than six inches in size from backfill.
4. Boulder, cobble, and rock mulch placement as field directed by Owner's Representative.
5. Permeable pathway, including pedestrian boardwalks.
6. Permeable parking lot.
7. Curb and ramp installation.
8. Street light installation.
9. Prefabricated restroom preparation and coordination.
10. Pavilion.
11. Electrical work.

12. Underground utilities (sanitary sewer, water, irrigation, rainwater conveyance, and storm drains).
13. Town Christmas Tree.
14. Pads and setting of six poly tanks (Tank-1).
15. Pads and setting of one corrugated metal tank (Tank-2).
16. Installation of gutters on the pavilion.

C. The following is a general list of non-biddable/excluded Work to be completed by others:

1. Landscaping, planting, and mulching.
2. Preformed scour hole installation.
3. Irrigation emitter placement.
4. Restroom greywater plumbing.
5. Greywater plantings.
6. Installation aboveground plumbing, valves, and accessories for rain tanks.
7. Rainwater pump installation.
8. Low-voltage lighting (e.g., pedestrian walkways and Christmas tree uplights).
9. Picnic table assembly.
10. Barbeque assembly and installation.
11. Sink and large barbeque in pavilion.
12. Educational/Discovery lab signage.
13. Tank-3 installation and associated accessories.
14. Park entrance sign and installation.
15. Prefabricated restroom purchase, which includes placement with a crane.
16. Flume and Water Play Discovery Lab.

1.04 DEFINITION OF PARTIES

A. OWNER'S REPRESENTATIVE: The Twain Harte Community Services District (CSD) or officials acting on behalf of the Twain Harte Community Service (CSD).

B. WATERSHED PROGRESSIVE: Individual, firm, or corporation to provide engineering and design services during the design and construction phase of the project.

C. BIDDER: Any individual, firm, or corporation submitting a proposal for the work contemplated.

D. CONTRACTOR: Individual, firm, or corporation who has entered into contract with the OWNER to complete the Work in accordance with the drawings and specifications.

E. SUBCONTRACTOR: Individual, firm, or corporation to supply work or material at the project site pursuant to a separate agreement with the Contractor.

F. SPECIFICATIONS: The directions, provisions, and requirements described herein, together with all written or printed agreements and instructions made, or to be made, pertaining to the method and manner of performing the Work.

1.05 SITE CONDITIONS

A. CONTRACTOR's Staging Area:

1. Any staging for personnel, equipment, and materials by the Contractor must be performed within the construction limits, in an area indicated on the Drawings, or in an area designated by the Owner.

2. The Contractor may request to use other areas for staging not indicated on the drawings. All such areas are subject to approval by the Owner's Representative.

B. Disposal of Waste Material:

1. Materials identified as waste by the Contractor shall be removed immediately from the project site and disposed of in accordance with applicable requirements and regulations.

2. Remove all excess or damaged construction materials from the project site.

3. Remove all unsuitable material from the project site, including vegetative debris.

4. Burning is not permitted on site.

C. Site Investigation and Representation

1. Information about existing conditions is shown on the construction drawings. It is the Bidder and Contractor's responsibility to verify the accuracy of the construction drawings.

2. The Contractor shall carefully review, inspect, and compare the contract documents with the field conditions (including subsurface conditions, underground facilities, and existing structures).

D. Information of Site Conditions:

1. The Contractor shall promptly report any conflict, error, or discrepancy that the Contract may discover at any time to the Owner's Representative.

E. Fire Prevention and Protection:

1. The Contractor shall perform all work in a fire-safe manner and comply with applicable fire prevention regulations.

1.06 GENERAL CONSTRUCTION RESPONSIBILITIES AND PROCEDURES

A. The Contractor shall not operate outside the designated limits of disturbance without prior approval from the Owner.

B. All work areas, unless otherwise noted on the construction drawings, shall be restored to pre-construction conditions.

1.07 OTHER REQUIREMENTS

A. Dimensions and Measurements:

1. The Contractor is responsible for construction staking, which is to be approved by the Owner's Representative.
2. The Contractor shall verify dimensions shown on the construction drawings and notify the Owner's Representative of discrepancies prior to proceeding with the Work.

B. Whenever a piece of equipment, an article, or a device is referred to in a singular number, such references apply to as many such items as are shown on the construction drawings or required to complete the Work.

PART 2 – PRODUCTS (Not used)

PART 3 – EXECUTION (Not used)

SECTION 01 20 50
MEASUREMENT AND PAYMENT

PART 1 – GENERAL

This Section describes the methods of measurement and payment for the specific bid items associated with the Work on the proposed Twain Harte Meadows Park. All other provisions of the Contract documents which relate to measurement and payment are applicable, except that where conflicts occur between this section and other provisions of the technical specifications or reference specifications, this measurement and payment section shall prevail.

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.01. METHOD OF PAYMENT

A. Payment will be made on the basis of the unit prices or lump sum bids for the various items as called for on the Bid Sheet(s) and included in the Contract as awarded. The quantities given in the Bid and contract forms are approximate only and are given as a basis for comparison of bids, and the Owner does not expressly or by implication agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of or any class or portion of the Work or to omit portions of the Work as may deemed necessary or advisable by the Engineer or Owner's Representative.

3.02. MEASUREMENT OF QUANTITIES

A. Full compensation for all expenses involved in conforming to the above requirements for weighing materials shall be included in the prices for the materials being weighed, and therefore, no additional allowance will be made.

B. The quantity of materials paid for by the lineal foot, square foot or square yard shall be determined by horizontal measurement.

C. The Contract shall submit a schedule of values of all lump sum items described below.

3.03. SCOPE OF PAYMENT

A. The Contractor shall accept the compensation as herein provided as full payment for furnishing all materials, labor, tools, and equipment necessary to complete the Work, and for performing all work contemplated and embraced under the Contract; also, for loss or damage arising from the nature of the Work, or from the action of the elements, except as heretofore provided, or from any unforeseen difficulties which may be encountered during the prosecution of the Work, until the final acceptance by the District, and for all risks of every description connected with the prosecution of the Work; also, for all expenses incurred in consequence of the suspension or discontinuance of the Work as herein specified; and for completing the Work according to the Plans and Specifications. Neither the payment of any estimate nor any retained percentage shall relieve the Contractor of any obligation to make good any defective work of materials.

3.04. BID ITEMS

Bid Item #1 – Mobilization, Demobilization, and Construction Coordination

1. Description

   This work includes the furnishing of all tools, equipment, labor, and materials required to accomplish all the following Work within the limits of disturbance designated on the plans or as directed by the Owner's Representative in accordance with the plans and specifications for Twain Harte Meadows. The Work includes but is not limited to the following:

   a) The Contractor shall develop a construction plan for the Work with means and methods that will allow completion of the work pursuant to these specifications using the space within the proposed Twain Harte Meadows area or shall, independently from the District, acquire any temporary easements from landowners that are necessary to stockpile materials or facilitate completion of the Work.

   b) **Mobilization** – The Contractor shall move in and set up all equipment, provision for power, materials, etc. as necessary to complete all aspects of this project. This item also includes the cost of all bonds, insurance, and permits for the project.

   c) **Easements** – The Contractor may determine the location, type, extent, and value to the Contractor of any temporary easement(s), which may facilitate completion of the Work, which is beyond the District's access easement and fenced tank site shown on the Plans and Specifications.

   d) **Construction Schedule** – The Contractor is responsible for preparing, amending, implementing, and complying with construction schedule for all Work on this project. The initial schedule shall be submitted to the Owner's Representative at the time of the award of the contract. The schedule shall be amended and submitted to the Owner's Representative, as necessary if progress varies significantly from the schedule and at a minimum, every month.

   e) **Construction Water** – The District will provide access to construction water.

   f) **Submittals** – The Contractor shall provide the submittals and associated planning and engineering including, field verification, structural calculations, shop drawings, materials data sheets, Material Safety Data Sheets (MSDS), certificates of compliance, and other submittals required by the plans and specifications.

   g) **Utility Coordination** – The Contractor is responsible for all coordination efforts with regards to utilities on the project site including temporary service disruptions, tie-ins, and scheduling inspections for all Contractor Work. The Contractor shall be responsible for any financial claims associated with missed inspections, repeat inspections, or any costs associated with re-working portions of the project due to failed inspections or lack of inspections based on the Contractor's failure to schedule and follow through the same.

   h) **General Site Work** - The work involved as part of the General Site Work bid item includes but is not limited to tree protection, storm drain protection and site cleanup, fencing for security, safety, stormwater pollution prevention, potholing for exact location of existing utilities if necessary, and all other general site work required to complete the Work as specified in the Contract and set forth in the Drawings.

i) **Demobilization** – The Contractor shall remove all equipment and leftover materials.

2. Measurement

   Measurement of Work associated with mobilization, demobilization, and construction coordination will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made at the lump sum, and a schedule of values for "Mobilization, Demobilization, and Construction Coordination" will be required. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #2 - Demolition

1. Description

   This work includes removal and disposal of all existing asphalt concrete/pavement from the Twain Harte Meadows project site, removal of the 6-inch cedar tree near the abandoned pool. In addition, this work includes saw cutting and removing pavement from the existing parking area in accordance with the plans, specifications, and the direction of the Owner's Representative. This work also includes the removal of abandoned pipes, and removal of the pool one foot below the finished grade. Finally, this bid item includes other demolition work that is shown on the plans, described in the specifications, or may be required as well as the legal disposal of all spoils associated with the demolition work.

2. Measurement

   Measurement of Work associated with demolition will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made at the lump sum, and a schedule of values for demolition work will be required. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item.

Bid Item #3 – Earthwork and Rough Grading

1. Description

   This work includes excavation, grading of rain gardens and bioswales within the tolerances specified, removal of unsuitable materials including rocks greater than 6 inches in size, and legal disposal of all spoils associated with earthwork. This bid item also includes excavation for Tank-3, which is associated with the Water Play Discovery Lab and any other excavation/grading work shown on the plans or described in the specifications. In addition, excavation and rough grading work includes any necessary dewatering as well as construction staking. Finally, earthwork and rough grading work includes off-haul of excavation materials.

2. Measurement
   Measurement of Work associated with earthwork and rough grading will be based upon completion of such work as a lump sum.

3. Payment

Payment for this bid item will be made at the lump sum, and a schedule of values for earthwork and rough grading work will be required. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item.

Bid Item #4 – Rock Mulch and Cobble Placement

1. Description

   This bid item includes the procurement, trucking, and placement of the cobble and rock mulch/gravel mix (pea gravel, river rock, and cobbles up to 10" in size) for the bioswales and rain gardens as shown on the drawings, described in the plans, and as directed by the Owner's Representative. The rock mulch and cobble will be approved by Owner's Representative, and placement will be field directed by Owner's Representative.

2. Measurement

   Measurement of Work associated with the volume of cobble and gravel much placed (CY).

3. Payment

   Quantities for cobble and gravel mulch will be paid for at the contract unit price per cubic yard. This price will include the materials, labor, and equipment required to place cobble and gravel mulch in accordance with the plans and specifications and as directed by the Owner's Representative. A schedule of values is required.

Bid Item #5 – Boulder Placement (1' to 2')

1. Description

   This bid item includes procurement, trucking, and placement of 1' to 2' boulders as shown on the drawings and as directed by the Owner's Representative. Boulder selection will also be directed by the Owner's Representative.

2. Measurement

   Measurement of Work associated with the number of boulders placed.

3. Payment

   Quantities of boulders will be paid for at the contract price per boulder. Such price will include the materials, labor, and equipment required to place boulders in accordance with the plans and as directed by the Owner's Representative. A schedule of values is required.

Bid Item #6 – Boulder Placement (2' to 4')

1. Description

   This bid item includes procurement, trucking, and placement of 2' to 4' boulders as shown on the drawings and as directed by the Owner's Representative. Boulder selection will also be directed by the Owner's Representative.

2. Measurement

   Measurement of Work associated with the number of boulders placed.

3. Payment

   Quantities of boulders will be paid for at the contract price per boulder. Such price will include the materials, labor, and equipment required to place boulders in accordance with the plans and as directed by the Owner's Representative. A schedule of values is required.

Bid Item #7 – Boulder Placement (4’ to 5’)

1. Description

   This bid item includes procurement, trucking, and placement of 4’ to 5’ boulders as shown on the drawings and as directed by the Owner’s Representative. Boulder selection will also be directed by the Owner’s Representative.

2. Measurement

   Measurement of Work associated with the number of boulders placed.

3. Payment

   Quantities of boulders will be paid for at the contract price per boulder. Such price will include the materials, labor, and equipment required to place boulders in accordance with the plans and as directed by the Owner’s Representative. A schedule of values is required.

Bid Item #8 – Permeable Pathway

1. Description

   This bid item involves installation of the permeable pathway in accordance with the plans, specifications, and ADA requirements. The work involved in this bid item includes construction staking, subgrade preparation, base coarse placement in addition to any materials, labor, equipment, and any other work required to install the permeable pathway. The Contractor is responsible for sourcing all materials required to complete the Work and installing the permeable pathway, complete in place as shown on the plans and described in the specifications.

2. Measurement

   Measurement of the work associated with this bid item is by the square foot.

3. Payment

   Payment for permeable pathway shall be made at the contract unit price per square foot. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #9 – Pedestrian Boardwalks

1. Description

   This bid item involves the installation of the pedestrian boardwalks shown along the pedestrian walkway in accordance with the plans, specifications, and ADA requirements. The work involved in this bid item includes all the materials, labor, and equipment required to install the pedestrian boardwalks, complete in place as shown on the plans and described in the specifications.

2. Measurement

   Measurement of the work associated with this bid item will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #10 – Permeable Parking Lot

1. Description

   The Permeable Parking Lot bid item includes subgrade preparation, placing rock subbase, installing the TrueGrid (or accepted equivalent), delineating parking spots with striping or parking markers (for standard and handicap designated spaces), placing parking blocks, and any other work required to place the permeable parking lot in accordance with the plans, specifications, and manufacturer's recommendations. This includes all the materials, labor, tools, and equipment necessary to complete in place as shown on the plans and described in the specifications.

2. Measurement

   Measurement of the work associated with this bid item is the square footage of permeable parking lot installed.

3. Payment

   Payment for the permeable parking lot shall be made at the contract unit price per square foot. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #11 – Curb and Curb Ramp Installations

1. Description

   This work involves all labor, materials, tools, and equipment involved in constructing the concrete curb and ADA curb ramp in accordance with the dimensions indicated on the plans and standard detail drawings.

2. Measurement

   Measurement of Work associated with curb and ADA curb ramp installation will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #12 – Prefabricated Restroom Preparation/Coordination

1. Description

   The Contractor will be responsible for the gravel and concrete building pad preparation as shown on the drawing provided by the prefabricated restroom company. The District is purchasing the pre-fabricated restroom, which includes placement of the restroom by crane. It is anticipated that the restroom will be delivered in March 2024. In addition, this work includes stubbing up utilities within six feet of the prepared foundation area. This bid item also includes coordinating installation of the prefabricated restroom, including preparing the area for crane and utility connection work. The restroom provider will run piping/conduit from the restroom to the stubs, but the Contractor is to make the final connection and will run electrical through the conduit to the breaker box in the restroom.

2. Measurement

Measurement of Work associated with prefabricated restroom installation work will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #13 – Pavilion

1. Description

   The contractor will be responsible for installing the pavilion as shown on the plans. This includes but is not limited to the pad, foundation, lighting, outlets and electrical associated with the pavilion, rock facing on posts, point-of-use electric water heater, retaining wall, grease trap (aboveground), staining, and any other work that may be involved in furnishing the pavilion.

2. Measurement

   Measurement of Work associated with pavilion will be based upon completion of such work as a lump sum. The Contractor is to submit a schedule of values for this bid item.

3. Payment

   Payment for this bid item will be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #14 – Electrical Work

1. Description

   This bid item includes any work involved in installing the electrical work on site. This includes but is not limited to obtaining permits, testing, installing the underground electrical conduit and service to all 120V or 240V points of connections, panel construction, breaker installation, connecting the pumps for the rainwater harvesting system to electrical, and coordination with existing trades and utilities.

2. Measurement

   Measurement of Work associated with electrical work not covered in Bid Item #10 will be based upon completion of such work as a lump sum

3. Payment

   Payment for this bid item will be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #15 – Underground Utilities (Sanitary and Water)

1. Description

   This bid item includes the work associated with installing the sanitary and water lines as shown on the plans and described in the specifications. Such work includes but is not limited to trench excavation, pipe bedding, pipe laying, coordination with existing for sanitary sewer and water, connections, tie-ins, shutdown coordination, pipe, fittings, appurtenances, compaction and backfill, and any other work required to properly install the sanitary sewer and water lines.

2. Measurement

   Measurement of the work associated with installing the water and sanitary sewer lines work will be based upon completion of such work as a lump sum.

3. Payment

   Payment for work associated with underground utility installation be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #16 – Underground Utilities (Irrigation, Rainwater Conveyance, HDPE Piping)

1. Description

   This bid item includes the installation of underground utilities (irrigation, underground rainwater conveyance, and storm drain HDPE piping) as shown on the plans. This work will involve trench excavation, pipe bedding, pipe laying and coordination with existing for irrigation, underground rainwater conveyance piping, storm drains/HDPE piping connecting basins and associated box inlet of HDPE pipes. In addition, the Contractor is responsible for furnishing and installing all pertinent materials, fittings, and appurtenances associated with the irrigation, underground rainwater conveyance, and HDPE piping.

2. Measurement

   Measurement of the work associated with installing the utilities associated with this bid item (e.g., irrigation, rainwater conveyance, HDPE piping) will be based upon completion of such work as a lump sum.

3. Payment

   Payment for work associated with underground utility installation be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #17 – Christmas Tree

1. Description

   Christmas tree installation and associated irrigation. The Contractor is responsible for providing the Christmas tree and any equipment required to install the Christmas tree.

2. Measurement

   Measurement of the work associated with installing the Town Christmas tree and associated irrigation will be based upon completion of such work as a lump sum.

3. Payment

   Payment for work associated with installing the town Christmas tree be made at the lump sum. This includes full compensation for furnishing all labor, material (including the tree), tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #18 – Poly Rain Tanks (Tank-1)

1. Description

   This bid item includes the procurement and installation of the poly rain tanks as shown on the plans and described in the specifications. This work includes installing the gravel pad, excavation, compaction, setting the tanks, and stubbing up the rainwater conveyance piping. Final pipe connection to the irrigation system and tank to be performed by others.

2. Measurement

   Measurement of the work associated with this work will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made at the lump sum. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #19 – Corrugated Rain Tanks (Tank-2)

1. Description

   This bid item includes the procurement and installation of the corrugated steel rain tank as shown on the plans and described in the specifications. This work includes installing the gravel pad, excavation, compaction, setting the tanks, and stubbing up the rainwater conveyance piping. Final pipe connection to the irrigation system, tank, and Water Play Discovery Lab to be performed by others.

2. Measurement

   Measurement of the work associated with this work will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made at the lump sum for the materials, labor, equipment, and tools required to complete this work. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #20 – Solar Streetlights

1. Description

   This bid item involves furnishing and installing streetlights for the permeable parking lot per the plans and specifications. Streetlights shall be approved by the Owner's Representative.

2. Measurement

   Measurement of the work associated with this bid item is each solar streetlight installed.

3. Payment

   Payment for this bid item will be made for each solar streetlight installed. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Bid Item #21 – Gutters Along the Pavilion

1. Description

   This bid item involves furnishing and installing gutters (GT-1) along the pavilion.

2. Measurement

   Measurement of the work associated with this work will be based upon completion of such work as a lump sum.

3. Payment

   Payment for this bid item will be made for each solar streetlight installed. This includes full compensation for furnishing all labor, material, tools, and equipment required to complete the work associated with this bid item. A schedule of values is required.

Exclusions/Non-Biddable Work to be Performed by Others

The following lists work to be performed by others.

- Prefabricated Restroom
  - Purchasing the prefabricated restroom, which includes placement of the restroom by crane.
- Discovery Labs:
  - Installation of Tank-3 and accessories for the Water Play Discovery Lab
  - Flume and Water Play Discovery Lab
  - Discovery Lab signage
- Piping:
  - Aboveground plumbing, valves, and accessories for the rainwater tanks
  - Restroom Greywater plumbing
  - Preformed scour holes at outlet of each pipe
  - Rainwater pump installation
- Landscaping & Irrigation:
  - Planting selection and installation
  - Final irrigation line and emitter placement
  - Greywater plantings
- Electrical:
  - Low-voltage lighting (e.g., pedestrian walkway lighting, Christmas tree upplight)
- Miscellaneous:
  - Picnic table assembly – includes concrete footings to prevent vandalism and theft.
  - Barbeque installation – includes concrete footings to prevent vandalism and theft.
  - Pavilion barbeque and sink
  - As-built (mark-up of plans)
  - Park Entrance Sign

SECTION 01 52 00
CONSTRUCTION FACILITIES

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. Temporary sanitary facilities, parking areas, temporary fencing, and security.

1.02 RELATED SECTIONS

A. SECTION 01 52 05, CONSTRUCTION STAGING AREAS

B. SECTION 01 74 14, CLEANING

1.03 TEMPORARY SANITARY FACILITIES

A. The Contractor may use the public restrooms located in the adjacent park on Meadows Drive.

B. If the Contractor deems it necessary to provide temporary sanitary facilities for this project, the Contractor shall locate the sanitary facilities in an area approved by the authorities having jurisdiction and maintain these facilities in a clean and sanitary condition during the work. Ensure the sanitary facilities are supplied with toilet paper, hand drying towels, and other related supplies.

C. Upon completion of the work, any temporary sanitary facilities shall be disinfected and removed from the site.

1.04 PARKING AREAS

A. Parking is indicated on the construction drawings. Off-site parking shall not interfere with existing community parking or traffic conditions.

1.05 TEMPORARY FENCING

A. The Contractor shall furnish, construct, maintain, and later remove temporary fencing around the jobs site as needed to provide site security (e.g., security of equipment, materials, and improvements) and to protect and keep safe the public from construction and unfinished improvements.

B. Any temporary fencing that is damaged from any cause during the progress of the Work shall be repaired or replaced by the Contractor at no additional cost to the Twain Harte Community Services District (CSD).

C. When no longer required for the work, temporary fencing shall be removed from the site. Removed fencing shall become the property of the Contractor.

D. Holes caused by the removal of temporary fences shall be properly filled to match adjacent surfaces.

1.06 SECURITY

A. Damaged, lost, or stolen materials or equipment shall be replaced by the Contractor at no additional cost to the CSD.

B. The Twain Harte CSD assumes no responsibility for loss of materials and equipment during the Work.

C. The Contractor shall repair any improvements damaged during the course of the work due to failure to appropriately secure the site.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 DEMOLITION

A. Remove base, asphalt, and concrete within the project site to the subgrade. Note that some of the concrete on site is partially buried.

B. When removing concrete associated with the abandoned inground swimming pool, remove concrete to a depth of at least 1 foot below finished grade. Concrete removal includes the removal of any steel reinforcement embedded within the concrete. Legally dispose of removed concrete offsite. All area depressions resulting from the removal of the concrete swimming pool shall be backfilled with native material and compacted to a relative density of not less than 90 percent.

C. Remove and dispose of abandoned drainage corrugated plastic piping (CPP) and corrugated metal pipe (CMP).

D. When applicable, backfill and compact depressions caused by excavations, demolition, and removal in accordance with the requirements outlined in SECTION 31 00 00, EARTHWORK.

3.02 SALVAGE

A. The existing boulder pile is to remain on site. Other items or materials to be salvaged shall be identified on the construction drawings and maybe used subject to Owner's Representative approval.

B. Repair or replace with new material, salvaged material damaged or destroyed due to Contractor's negligence, as determined by the CSD.

3.03 DISPOSAL OF REMOVED MATERIALS AND DEBRIS

A. Dispose of removed materials, waste, trash, and debris in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by the Twain Harte CSD.

B. Burying trash and debris on site will not be permitted. Similarly, burning of trash and debris at the site will not be permitted.

C. Removed materials, trash, and debris shall become the property of the Contractor and shall be removed from the site and be disposed of in a legal manner. Location of the disposal site and length of haul shall be the Contractor's responsibility.

SECTION 01 52 05
CONSTRUCTION STAGING AREAS

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. Contractor staging area requirements.

1.02 RELATED SECTIONS

A. SECTION 01 52 00, CONSTRUCTION FACILITIES

B. SECTION 01 74 14, CLEANING

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 CONTRACTOR STAGING AREAS

A. The Contractor shall only use site areas designated specifically on the construction drawings or by the Twain Harte Community Services District (CSD) for the Work.

B. The Contractor shall not block access to/from the adjacent park facilities, golf course, fire station or any emergency vehicle access lane unless specifically granted by the Twain Harte Community Services District (CSD).

D. The Contractor shall keep the staging area clear of trash and debris and in neat order.

SECTION 01 74 14
CLEANING

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. Cleaning and cleanup during construction.

B. Debris disposal.

C. Final site cleanup.

1.02 RELATED SECTIONS

A. SECTION 01 52 00, CONSTRUCTION FACILITIES

B. SECTION 01 52 05, CONSTRUCTION STAGING AREA

C. SECTION 02 41 00, DEMOLITION

1.03 CODES AND STANDARDS

A. Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Article 2, Regulation for Reducing VOC Emissions from Consumer Products.

1.04 CLEANING AND CLEANUP DURING CONSTRUCTION

A. The project site, including the Contractor's work and storage areas, shall be kept in a neat, clean, and orderly condition during the course of the Work. The Contractor shall conduct generally daily clean-up and disposal tasks. Such tasks include the removal of waste, trash, rubbish, and debris away from the site.

1.05 DISPOSAL OF DEBRIS

A. The Contractor shall dispose of all waste, trash, rubbish, and debris in accordance with applicable laws and ordinances and as prescribed by the Twain Harte Community Services District (CSD). The Contractor shall bury no waste material or debris on the project site or burn any trash or waste on the site.

B. The Contractor is responsible for identifying an acceptable disposal site for waste, trash, rubbish, and debris.

1.06 FINAL SITE CLEANUP

A. Upon completion of the Work, ensure the site is in a clean, neat, and acceptable condition. Remove all construction waste, unused materials, loose rock and stones, excess soil, and debris.

B. Ensure all existing and new drainage systems are free of debris and damage.

C. Clean and protect all conduit openings.

D. Upon completion of the Work, the Contractor shall remove all markings made during the course of the Work from streets, sidewalks, walls, or any other infrastructure owned by the Twain Harte CSD.

1.07 DISPOSAL OF MATERIALS

A. The Contractor shall dispose of materials unsuitable for reuse in the Work offsite. Suitable materials may be reused in the Work for embankment, fill, or backfill subject to Owner's Representative approval.

PART 2 – PRODUCTS

2.01. CLEANING PRODUCTS

A. Use cleaning products that meet the requirements of the Green Seal GS-37 standard or comply with the requirements and maximum volatile organic compounds (VOC) limits of Title 17, California Code of Regulations, Division 3, Chapter 1, Subchapter 8.5, Article 2, Regulation for Reducing VOC Emissions from Consumer Products.

PART 3 – EXECUTION

3.01 GENERAL

A. **Prevention:** The Contractor shall prevent the pollution of storm drain systems and the creek near the construction Project site resulting from the construction. The Contractor shall keep pollutants out of storm drains by reducing the possibility of accidental discharge of materials and wastes, by reducing erosion and sedimentation, and by any action as required. The Contractor shall ensure that all employees and subcontractors are aware of the consequences as described in paragraph 3.01C. below. The Contractor shall include appropriate subcontract provisions to ensure that these requirements are met by all subcontractors.

B. Notification: If the Contractor causes or permits the spillage or overflow of any oil, or petroleum product, hazardous substance, contaminant, waste or wastewater, including overflows or releases of untreated or treated (partially or fully) wastewater, and backups into buildings and on private property, the Contractor shall notify the District as soon as possible to the extent notification can be provided without substantially impeding cleanup or other emergency measures. In no event shall such notification be later than one (1) hour after knowledge of the occurrence.

C. **Cleanup:** Immediately upon gaining knowledge of such spillage, overflow, or discharge, the Contractor shall eliminate the cause of the spillage, overflow, or discharge and take action to minimize any damages. The Contractor shall also immediately implement a cleanup program. The cleanup, including sampling and testing required by regulatory agencies to determine the nature and level of contamination, shall be performed and completed to the satisfaction of the various regulatory agencies involved and the District, at the expense of the Contractor. If the Contractor's response is not satisfactory to the District, the District may, at its own discretion, mobilize to eliminate the cause of the overflow and implement a cleanup program, including any necessary sampling and testing. District costs of cleanup efforts shall be at the Contractor's expense and collected at the discretion of the District. Any fines, penalties, and/or subsequent actions imposed upon the District and/or the Contractor by regulatory agencies related to the spillage, overflow, or discharge and any subsequent monitoring, testing, and reporting, as required by regulatory agencies, shall also be at the expense of the Contractor. The Contractor shall keep a stockpile of spill

cleanup materials, such as rags or absorbents, readily accessible on site. The quantity of cleanup materials shall be appropriate in consideration of the risk of an occurrence of a spill, overflow, or discharge.

3.02 MANAGEMENT OF NONHAZARDOUS MATERIAL AND/OR WASTE

A. **Designated Area**: The Contractor shall propose designated areas of the Project site, for approval by the District, suitable for material delivery, storage, and waste collection that to the maximum extent practicable are near construction entrances and away from catch basins, gutters, drainage courses, and creeks.

B. **Backfill or Excavated Material:** The Contractor shall not allow backfill or excavated material to enter the storm drains or creeks. When rain is forecast within 24 hours or during wet weather, the Contractor may be required to cover such material with a tarpaulin and to surround the material with sandbags.

C. **Disposal:** At the end of each working day, the Contractor shall collect all scrap, debris, and waste material, and dispose of such materials properly. The materials may be stored in the Contractor's yard in stockpiles or placed in dumpsters. The Contractor shall inspect dumpsters for leaks and replace or repair dumpsters that leak. The Contractor shall not discharge water from cleaning dumpsters on site. The Contractor shall arrange for regular waste collection before dumpsters overflow.

3.03 MANAGEMENT OF HAZARDOUS MATERIAL AND/OR WASTE

A. **Storage:** The Contractor shall label and store all hazardous materials, such as pesticides, paints, thinners, solvents, and fuels, and all hazardous wastes, such as waste oil and antifreeze, in accordance with all applicable state and federal regulations. The Contractor shall store all hazardous materials and all hazardous wastes in accordance with secondary containment regulations. All such materials and wastes shall be covered, as needed, to avoid rainwater becoming polluted with hazardous constituents, which could result in potential management of collected rainwater as hazardous waste. The Contractor shall keep an accurate, up-to-date inventory, including Material Safety Data Sheets (MSDS), of hazardous materials and hazardous wastes stored on site.

B. **Usage:** When rain is forecast within 24 hours or during wet weather, the Contractor shall refrain from applying chemicals in outside areas. The Contractor shall follow the material manufacturer's instruction regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals. The Contractor shall post warning signs in areas treated with chemicals.

C. **Disposal:** The Contractor shall arrange for regular hazardous waste collection to comply with time limits on storage of hazardous wastes. The Contractor shall dispose of hazardous waste in accordance with Part V, General Conditions, Section GC-25, Contaminated Soil/Materials. The Contractor shall not wash any spilled material into streets, gutters, storm drains, or creeks and shall not bury spilled hazardous materials. The Contractor shall

report any hazardous material spills to the District in accordance with paragraph 3.01B above.

3.04 VEHICLE/EQUIPMENT CLEANING, MAINTENANCE, AND FUELING

A. **General**: The Contractor shall inspect vehicles and equipment arriving on site for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until repairs are made.

B. Cleaning: The Contractor shall perform vehicle or equipment cleaning with water only in a designated, bermed area that will not allow rinse water to run off site into streets, gutters, storm drains, or creeks. Soaps, solvents, degreasers, steam-cleaning equipment, or equivalent methods shall not be allowed.

C. **Maintenance and Fueling**: The Contractor shall perform maintenance and fueling of vehicles or equipment in areas that will not allow run-on of storm water or runoff of spills to storm drains and that provide for confined cleanup. Examples are working in bermed areas or utilizing drip pans. The Contractor shall not contaminate the soil or groundwater with such maintenance and fueling activities.

The Contractor shall use secondary containment, such as a drip pan, to catch leaks or spills any time that vehicle or equipment fluids are dispensed, changed, or poured, and shall clean up leaks and spills of vehicle or equipment fluids immediately and dispose of the waste and cleanup materials as hazardous waste, as described in paragraph 3.03C above.

3.05 CONCRETE, GROUT, AND MORTAR WASTE MANAGEMENT

A. **Concrete Truck/Equipment Washout**: The Contractor shall not wash out concrete trucks or equipment into streets, gutters, storm drains, or creeks. The Contractor shall perform washout of concrete trucks or equipment off site or in a designated area on site where the water will flow onto dirt or into a temporary pit in a dirt area. The Contractor shall let the water percolate into the soil and dispose of the hardened concrete in a trash container. If a suitable dirt area is not available, the Contractor shall collect the wash water and remove it off site.

B. **Exposed Aggregate Concrete Wash Water**: The Contractor shall avoid creating runoff by draining water from washing of exposed aggregate concrete to a dirt area. If a suitable dirt area is not available, the Contractor shall filter the wash water through straw bales or equivalent material before discharging to a storm drain. The Contractor shall collect sweepings from exposed aggregate concrete for disposal.

SECTION 12 93 00
SITE ELEMENTS

PART 1 – GENERAL

1.01 SCOPE

A. Furnish and install site elements (e.g., picnic tables and barbeques) as shown on the drawings and as specified herein:

a. Ten Picnic Tables (Section 2.01)

b. Two small barbeques (Section 2.02A)

c. Three distinct picnic areas.

1.02 GENERAL REQUIREMENTS

A. This work shall be coordinated with all associated work to ensure that all items are located properly per the plans and that work is completed in the proper sequence and accomplished efficiently.

B. Concrete footings are to be installed on barbeques and picnic tables to prevent theft.

C. The site furnishings schedule below is not inclusive of all site elements to be installed.

1.03 SHOP DRAWINGS SUBMITTALS

A. Submittals should include product data indicating the materials, construction, configuration, dimensions, and finishes of the site elements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Products shall be transported, handled, stored, and protected with care.

PART 2 – PRODUCTS

2.01. PICNIC TABLES

A. BERG picnic table (Type h) or approved equivalent.

2.02. BARBEQUES

A. N.O.F, Inc. Standard Park Grill, 300 square inch, inground mount or approved equal.

PART 3 – EXECUTION

3.01. GENERAL

A. Assembly, construction, and installation of items shall be of high craftsmanship and in accordance with the manufacturer's recommendations. All construction shall be accurately fitted, set plumb and level, and free of any surface blemishes.

B. Verify that field measurements, substrates, and conditions are as required.

SECTION 22 14 53
RAINWATER HARVESTING SYSTEM

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. The work described in this specification is intended for the constructability and installation of a rainwater harvesting system per applicable codes and standards. This section includes specifications for the rainwater harvesting system and its components, quality assurance and inspection.

B. Rainwater Harvesting System:

a. Rainwater Pre-Filter(s)

b. Storage Tanks

c. Distribution Pump(s)

d. Controls

1.02 RELATED SECTIONS

A. SECTION 01 52 00, CONSTRUCTION FACILITIES

B. SECTION 01 74 14, CLEANING

1.03 APPLICABLE CODES AND STANDARDS

A. International Organization for Standardization (ISO):

a. ISO 9001 – Quality management systems requirements.

B. California Plumbing Code (CPC-2022)

a. Chapter 15: Alternate Water Sources for Non-Potable Applications

b. Chapter 16: Non-Potable Rainwater Catchment Systems

1.04 SITE CONDITIONS

A. Verify site conditions where the rainwater harvesting system is to be installed and ensure constructability and installation access is free and clear of obstructions.

B. Notify Owner's Rep of any open depressions and excavations made as part of the demolition/grading work for system installation and post warning signs if applicable.

C. Protect active sewer, water, gas, electric, drainage, and irrigation indicated or, when not indicated, found, or otherwise made known to the CONTRACTOR before or during installation work. If a utility is damaged, immediately notify the Twain Harte Community Services District (CSD) for corrective action.

1.05 QUALITY ASSURANCE

A. Product and Equipment Manufacturer Qualifications:

a. Minimum of 10-years of experience of this Section.
b. Successful completion of previous projects of similar scope and complexity.
c. Maintain ISO-9001 production facilities including quality management protocols for production.

B. Installer Qualifications:
a. Successful completion of (3) previous projects of similar scope of complexity.
b. Maintain trained technicians on staff providing field service and warranty related work.
c. Minimum of (3) years of experience in work in this Section.
d. This does not apply to the contractor who is installing underground piping, tank pads and setting tanks.

C. Installation and Excavation Safety: In accordance with OSHA requirements.

1.06 DELIVERY, STORAGE AND HANDLING

A. Do not deliver (unless otherwise specified) system components until time needed for installation and after proper protection can be provided for materials.
B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
C. Protect from damage due to weather, excessive temperature, and construction operations.
D. Leave protective coverings in place until just prior to installation.
E. Store water storage components with forklifts (or approved equivalent) and manufacturers recommended equipment during transportation and site construction. System components shall be protected from damage during delivery.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within manufacturers limits for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.08 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty against defects in materials and workmanship.

PART 2 – PRODUCTS

2.01 MATERIALS, EQUIPMENT, AND FACILITIES

A. The CONTRACTOR shall furnish all materials, tools, equipment, devices, appurtenances, facilities, and services as required to perform the installation of the rainwater harvesting system as shown in the construction drawings and described in the specifications.

2.02 MANUFACTURERS

A. Acceptable Manufacturer(s) for Storage Tanks:

a. RainHarvest Systems LLC.

b. Bushman USA

c. Aquascape

c. American Tank Depot

d. Norwesco

B. Acceptable Manufacturer(s) for Pumps and Pump Skids:

a. RainHarvest Systems

b. Grundfos

c. Aquascape

d. Oase

e. RainFlo

C. Acceptable Manufacturer(s) for Controls and Float Switches:

a. RainHarvest Systems

b. RainFlo

c. Aquascape/Hudson

D. Acceptable Manufacturer(s) for Rainwater Filters, Storage Tank Accessories:

a. RainHarvest Systems

b. RainAid

c. RainFlo

d. GRAF

E. Substitutions: Must be equal to specified equipment as determined by Owner's Representative or Designer.

2.03 RAINWATER HARVESTING SYSTEMS

A. Rainwater Harvesting Systems:

a. The system shall collect rainwater from the roof and convey rainwater through roof drains, downspouts and conveyance piping, gravity fed pre-filters. Filtered rainwater will travel through the pre-filter and into a rainwater storage tank. Water will be drawn out of the storage tank and pumped through a submersible pumping system to provide water at the desired design point of connection on an on-demand basis.

B. Design Requirements: Filter, store, treat and distribute harvested rainwater as specified on plans.

C. Water Filtration Method: Include sediment and UV filtration.

D. Hydrostatically test pump to manufacturer's requirements prior to final installation.

E. Components:

a. Rainwater Pre-Filter: Model: RainHarvest Leaf Eater Advanced Downspout Filter

b. Rainwater Storage Tanks:

- Bushman Poly 5050 – Model: CWTX5-132 – Capacity: 5,000-Gallons

- BH Classic Corrugated – Model: BH0X9-07 – Capacity: 5,000-Gallons

- Modular Underground System – AquaBlox Large – Capacity: 1,152-Gallons

- Rainwater Inlet: 3-inches

- Rainwater Overflow: 3-Inches

- Rainwater Outlet (pumped): 1-Inches

c. Pump Systems:

- Model: Grundfos SBA 3-45-AW Submersible Pump – 1.43 HP.

- Model: Aquascape 9PL 7,000 gph – 1000W

- Model: Oase Aquamax Eco Classic 1900 Pump – 70W

- Plumbed to allow for removal without entering tank.

- Connected to power supply by power cable and waterproof connections.

d. Rainwater System Control:

- Water level measurement with automatic switchover to municipal backup water supply. Controller to activate valve based on programmed water level in the rainwater system controller.

f. Non-Potable Water Signage:

- All rainwater harvesting equipment and conveyance pipes shall denote "Non-Potable Water – Do Not Drink".

g. Storage Tank Accessories:

- Floating Filter and Hose (reference Grundfos SBA 3-45 Pump Assembly)

h. Make Up Water Valve:

- MV-1: ¾” Rain Aid or approved equal

- MV-2: 1” Hudson on-demand fill valve or approved equal

h. Accessories:

- Bulkhead Fitting: Sized to match system inlet, outlet, pump flow rate, vents and other penetrations.

- Vent Assembly: PVC rodent-proof screen/cap for tank air and vacuum relief; Extent from top of tank to above grade.

- Waterproof Electrical Connection Box: Located in manway, field installed and inspected.

- Ultraviolet treatment: Oase bio-smart 5000 pond filter w/ vitronic 18 UV Clarifier or approved equal

PART 3 – EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under given project conditions.

B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer’s recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

C. If preparation is the responsibility of another installer, notify Owner’s Representative in writing of deviations from manufacturer’s recommended installation tolerances and conditions.

D. When applicable, backfill and compact depressions caused by excavations, demolition, and removal in accordance with the requirements outlined in SECTION 31 00 00, EARTHWORK.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s instructions, per plan and in proper relationship with adjacent construction.

B. Arrange equipment so that components requiring removal or maintenance are readily available accessible without disturbing other components. Arrange for clear passage between components.

D. Do not bury components deeper than manufacturer’s recommended depth or in a manner that would exceed engineering loads.

E. Ground components in accordance with component manufacturer's instructions.

F. Install pre-filters at the time storage tanks are installed.

3.03 FIELD QUALITY CONTROL

A. Field Inspection: Coordinate field inspection with Owner's Representative within one (1) year of construction.

B. System Testing shall be provided by contractor:

a. Installation oversight and technical support.

b. Terminate and test control system wiring and operation of electrical components.

c. Demonstrate proper pump and controls operation.

d. Make adjustments to meet user-defined system performance.

e. Review operation and maintenance procedures with Twain Harte CSD.

3.04 DISPOSAL OF REMOVED MATERIALS AND DEBRIS

A. Clean and protect products in accordance with manufacturer's recommendations.

B. Touch-Up, repair or replace products before substantial completion.

C. Dispose of scrap materials, waste, trash, and debris from the installation of the rainwater harvesting system in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by the Twain Harte CSD.

D. Burying of trash and debris on site will not be permitted. Similarly, burning of trash and debris at the site will not be permitted.

E. Scrap materials, trash, and debris shall become the property of the CONTRACTOR and shall be removed from the site and be disposed of in a legal manner. Location of the disposal site and length of haul shall be the CONTRACTOR's responsibility.

END OF SECTION 32 84 00

SECTION 26 00 00
ELECTRICAL SPECIFICATIONS

PART 1 – GENERAL

1.01. SUMMARY

A. Delegated Design – Work under this section consists of all engineering, installation labor, materials, equipment, permits, fees, and transportation necessary for and/or reasonably incidental to, the construction, completion, commissioning, and certification of an electrical system for the project in working order.

B. Delegated design, contractor is the Engineer of Record and is responsible for design, furnishing, and install complete and fully functioning electrical systems including all equipment and systems specified herein. Work specific to electrical design includes the following:

C. Complete systems design, engineering, and coordination of work with Architect and work of other trades.

D. Plan Check approval.

E. Coordination and installation of utility service equipment.

F. Service and distribution equipment.

G. Feeders to switchboards, distribution panels, connections to HVAC equipment, Owner provided equipment.

H. Branch circuit wiring from the distribution panels for lighting, receptacles, motors, signal systems and other detailed circuit wiring.

I. Luminaires, lighting controls, receptacles, relays, [seismic and] supports for installed components and other accessory items.

J. Wiring and power connections for motors installed for heating, cooling, and ventilation.

K. Furnish and install all required in-place equipment, cables, conduits, [j-hooks,] fasteners, boxes, and miscellaneous materials for the satisfactory interconnection and operation of all associated electrical systems.

1.02. CODES AND STANDARDS

A. Where locally adopted codes are silent on an issue, NFPA standards shall apply.

B. Materials and equipment shall be listed and labeled by Underwriters Laboratories or as required by authorities having jurisdiction.

C. Industry standards and manufacturers' recommendations, diagrams, or requirements shall be strictly adhered to for installation of materials and equipment.

D. This project shall strictly comply with the following locally approved codes including their adopted amendments that shall be used for this project.

E. Codes
1. California Building Code: CBC
2. California Electrical Code: CEC
3. California Energy Code: CENC
4. California Fire Code: CFC
5. California State Fire Marshal Requirements: CSFM
6. California Administrative Code: Title 24
7. National Electrical Code: IFC
8. Americans with Disabilities Act: ADA

F. Standards
1. American National Standards Institute: ANSI
2. American Society for Testing and Materials: ASTM
3. Certified Ballast Manufacturer: CBM
4. Electrical Testing Laboratories: ETL
5. Electronics Industries Association: EIA
6. Federal Aviation Administration: FAA
7. Illuminating Engineering Society of North America: IESNA
8. International Electrical Testing Association: IETA
9. Occupational Safety and Health Administration: OSHA
10. National Electrical Manufacturers Association: NEMA
11. National Fire Protection Association: NFPA
12. Underwriters Laboratories: UL

G. Branch Circuits
1. All lighting branch circuits shall be separate from power and receptacle branch circuits.
2. All branch circuits serving computer loads shall have a dedicated neutral conductor.

H. Basic Materials and Methods
1. All boxes, brackets, bolts, clamps, etc., shall be galvanized, electro- galvanized, metalized, or sherardized.
2. Cast aluminum, stainless steel, and non-metallic materials may be used in specific locations where appropriate for the location.

PART 2 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS

2.01. REQUIREMENTS

I. Minimum size wire for lighting and power feeders and branch circuits (20 Ampere) shall be No. 12 AWG copper.

1. Minimum size wire for control circuits shall be No. 14 AWG copper. All wire shall be stranded.

J. Conductor Types
   1. All conductors for feeders rated at 100A and larger (No. 2 AWG CU and No. 1AWG AL) shall be Type XHHW copper or aluminum alloy (Southwire Stabiloy or equivalent), 600V, insulated with virgin cross-linked polyethylene insulation.
   2. All conductors for feeders rated less than 100A (No. 2 AWG CU) shall be type THHN/THWN, copper, 600V, insulated with virgin PVC compound and shall have an overall extruded nylon jacket.
   3. Conductors shall be insulated with virgin PVC compound and shall have an overall extruded nylon jacket.
   4. Nylon "skim" or "dip" coating IS not acceptable.

K. A green ground wire, sized according to the NEC Table 250-122, shall be installed in each conduit, and kept isolated from the white or gray neutral wire.

L. All wire and/or cable shall be delivered to the job site in full factory lengths of 500'-0" minimum. Longer reels may be used where conditions dictate.

M. Factory “shorts”, scrap or warehouse and prior job “clean-outs” (leftovers) will not be acceptable.

N. Feeder phase identification from left to right or front to back facing front of equipment shall be one of the following:

X	Y	Z	N
Black	Red	Blue	White (120/208 Volt Feeders)
Yellow	Brown	Orange	Gray (277/480 Volt Feeders)

O. Wire Connections and Devices:
   1. Taps and splices in all feeder and branch circuit conductors larger than No. 8 shall be made with approved solderless, pressure type bolted connectors.
   2. Splices in conductors No. 8 and smaller may be made with preinsulated Scotchlock or Ideal wing-nut spring tension connectors.
   3. Junctions made in exterior circuits shall utilize a setscrew junction connector with three attachment points and a removable gel-filled cap and clamp Raychem Gelcap SL.

4. MC Cable shall be allowed for use as final connection to motors and luminaire power whips. Additionally, MC Cable may be used on branch circuits only with approval of the Office of Design and Construction. Conduit shall be provided from the branch panel to a local junction box. From the local junction box to the final device, MC Cable is allowed.

PART 3 – GROUNDING & BONDING

3.01. REQUIREMENTS

A. Flexible connections to motors shall be jumpered with a No. 14 green equipment grounding conductor, or per National Electrical Code Table 250- 122.

B. Install a green bonding jumper between the outlet box and the receptacle grounding terminal on all flush mounted receptacles.

C. An insulated ground wire shall be installed in all feeders, branch circuit and lighting circuit raceways. Ground wire shall be sized in accordance with N.E.C. Article 250.

D. Grounding bushings shall be utilized on each conduit which is not bonded to a grounded enclosure by means of properly installed conduit nuts, one on each side of the enclosure panel and properly tightened such as to cut through the panel paint and make bare metal to metal contact.

E. Ground all step-down transformers in accordance with N.E.C. Article 250-30 for Grounding Separately Derived Alternating Current Systems.
   1. The bonding jumper shall be directly connected to a grounding electrode.
   2. The transformer case shall be bonded to the grounding electrode conductor but shall not be used as the grounding electrode.
   3. Grounding electrode conductor shall be protected within rigid metallic conduit.

F. Install grounding bonding jumper across all building expansion joints, conduit, busway, and cable tray expansion fittings.

G. Install a building grounding electrode system in accordance with N.E.C. Article 250 and as required by the local inspecting authority.
   1. The building framework, metal siding, underground metal water piping, natural gas piping, concrete encased electrode and other made electrodes shall be sufficiently bonded together to form the grounding electrode system.
   2. Connections to the metal underground water piping system shall be made on the line side of the water meter.
   3. Natural gas piping shall not be utilized as a grounding conductor.
   4. It shall be the Contractor's responsibility to provide a grounding system acceptable to the local inspecting authority.

H. Buildings with steel framework shall have a ground loop (counterpoise) installed around the perimeter of the building and connected to the steel.

I. Columns at every corner and intermediate points 60 feet on center. Use #4/0 tinned copper buried at least 18” below finished grade. Provide ground rod connected to loop at each corner and 60 feet on center. Connect all lightning downleads to loop. Ground rods shall be ¾” X 10’ copper clad steel.

J. Provide at least one ground test for each service at the ground road closest to the service entrance. Use bolted and clamped type connections between conductor and ground rod.

K. The Contractor shall demonstrate by testing that the electrical service grounding system to earth resistance value is 10 Ohms or less, utilizing a “clamp-on” or 3-point fall of potential tester.

PART 4 – RACEWAY AND BOXES

4.01. REQUIREMENTS

A. Minimum conduit size shall be 3/4 inch for power and lighting circuits.

B. Provide three (3) spare 1-inch conduits up to 24” above finished ceiling and one down.

C. All rigid conduit and electrical metallic tubing shall be hot-dipped galvanized, sherardized, metalized, or electro-galvanized. Use of aluminum conduit is not permitted.

D. Conduit in stud partitions, concealed above ceiling, or above the bottom chord of bar joists may be electrical metallic tubing.

E. Conduit for circuits 100V to ground or greater in mechanical equipment rooms, electrical equipment rooms, chases, and areas subject to physical abuse shall be exposed rigid galvanized steel or intermediate grade conduit below six feet from floor.

F. Conduit for circuits below 100V to ground in mechanical equipment rooms, chases, and areas subject to physical abuse shall be electrical metallic tubing.

G. Conduit on exterior block walls, or exposed exterior shall be full weight rigid galvanized steel.

H. Buried Conduit:
   1. Exterior conduit below grade shall be minimum 1".
   2. Conduit buried in concrete pours shall be Schedule 40 PVC, Schedule 80 PVC, or electrical non-metallic tubing.
   3. Conduit buried beneath building slabs shall be Carlon Schedule 40 or Schedule 80 PVC.
   4. Exterior conduit below grade shall be Carlon Schedule 40 or Schedule 80 PVC.

I. Feeder conduits for 5 kV and 15 kV systems installed below grade shall be encased in red concrete for their entire length.

J. Flexible galvanized steel conduit shall be used for "make-up" connections to rotating machinery equipment or flush lighting fixtures. Flexible conduit in damp or wet locations shall be liquid tight. Flexible conduit at exhaust fans shall allow hinged access into the exhaust fan.

K. Conduits installed surface mounted shall utilize one-hole or two-hole type straps.

L. Pull and Junction Boxes:
   1. All pull boxes shall be galvanized sheet steel, minimum No. 14 gauge.
   2. Pull boxes shall not be installed in inaccessible locations.

PART 5 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

5.01 REQUIREMENTS

A. Nameplates should be provided on all major equipment, including the following:
   1. Primary Switches
   2. Circuit Breakers & Switches in Distribution Panels
   3. Disconnect Switches
   4. Panels
   5. Motor Starters
   6. Motor Controls
   7. Transformers
   8. Contactors

B. Nameplates shall be plastic laminate, white face with black engraved letters, numbers, etc. for normal power; red face with white letters, numbers, etc. for emergency power, attached with stainless steel screws.

C. Warning/Sense tape with metal backing shall be installed 12” above exterior below grade feeders.

D. Provide ‘arc flash warning’ and ‘PPE ratings’ (as defined by NFPA 70E) signage on all switchgear, switchboards, motor control centers, distribution panels, panelboards and similar equipment as defined in section 26 05 74 Arc Flash Program.

PART 6 – PANELBOARDS

6.01 REQUIREMENTS

A. The panelboards shall be not more than 92” high and shall be fully rated for the short circuit current available at the terminals. Series-rated equipment is not acceptable.

B. Distribution panelboards may be circuit breaker or fusible switch type.

C. Neutral bus shall be fully rated and isolated from the ground, except as service rated equipment.

D. Bus bars shall be extended to the maximum standard height in each section.

E. Sections of distribution panels shall be bussed with full capacity, three-phase, four- wire copper.

F. Equipment supplied with vertical bus sized to accommodate only the branch feeders supplied will be rejected.

G. All panelboard circuit breakers shall be bolt-on type.

H. Panelboards shall be designed with 20% spare capacity (physical and electrical capacity).

I. Panelboards shall be dead front type and equipped with thermal magnetic molded case circuit breaker units, as indicated.

J. Cabinets shall be galvanized, code gauge, sheet steel and shall be minimum of 17" wide and 5-3/4" deep.

K. Provide adequate wiring and gutter space and a means for circuit identification.

L. Provide a glazed, typewritten circuit directory.

M. Breakers shall be common trip, bolt on type, rated a minimum of 10,000 amperes for 208v and 22,000 amperes for 480v interrupting capacity. Breakers shall be rated for the load connected.

N. Provide flush doors with lock and keys. Provide two (2) keys for each panel.

PART 7 – MOTOR CONTROLS

7.01 REQUIREMENTS

A. Motors 1/3 HP and smaller shall be 120V or 208V, single-phase.

B. Motors that are an integral part of packaged equipment may vary from the above to meet manufacturing standards.

C. Motor Starters:
   1. All motor starters and associated controls shall be provided with engraved laminated plastic nameplates.
   2. All single speed starters for motors smaller than 1/2 horsepower shall be manual starters complete with overload and pilot light.
   3. Furnish a 16-gauge sheet metal enclosure with hinged cover of sufficient size to house the spare fuses and pullers.

D. Mount the enclosure near the load where practical.

E. Where motors are grouped reasonably close together, motor control centers should be used.

F. The minimum size combination starter shall be NEMA No. 1.

PART 8 – WIRING DEVICES

8.01 REQUIREMENTS

A. Switches:
   1. Wall switches shall be 20A, industrial heavy duty Specification grade, nylon toggle, brass binding screws and shall be:
      a. Cooper 2221 Series
      b. Hubbell HBL1221 Series
      c. Leviton 1221 Series
      d. Pass & Seymour PS20AC1 Series

B. Receptacles:
   1. Duplex receptacles shall be industrial heavy duty specification grade 20A, side and back wired, solid brass mounting strap, fiberglass reinforced housing.
      a. Cooper 5362 Series
      b. Hubbell HBL5362 Series
      c. Leviton 5362 Series
      d. Pass & Seymour 5362 Series
   2. Duplex receptacles connected to emergency power shall be red.
   3. GFCI type duplex receptacles shall be feed-thru type.

C. Cover plates:
   1. Switch and receptacle plates shall be Type 302 stainless steel, Hubbell 97000 Series or approved equal by Cooper, Leviton or Pass and Seymour.

D. Installation:
   1. Feed through wiring devices shall be pig-tailed.
   2. Wiring devices shall not be split wired.
   3. Circuit numbers shall be indicated on the inside face of the coverplate.

PART 9 - FUSES

9.02 REQUIREMENTS

A. Low voltage fuses shall be manufactured by Bussmann, Ferraz Shawmut or Littelfuse.

B. All fuses 0 to 600 amps shall be Type R rejection series.

C. All fuses shall be of the current limiting type as follows:
   1. 0 to 90 amps dual element, time delay Class RK-5; Bussmann FRN- FRS, Ferraz Shawmut TR-R TRS-R or Littelfuse FLN-R/FLS-R.
   2. 100 to 600 amps dual element, time delay, Class RK-1; Bussmann LPN- LPS, Ferraz Shawmut A2D-R A6D-R or Littelfuse LLN-RK/LLS- RK.
   3. Above 600 amps time delay, Class L; Bussmann KRP-C, Ferraz Shawmut A4BQ, 601 to 2000 amps, and A4BY above 2000 amps or Littelfuse KLP-C.
   4. Motors shall be protected by dual element, time delay fuses.
   5. Where circuit breaker panels are protected by fuses, they shall be fast acting, current limiting type.

PART 10 - DISCONNECTS

10.01 REQUIREMENTS

A. Motors located remote from the combination starters shall have a lockable disconnect in the power feeders, not a lockout stop in the control circuit.

B. Disconnects for exterior equipment and similar applications shall be rain tight, NEMA 3R.

C. All disconnect switches shall have interlock defeaters for maintenance purposes.

D. Fusible switches shall have rejection type fuse clips.

E. Disconnect switches shall be heavy duty type as manufactured by Square D, General Electric, Siemens, or Cutler-Hammer.

PART 11 – TRANSIENT VOLTAGE SUPRESSION

11.01 REQUIREMENTS

A. Surge protection devices shall be provided on each main distribution, and sub- distribution switchboard or panelboard. Surge protection devices shall be provided on branch panels that serve sensitive electronic loads (i.e., computers).

B. TVSS units shall comply with UL 1449, 2nd edition.

C. TVSS units shall be modular in design and replaceable without interrupting power to the switchboard or panelboard. Provide with non-fused switch or circuit breaker disconnect.

D. The protection levels shall be:
   1. 200 kA (L-N, L-G, L-L, N-G) MDP
   2. 100 kA (L-N, L-G, L-L, N-G) SDP
   3. 60 kA (L-N, L-G, L-L, N-G) Branch Panel

PART 12 – LIGHTING

12.02 REQUIREMENTS

A. The wiring system for interior lighting shall utilize conduit and wire. Modular type systems shall not be permitted, except in Master/Satellite systems where a ballast in the Master Luminaire also controls lamps in the Satellite luminaire.

B. Illumination levels shall be as described in the latest edition of the IESNA Lighting Handbook.

END OF SECTION 26 00 00

SECTION 26 56 00
STREET LIGHTING

PART 1 – GENERAL

1.01 EQUIPMENT

A. Street lighting fixtures as indicated on the Plans shall be furnished by the Contractor. The Contractor is responsible for coordinating with the manufacturers of specified fixtures and provide submittals for approval and to ensure that subsequent orders and delivery dates will not conflict with the job schedule. The Contractor shall apply the following procedure when ordering light fixtures:

   a. The Contractor shall maintain complete and accurate documentation of communication with suppliers.

   b. The Contractor shall request fixture submittals for the approval of the Owner within five days of notification of the award of contract and shall verify that the submittals have been received by the Owner. Allow for a review time of 15 business days.

   c. The confirmed order of purchase of the fixtures shall be placed early enough to allow for timely delivery of the fixtures. If there is to be a delay in the delivery, the Contractor shall make every reasonable attempt to inform the Owner of the delay at the soonest possible time. At a minimum, the Contractor is to secure a confirmed delivery date from the manufacturer at the time of ordering and follow up on this delivery data periodically until the order is received by the Contractor.

   d. If there is to be a delay in delivery, the Contractor is to make available to the Owner all of the written records pertaining to the order.

1.02 QUALITY ASSURANCE

A. Lighting fixtures shall be manufactured by a recognized manufacturer and bear the approval label of a test laboratory recognized by the code enforcing agency. Additionally, this label shall conform to the specific location of installation such as “damp” or “wet.”

B. All fixtures shown on the Plans are to be furnished with all necessary mounting devices and accessories. In all cases, the Contractor is responsible for installing the fixtures with proper and appropriate structural support.

C. Lamps shall be provided for all fixtures. Where specific lamps are indicated on the Plans, these lamps (or approved equal) shall be provided by the Contractor. Where general specifications of lamps are indicated on the Plans, they shall be Sylvania, General Electric, Phillips, or approved equal prior to purchase.

D. The Contractor shall exercise care when handling and installing fixtures to protect finishes, lenses, and other visible components. The Owner and Owner’s Representative reserve the right to reject any damaged or flawed materials and products.

PART 2 – PRODUCTS

2.01. MATERIALS REQUIREMENTS

A. The solar light assembly shall be modular in construction enabling plug and play installation. Each component of the assembly shall be replaceable without affecting the function of other components.

B. Individual components shall utilize plug-in quick connectors with male and female parts labelled for matchup.

C. The solar light assembly shall be capable of automatic updates, remote monitoring, and diagnostics for each unit individually through 4G/LTE connectivity.

D. The assembly shall allow for logging of weather trends to factor upcoming weather forecast to predict needed power consumption and adjust luminaire operation to prevent downtime.

E. The solar light assembly shall meet the structural requirements specified in AASHTO: Standard Specifications for Structural Supports for Highways, Signs, Luminaires and Traffic Signals, 6th Edition and be designed for a basic wind speed of 90 mph. Structural design including foundation design for the solar light pole shall be prepared by or under the direction of and signed by a structural engineer, registered in the state of California.

F. The solar light assembly shall include a lockable hand hole that is sized to provide easy access to the battery, controller, driver and/or other components necessary for the operation of the solar powered lights. The insides of the poles shall contain provisions for securely mounting or placing system components inside the pole without being suspended within the pole.

2.02. POST TOP ACORN LUMINAIRE

A. The post top luminaire shall be a glass “Acorn” style luminaire with an aesthetic appearance as shown on the plans. The LEDs shall have a life expectancy of 100,000 hours with not less than 70% of original brightness rated at 25 degrees C. The LED’s and printed circuit boards shall be 100% recyclable and shall be protected from moisture and corrosion by a conformal coating of 1 to 3 mils.

Style:	Acorn, glass.
Height:	Nominal 33 inches.
Width:	Nominal 14 inches.
Diameter:	< 16 inches.
EPA:	< 1.5 (ft^2).
Material:	356 alloy cast aluminum fitters.
LED Panel:	LED grade high efficiency prismatic glass.
Wattage:	Maximum consumption 40W.
Lumen Output:	4400 lumens (nominal).
Efficacy:	Minimum 100 lumens per watt.

Distribution:	Type 5.
Mounting:	Post top mountable on 3” diameter x 3” high tenon.
Forward Voltage:	52 VDC, +/- 10%.
Color:	Black textured.
Warranty:	7-year limited warranty.

2.03. SOLAR PANEL

A. The pole shall include a removable and field replaceable cylindrical solar module panel with 360-degree power generation coverage, capable of meeting the entire power requirements for the post top luminaires. The cylindrical solar panel shall not project more than 1/2 inch beyond the face of the structural pole when installed at any point along its circumference.

The solar panel shall meet the following requirements:

Type:	Monocrystalline silicon cells.
Material: glass.	Scratch-resistant, self-cleaning smoothness, non-yellowing borosilicate
Diameter: pole shaft	Outer diameter of cylindrical solar module not to exceed 0.5 inch plus outer diameter.
Height:	Not to exceed 6-feet per module.
Elevation:	Lowest point of the solar panel, minimum 7.5 feet above ground.
Efficiency Rating:	20% efficient, minimum.
Life Expectancy:	25-year nominal, minimum.
Mounting position:	Vertical.
Ambient Oper Temp:	-4 degrees F to 140 degrees F.

2.04. BATTERY

A. The battery for the solar powered luminaire shall be sized to be located within the pole with access through the lockable handhole cover. The battery shall be of a Lithium Ion configuration.

The battery shall meet the following requirements:

Storage Capacity:	850Wh minimum.
Turnaround Charge:	Minimum 95% efficiency.
Cycle life:	Minimum 80% retention after 2,000 cycles at 91 degrees F.
Battery Cell:	Balancing and monitoring capable for system optimization.
Operating Temp:	-4 degrees F to 140 degrees F.
Life Expectancy:	Minimum 8 years.
Warranty:	5 years, no pro-rating.

2.05. CONTROLLER

A. The controller for the solar system shall be sized to be located within the pole with access through the lockable handhole cover. The controller shall allow for system to factor past weather data for future weather forecasts to predict power consumption requirements algorithmically and adjust luminaire operation.

The controller shall meet the following requirements:

Connectivity:	4G/LTE or later allowing automatic updates, remote monitoring and diagnostics.
Comm Protocol:	GSM LTE-M TLS 1.2 or later.
System Monitoring:	Sensors for ambient temperature, power input, LED output with remote monitoring and diagnostics.
Charge control:	Minimum (2) maximum power point trackers (mppt).
GPS Capabilities:	GPS transponder allowing Lat/Lon positioning and live dusk to dawn calcs.
Reporting Capabilities:	Real-time reporting of battery charge status, battery voltage, system temp and luminaire status.
Programming Capable:	Local programming via USB port or over the air updates.
Operating Temp:	-4 degrees F to 140 degrees F
Life Expectancy:	Minimum, 8 years.
Warranty:	5 years, no pro-rating.
Remote Monitoring:	5 years included with purchase.

The batteries and controller in the solar light system shall be pre-wired by the manufacturer. The controller shall be in an “off” position during transport and storage.

2.06. SOLAR LIGHT POLE

A. The light poles shall be a Hapco solar light poles or approved equal. In general, the finish on light pole assemblies shall match that of the fixture. The Owner and Owner’s Representative reserve the right to reject unmatched material. Poles shall be handled carefully at the job site and any scratches shall be repaired. Any damaged poles are to be replaced if rejected. Poles will be direct-bury behind the sidewalk.

B. The solar light pole shall meet the following requirements: The pole shaft will be constructed of seamless extruded tube of 6063 Aluminum Alloy per the requirements of ASTM B221. The shaft assembly shall be full-length heat treated after base weld to produce a T6 temper.

Material:	6063 Aluminum Alloy.
Diameter:	8 inches (nominal).
Type:	Round, tapered aluminum.
Luminaire Mount:	Post top, 3-inch diameter x 3-inch high tenon.
Height:	Nominal 12’ to pole top, not including direct bury length.

Color	Black powder coat finish.
Foundation Type:	Direct bury or anchor bolt.
Warranty:	Lifetime warranty against corrosion. LIGHT POLE ASSEMBLIES

PART 3 – EXECUTION

3.01. LIGHTING POLE BASES

A. Where light pole assemblies include components set perpendicular to the pole, these members are to be set plumb with respect to right angles. Light fixture poles shall be set within one (1) degree of plumb.

B. The Contractor shall ensure final operation of lights.

SECTION 31 20 00
EARTHWORK

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. Excavating and fill for rough grading at the site.

B. Trenching and backfilling for utilities and rainwater conveyance.

C. Stockpiling of soil for later use.

1.02 RELATED SECTIONS

A. SECTION 01 52 05, CONSTRUCTION STAGING AREAS

B. SECTION 01 74 14, CLEANING

1.03 CODES AND STANDARDS

A. State of California, Department of Transportation (CalTrans), Chapter 19, 2018

B. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

C. Code of Federal Regulations Title 29 CFR Part 1926, Subpart P, Excavations.

D. Occupational Safety and Health Administration (OSHA) Document 2226.

E. ASTM 21556: Density and Unit Weight of Soil in Place by Sand-Cone Method.

F. ASTM D 1557: Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 lbf/ft^3)

G. ASTM D 2922: Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

H. ASTM D 2937: Density of Soil-In-Place by the Drive-Cylinder Method.

I. ASTM D 422: Standard Test Method for Particle-Size Analysis of Soils

J. ASTM D 2419: Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate

K. Title 29 CFR Part 1926: Safety and Health Regulations for Construction.

1.04 TEST AND INSPECTIONS

A. **Fill Material**: Determine suitability of fill material not previously evaluated.

B. **Maximum Density Tests**: Determine optimum moisture content and maximum dry density of fill materials placed and compacted in accordance with ASTM D1557, Procedure A.

C. **Field Density Tests**: Determine in-place density of fill materials placed and compacted in accordance with ASTM D 1556, ASTM D 2922, or ASTM D 2937. One test should be conducted for every 10,000 square feet per lift.

1.05 DEFINITIONS

A. **Backfill** is soil material used to refill the spaces from excavation.

B. **Borrow Material** refers to material obtained from sources off the site.

C. **Dewatering** consists of discharging accumulated stormwater, groundwater, or surface water from excavations or temporary containment facilities.

D. **Embankment** is soil material being placed upon the surface of existing ground where the resulting construction will be higher than the adjacent ground surface.

E. **Excavation** is the removal of material above subgrade elevations indicated on the plans.

F. **Existing Boulders** are boulders salvaged from site areas as noted on Plans and as directed by Owner's Representative.

G. **Fill** is soil material used to raise the existing grade.

H. **Final Backfill** is the material above the select backfill zone to three (3) inches below finish grade.

I. **Initial Backfill** is material surrounding and covering pipe extending from the pipe bedding to six inches above the top of the pipe.

J. **Palliation** involves intermittently watering and sprinkling water with such frequency as will satisfactorily alleviate dust.

K. **Pipe bedding** is material placed under and around pipes to provide equal support along the length of pipe installed underground in a trench.

L. **Recycled Fill** refers to asphalt concrete paving debris from demolition work.

M. **Select Backfill** is material above the initial backfill zone and below the finish backfill zone.

N. **Site Boulders** are New, imported, boulders.

O. **Subgrade** refers to the surface of an excavation or the top surface of a fill or backfill immediately below subbase or topsoil materials.

P. **Structures** refers to retaining walls, slabs on-grade, rain tanks, curbs, electrical or mechanical appurtenances, or any other man-made stationary feature constructed above or below the ground surface.

Q. **Topsoil** is all the soil above the lower root line of fine vegetation.

1.06 EXISTING UTILITIES

A. The Contractor shall locate and mark all substructures and utilities prior to beginning excavation.

B. The Contractor shall dig test pits to confirm the location of underground facilities. These test pits shall include dewatering, backfilling, and surface restoration when necessary. If test pits are excavated in paved areas, surface restoration will consist of temporary pavement until final trenching and pavement restoration is completed.

C. When utility line excavation occurs near existing utilities, whether or not indicated on the Plans, ensure existing utility services remain fully operational. Protect and support utility lines in a manner to prevent damage. Method of protection is subject to Owner's Representative's approval.

D. Expeditiously repair damaged utilities at no cost to the Owner.

1.07 DUST CONTROL

A. Effectively dust-palliate working area, unpaved areas, and involved portions of the site throughout the entire construction period.

B. Chemical treatment of any type is not permitted. Use of reclaimed water shall conform to the requirements and guidelines of governing health authorities and be specified approved by Owner's Representative.

1.08 TRAFFIC

A. The Contractor shall minimize the amount of interference with adjacent roads, streets, walkways, and other occupied facilities during earth-moving operations.

B. The Contractor shall not block the entrance or exit of the neighboring fire station.

C. The Contractor not close or obstruct street, walkways, park, golf course or other neighboring occupied or used facilities without permission from the Twain Harte Community Services District (CSD).

1.09 DISPOSAL OF MATERIALS

A. The Contractor shall dispose of materials unsuitable for reuse in the Work offsite. Suitable materials may be reused in the Work for embankment, fill, or backfill.

B. Unless otherwise specified by Owner's Representative, material obtained from the project excavations may be presumed to be suitable for use as fill or backfill provided that all organic material, rubbish, debris, and other objectionable material is first removed.

1.10 DEWATERING

A. The Contractor shall prevent surface water and groundwater from entering excavations and from ponding on subgrades.

B. The Contractor shall reroute surface water away from excavated area and not use excavated trenches as temporary drainage ditches.

C. The Contractor shall discharge of water within the project limits. If water cannot be discharged within the project limits due to site constraints, dispose of uncontaminated water in an area approved by the Twain Harte CSD.

D. The Contractor shall ensure that any dewatering discharge does not cause erosion, scour, or sedimentary deposits that could impact natural bedding materials.

E. The Contractor shall conduct all dewatering operations in accordance with the CalTrans *Field Guide to Construction Site Dewatering.*

1.11 ALLOWABLE TOLERANCES:

A. All cut and fill shall be within a tolerance of $\pm$0.10 feet for grades indicated on the Plans.

B. All structures (including hardscape) shall be within $\pm$0.02 feet of the grades indicated on the Plans.

1.12 SUPPORTED EXCAVATION

A. The Contractor shall provide ladders, steps, ramps, or other safe means of egress for workers in trench excavations 4 feet or deeper per Occupational Safety and Health Administration (OSHA) standards.

1.13 CONTAMINATED MATERIALS

A. The Owner is not aware of any contaminated material within the project limits. If such material is encountered, the Contractor shall contact the Engineer immediately for directions.

1.14 EXPLOSIVES

A. The use of explosives is not permitted at the site.

PART 2 – PRODUCTS

2.01. BACKFILL

A. Backfill material shall be compacted to achieve a minimum relative compaction of 90%.

B. Material from excavations that is to be used for backfilling should be free of trash, debris, and stones greater than 6 inches.

C. Material excavated in excess of that required for backfilling will be disposed of away from the site, unless otherwise permitted by the Twain Harte CSD.

D. If backfill is to be placed around a structure, the material is to be spread equally around all sides.

2.02. BORROW SOIL

A. Borrow material shall be non-expansive, predominantly granular material that is free of particles less than 2 inches in any dimensions, free of organic and inorganic debris, and not more than 12 percent by weight passing the No. 200 sieve behind retaining walls and 25 percent elsewhere.

B. Borrow material must be free of man-made refuse such as concrete, asphalt concrete, residue from grinding operations, metal, rubber, debris, and rubble.

2.03. RECYCLED FILL

A. In lieu of disposal off-site, some asphalt concrete paving debris, resulting from the work of this Project only, may be crushed for limited use as recycled fill. Imported asphalt concrete debris may not be broken, crushed, or otherwise processed on-site.

B. Recycled fill shall conform to SSPWC Section 200-2.4 unless otherwise indicated by the Owner's Representative.

C. Recycled fill shall comprise no more than 10 percent (by volume, compacted) of the total fill.

D. Recycled fill is limited to not less than two feet below the bottom of concrete pads and foundations. Recycled fill is not to be used in the top one foot of landscaped areas.

E. Imported recycled fill is not acceptable.

2.04. RAIN GARDEN / BIO-SWALE SOIL MIX

A. Rain garden / bio-swale soil mix material must be suitable for the purpose intended and be free of unsuitable material and contaminants.

B. Soil Mix shall, at a minimum, be composed of 50%-60% Sand, 20%-30% of Top Soil and 20%-30% Compost.

C. Soil Mix material must be free of trash, site debris and other materials not meeting the composition mix above.

2.05. SITE BOULDERS AND COBBLES

A. Existing Site Boulders on the Twain Harte Meadows site as identified by the field survey to be relocated as per plans. Existing boulders can be observed on-site. Sizes range approximately from 1.5 by 2 feet to 3 by 3 feet.

B. The Contractor is responsible for sourcing the boulders required to supplement what is available on-site (Site Boulders) per the boulder schedule shown on the Plans. The Site Boulders shall be select, high-quality stone. Broken boulders, boulders with sharp edges, friable boulders or scarred boulders will not be accepted. All New Boulders shall be selected by and approved by the Owner's Representative. The Contractor has the option to source boulders that are like those used at the bocce ball court, which is adjacent to the proposed Twain Harte Meadows site (see company contact information below).

a. <u>Company Information:</u>
Timberline Environmental Services, Inc.
Office address: 22709 Twain Harte Dr., Twain Harte, CA 95383
Shop address: 29925 Highway 108, Cold Springs, CA 95335
Phone: (209) 586-1541 Office
Cell: (209) 481-5790 Terry Northcutt
Terry Northcutt, CEO, President
Email: terry@timberlineenv.us
Contract Administrator: dee@timberlineenv.us Dee Helzer
Accounts payable: office@timberlineenv.us
Small Business HUBZone
CAGE No. 1QUU2
Registered in SAM.gov, M7PKP57L2JM3
Website: Timberlineenvironmental.com

C. Color shall be variable, from light brown to tan and grey, as determined by the Owner's Representative from the quarry inventory.

D. In addition, the Contractor is responsible for sourcing the gravel/cobble mix (rock mulch) for the bioswales and rain gardens. Gravel and cobble placement will be field directed by the Owner's Representative. The gravel and cobble mix for rain gardens and bioswales shall be as follows:

- 2 parts ¾" to 1" wash gravel,
- 6 parts 1" to 3" wash gravel,
- 2 parts 4" to 6" wash gravel,

- 1 part 6” to 10” cobble, and
- 1 part pea gravel.

E. The Contractor is responsible for procuring and transporting all stone to the site and completing the work as specified. Contractor will have an excavator with a thumb attachment to minimize damage to boulder material and grading of park stormwater basin.

2.06. PIPE BEDDING

A. Unless otherwise indicated on the Plans, pipe bedding shall be comprised of clean sand and native free-draining granular materials, free from all vegetation and debris.

B. Bedding shall meet gradation requirements when tested in accordance with ASTM D 422 and have a minimum sand equivalent of 30 as determined by ASTM D 2419.

Sieve Size	% Passing Sieve by Weight
½ inch	100
No. 4	70 - 100
No. 16	50 - 90
No. 50	10 - 50
No. 200	0 - 10

PART 3 – EXECUTION

3.01. PROTECTION

A. The Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other potential hazards created by earth-moving operations.

B. Do not allow earth-moving equipment within the branch spread perimeter (drip line) of existing trees that are to remain.

C. When excavation adjacent to existing trees to remain is necessary, exercise all possible care to avoid injury to trees and tree roots. Excavate by hand all areas where there are roots two inches or larger. Tunnel under and heavily wrap with burlap roots two inches or larger in diameter, except when directly in the path of the pipe or conduit, to prevent scarring and excessive drying. When a trenching machine runs close to trees that have roots smaller than two inches in diameter, hand trim the wall of the trench adjacent to the tree, making clean cuts through the roots. Paint roots one inch and larger in diameter with two coats of Tree Seal or approved equal. Close trenches adjacent to trees within 24 hours. When this is not possible, shade the side of the tree adjacent to the tree with burlap or canvas.

D. Barricade all open trenches during work hours and cover at the close of each day’s work.

E. Provide adequate barriers marked with white flags, throughout the duration of the installation to project site improvements, existing features, and stockpiles of materials.

F. Sequence, schedule, coordinate, and perform the Work to maintain safe, unobstructed passage as required for emergency egress and general site access. Provide any and all bridging of trenches of work, barricades, etc., that may be required to comply with applicable safety regulations.

3.02. DEWATERING

A. The Contractor shall reroute surface water away from excavated area and not use excavated trenches as temporary drainage ditches.

B. The Contractor shall discharge of water within the project limits. If water cannot be discharged within the project limits due to site constraints, dispose of uncontaminated water in an area approved by the Twain Harte CSD.

C. The Contractor shall ensure that any dewatering discharge does not cause erosion, scour, or sedimentary deposits that could impact natural bedding materials.

D. The Contractor shall conduct all dewatering operations in accordance with the CalTrans *Field Guide to Construction Site Dewatering.*

3.03. ROUGH GRADING

A. Site rough grading will generate a graded soil surface to the appropriate tolerances. In addition, drainage terraces, swales, and other drainage structures necessary for the protection of existing structures at the site are to be installed.

B. Rough grading includes excavating pavements and other obstructions visible on the surface and 1-foot below the surface, removing underground structures, removing abandoned drainage pipes, and removing other materials as indicated.

C. Elevations and contours indicated on the drawings are to finish grade unless otherwise indicated. Make allowances for pavement thickness, bases, and landscape material where applicable.

3.04. EXCAVATION, GENERAL

A. Excavate materials of every nature to the dimensions and elevations indicated on the Plans. Use equipment of suitable type for the materials and conditions involved in the Work.

B. Where additional excavation is required to remove unsatisfactory materials that may be encountered, such additional work shall be paid for by means consistent with the terms outlined in the Contract.

C. Place backfill on subgrades free of mud, frost, snow, or ice.

D. Uniformly grade area to a smooth surface that is free of surface irregularities.

E. Remove materials not approved for use as topsoil or fill and excess excavated materials from the site.

F. Confine excavated materials to immediate area of stockpiled location designated by the Owner's Representative.

3.05. COMPACTION

A. **Parking and Pedestrian Walkway**: Compact soils below parking areas and walkways to 90 percent of the Modified Proctor maximum dry density for the full depth of fill.

B. **Landscape Areas**: Compact soils below all landscape, planting, and sod areas to 85% of the Modified Proctor maximum dry density for the full depth of fill unless otherwise noted on the Plans.

C. **Building Areas:** Compact soils below buildings (and for a distance of five feet beyond the perimeter footing) to at least 90 percent of the Modified Proctor maximum dry density for the full depth of fill. Proof roll from a level that is two feet above ambient water table. This may require locally filling low areas prior to using a vibratory compactor. Densify subsoils by making repeated overlapping coverages of roller as it operates at its full vibrational frequency and at a travel speed of no more than two feet per second.

D. **Utility Trenches:** Compact the initial backfill to a relative compaction of 95%.

3.06. TRENCH EXCAVATION

A. The Contractor shall excavate trenches for rainwater conveyance piping, stormwater conveyance piping, and other utilities indicated on the construction Plans.

B. The Contractor shall excavate trenches to uniform widths per ASTM D2321.

C. The Contractor shall excavate and shape trench bottoms such that they support pipes and conduit. The subgrade should be shaped to provide continuous support for bells, joins, pipe barrels, joints, and fittings. The Contractor shall remove all projecting stones and shape objects along the trench subgrade.

D. The Contractor shall excavate trenches six (6) inches deeper than the elevation of the pipe invert to allow for the placement of bedding course.

E. The Contractor shall place backfill on subgrades free of mud, frost, snow, or ice.

F. Barricade all open trenches during work hours and cover at the close of each day's work.

G. Maintain trenches and other excavations free of water while lines are being placed and until backfill has been completed and approved. Ensure adequate pumping equipment is available at all times for emergencies and dispose of water in such a manner as not to create a nuisance or cause damage to property. Do not allow water to migrate outside of the construction area and use Owner-approved methods to confine water to construction areas.

H. **Bracing and shoring** – Support excavations in accordance with all legal requirements. Set and maintain sheet piling and shoring timbers in a manner that will prevent caving of walls of excavations or trenches.

I. **Bedding** – Do not cover lines until they have been inspected and approved for alignment and grade and recording for "as-built" survey information by the Owner's representative. Commence bedding immediately after approval and survey information recording. Then carefully place bedding around utility lines so as not to displace or damage the line. Fill symmetrically on each side of the line. Compact bedding to 90 percent of the maximum dry density in accordance with ASTM D 1557 using mechanical equipment.

3.07. SOIL FILL

A. Place fill in uniform lifts not exceeding eight inches in loose thickness that will uniformly compact to the required densities.

B. Bring each layer to between ± 2 percent of optimum moisture content before compaction. Add water by uniformly sprinkling and mixing it with the soil. Add or blend additional fill materials or dry out existing material as required.

C. When moisture content and condition of each layer is satisfactory, compact to the specified density. Compact areas not accessible to motor-driven equipment with mechanical or heavy hand tampers.

D. Rework compacted areas failing to meet specified density as determined by tests. Recompact and retest as required to achieve property density.

E. Prior to placing fill material on existing surfaces, scarify to a depth of six inches and recompact to the same degree of compaction as the overlying fill material.

3.09. SITE BOULDER PREPERATION AND PLACEMENT

A. Subgrade Preparation

1. Areas where Site Boulders (including existing boulders (relocated)) are to be placed shall be graded to achieve the design intent under direction from the Owner's Representative. General grade elevations are shown on the plans. Boulder elevations shall be determined in the filed by the Owner's Representative. The soil surface shall be smooth and free from any obstructions to provide adequate contact area between the soil and boulders.

2. Site Boulder and Existing Boulder Placement

i. Contractor shall provide personnel both experienced and skilled in boulder placement (high-end residential garden level craftmanship) to complete the specified boulder placement. Provide at a minimum, (1) equipment operator and appropriate machine/equipment and (2) man crew for boulder setting. Boulder placement will be field directed by the Owner's Representative.

ii. Site boulder and Existing boulder setting shall be completed under direct observation of the Owner's Representative. Approved mock-up will be used to control all boulder installation detailing and quality.

iii. Site Boulders and Existing Boulders shall be located/relocated within the site per the Plans and Owner's Representative direction.

iv. Prepare site to accept Site boulders and Existing boulders as described on the plans and as directed by the Owner's Representative. Verify placement and boulder and stone types and sizes with Owner's Representative prior to installation. Boulders shall be placed after rough site grading has been completed, and prior to site paving operations. See plans for additional information.

v. Contractor shall be required to use a track excavator with articulating thumb and zero clearance arm capable of picking up, rotating, handling, and setting 2+ ton boulders. Site boulders and exiting boulders shall be expertly set to ensure a high quality, residential garden level of boulder setting workmanship. Ensure tight, permanent fit between adjacent boulders and native soil.

vi. Transport site boulders and existing boulders to general locations shown on plans. Install site boulders and existing boulders in final locations directly by Owner's Representative in the field.

vii. Project all site improvements during the Site Boulders and Existing Boulders placement.

3.09. GRAVEL AND COBBLE PLACEMENT

A. Gravel and cobble placement in rain gardens and bioswales will be field directed by the Owner's Representative.

3.10. CLEAN UP

B. Keep project site and adjacent streets reasonably free from accumulation of debris resulting from work specified in this section.
C. Immediately remove dirt, debris, and overreaching construction clutter from buildings and structures, walls, pavements, and curbs.

END OF SECTION 31 20 00

SECTION 31 21 00
PATHWAYS

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. Pathway material and construction in accordance with ADA standards.

1.02 RELATED SECTIONS

A. SECTION 31 21 00, EARTHWORK

1.03 CODES AND STANDARDS

A. ASTM C136-Sieve Analysis of Fine and Coarse Aggregates

B. ASTM D2419- Sand Equivalent Value of Soils and Fine Aggregates

C. Caltrans Standard Specifications for Public Works Construction

D. RIS-Redwood Inspection Services Grades of California Redwood

E. CalTrans Permanent Pedestrian Facilities ADA Compliance Handbook

1.04 SEQUENCING

A. Do not install work specified in this section prior to acceptance of earth moving. Coordinate work specified in this section with work specified in other sections to minimize cutting of - and operation of - heavy equipment over newly installed surfacing.

1.05 QUALITY ASSURANCE/FIELD QUALITY CONTROL

A. Installer

a. Installations 500 square feet and over up to 3,000 square feet – must be a recommended installer at a minimum. Installations 3,000 square feet and over – must be an Approved Installer.

b. The installation instructions in this Specification are meant as a guide for bidding purposes and will be superseded by the approved Submittal of installation instructions from manufacturer and any field direction.

c. The Contractor shall dig test pits to confirm the location of underground facilities. These test pits shall include dewatering, backfilling, and surface restoration when necessary. If test pits are excavated in paved areas, surface restoration will consist of temporary pavement.

B. Porous Base Rock Testing

a. Testing shall occur during installation at 1-ton increments of shipping for sieve conformance. Results shall be submitted prior to completion of the stone base installation.

i. The stone field area shall have a permeable rate no less than 14” per hour. The testing shall be per Din 8035 Part 7, ASTM 2434 (constant head), or ASTM F2898 testing methods.

ii. In addition to the lab testing, after installation of any aggregate base

cross-section, designed to conduct rainfall to the sub-soils and/or under-drain system, the finished aggregate base shall be tested, *in situ* for infiltration rate, using method ASTM F2898. **The test shall be performed by a registered Geotechnical Engineer or certified agronomist.**

b. The Contractor is responsible to meet this performance specification, before proceeding with installation, and shall bear the cost of the on-site testing and the cost of any additional work necessary to achieve compliance with the specification.

c. All test results shall be logged and documented by the Owner's Technical Representative or Geotechnical Engineer. If at any time the processed stone base does not meet specifications, it shall be the Contractor's responsibility to restore, at his expense, the processed stone base to the required grade, cross-section and density.

d. After the contractor has independently confirmed compliance with all the above tolerances (planarity and elevation verified by a licensed surveyor and compaction, gradation, & permeability verified by Geotechnical Engineer, he shall notify the appropriate party and schedule a final inspection for approval. The contractor shall make available an orbital laser system to the Inspection Team for the inspection process.

e. The compaction rate for porous base rock should be 88%. The compaction rate for non-porous base rock should be 95%.

C. Standard Specifications:

a. Shall mean the California Department of Transportation Standard Specifications, latest active edition.

b. The pathway shall have a maximum longitudinal slope of 5% and a maximum cross slope of 2%.

1.06 MOCKUP

A. Construct mockup of crushed aggregate blended with surfacing, including base course and edging, at location approved by [Owner's Representative]. Build mockup 1 days prior to installation. The intent of the mockup is to demonstrate surface finish, texture, color, and standard of workmanship.

B. Notify Owner's Representative 1 day in advance of mockup construction.

C. Allow Owner's Representative to view and obtain approval of mock-up before proceeding with rest of crushed aggregate admixture surfacing.

D. Approved mock-up may remain as first in place construction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver all Admixture materials in original, unopened packaging. Protect materials and aggregate from contamination with foreign matter. Store under waterproof cover and

protect from dampness.

1.08 FIELD CONDITIONS

B. Do not install crushed aggregate blended with admixture surfacing when sub-base is wet at saturated field capacity.

C. Do not install materials when rain falls on it within 48 hours after the install, or when the temperature will go below freezing within the next five days following installation.

PART 2 – PRODUCTS

2.01. CRUSHED AGGREGATE BLENDED WITH ADMIXTURE SURFACING MATERIALS

A. Decomposed (DG), crushed aggregate.

a. DG shall have a 3/8" maximum gradation, produced from naturally friable rock/granite with enough fines to produce a smooth walking surface. Materials should be free from clay lumps, organic matter, and deleterious material. Blends of coarse sand and rock dust are not acceptable.

b. Use a single supply source for the entire quantity required.

c. Gradation, in accordance with ASTM C136:

i. Color: Should have gold to yellow hues. To be selected by Owner's Rep from manufacturer's standard colors.

B. Aggregate binder:

a. Provide Admixture. Color: Per Owner's Representative's decision.

2.02. BASE COURSE MATERIAL

A. Class II Permeable Base Rock.

B. Soft stone materials (i.e., sandstone, limestone, and shale materials) are not suitable. Stone supplier shall certify that all supplied stone will be clean of this type of stone. All types of stone shall meet the following stability requirements.

Test Method	Criteria
LA Abrasion (Calif. Test 211)	Not to exceed 40
Durability Index (Calif. Test 229)	Not less than 40

C. In addition, if stone stability to water and vehicles is in question, Owner has the right to perform additional testing to ensure material shall adhere to requirements of Caltrans Section 68, as well as additional applicable ASTM tests.

D. All testing fees shall be paid for by the Contractor.

E. **Permeable Stone:** Stone base materials shall be washed, 100% fractured, by mechanical means, with elongated characters on each individual particle larger than 1/4". Materials shall be devoid of mineral fines. All particles smaller than 1/4" shall be produced by manufactured means only. Rounded sands or aggregates are prohibited.

F. **Delivery Moisture Content:** Processed stone shall contain 90% to 110% of the optimum moisture content to ensure that fines do not migrate in transit or during placement and to facilitate proper compaction. The contractor shall ensure that the aggregate leaving the

source plant meets this requirement. The contractor is required to apply water to the processed stone on site to attain and maintain this minimum moisture content.

G. Aggregate or aggregate blends of permeable stone shall conform to the following gradation:

Sieve	Percent Passing by Weight (Intended Result)	Range
1”	100	100
3/4”	100	90 - 100
3/8”	78	40 - 100
No. 4	36	25 – 40
No. 8	26	18 – 33
No. 30	11	5 – 15
No. 50	6	2 – 10
No. 200	2	0 - 5

Durability Index (CTM #229) – 40 min
Sand Equivalent (CTM #217) – 70
LA Rattler (CTM #211) – 500 Revs, less than or equal to 40%

H. Specs for ⅜” minus and ¾” minus Crushed Aggregate Following ASTM D 1140-17:

I. 100% fractured on all sides with no rounded particles Sieve 200 - Non-expansive Clay Fines - not to exceed 18%

J. The below test is for ⅜” minus stone, at approximately 90% compaction when tested.

Sieve Size	% Passing	Sieve Ranges
1/2"	100	100
3/8”	95	98
No. 4	85	90
No. 8	75	85
No. 16	55	70
No. 30	38	57
No. 50	24	33
No. 100	15	24
No. 200	9	18
No. 400	0	9

2.03. ACCESSORIES

K. Water: Free from contaminants that would discolor or be deleterious to crushed aggregate blended with admixture surfacing.

L. Installation: Do not use a vibratory plate to compact the pathway. Use a lawn roller filled with water to compact. Use a 36" drum roller or dual-drum roller in static position for driveways and larger installations. It is highly recommended to use a volumetric truck for driveways and larger installations; if possible, the use of a paver is highly recommended as well.

PART 3 – EXECUTION

3.01. EXAMINATION

A. Examine grading and subsoil conditions. Do not proceed until conditions are acceptable.

3.02. PREPARATION

A. Excavation: Excavate to depth required so edges of crushed aggregate blended with admixture surfacing will match adjacent grades and have a maximum longitudinal slope of 5%.

B. Base Course Installation: Class II permeable base rock at 90% compaction.

C. Edging: Install flush with crushed aggregate blended with admixture. Provide sufficient stakes to secure in place.

3.03. INSTALLATION

A. There are two installation methods: “Dry” and “Wet.”

i. The dry method is for installations up to 500 square feet (most home applications).

ii. The wet method is appropriate for installations over 500 square feet (most large, commercial installations) and may require the use of a volumetric truck.

B. Mixing Method

i. Installations of less than 500 square feet may be mixed on-site.

ii. Installations of 500 square feet and over up to 3,000 square feet, must be delivered pre-mixed to the site.

iii. Installations 3,000 square feet and over up to 5,000 square feet must be supplied by an approved pre-mix facility.

iv. Installations over 5,000 square feet require the use of a volumetric truck.

C. Installation Depth (also known as “lift”)

i. For residential/pedestrian applications, 3-inch-thick layer (“lift”) over a 4-inch subgrade of compacted Class II base rock. Compaction rates for all applications are 88% to 92%.

D. Measurements

i. CRUSHED AGGREGATE BLENDED WITH ADMIXTURE SURFACING MATERIALS

1. Residential/Pedestrian Application - (2 bag mixture) One cubic yard of aggregate/decomposed granite and two (85 lbs) sacks of admixture combined shall cover 108 square feet at a 3-inch thickness.

a. Note: Aggregate/decomposed granite should be 3/8” minus material and follow our sieve percentages in this Specification Guide within a +/- 5% range.

ii. Class II Base Rock:

1. Residential/Pedestrian Application - After final compaction, base rock should have a 4-inch depth.

E. Mixing Ratios

i. Residential/Pedestrian Application – (2 bag mixture) The aggregate/decomposed granite (DG) is mixed with admixture at a 19:1 ratio (19 units of DG to 1 unit of admixture, measured in volume).

F. DRY METHOD INSTALLATION

i. **Class II Base Rock:** Moisten and compact base rock on the entire installation area to an even depth of 4-inch application. A vibratory plate can be used to compact the base rock; it should not be used to compact the admixture for residential installations.

ii. **Admixture:** Wheelbarrow the prepared Admixture/DG mixture to the installation site and place a layer of the mixture to one-half of the desired final lift. Be sure to spread the mixture out before proceeding to step 3; this will ensure the mixture is moistened and mixed thoroughly.

iii. Moisten the material with a hose end trigger sprayer attachment, avoiding puddling - oversaturation is detrimental and will negatively affect the integrity of the finished product. Rake area lightly to evenly distribute water throughout the mix or "lift". Walking on the area is perfectly acceptable; initial compaction can be performed by walking on the edges and corners.

iv. Install a second lift as above; when doing this, make sure to pay particular attention to the edges to ensure even material height, and moisten to dampen mixture.

v. Moisten until both lifts are damp. Proper moisture content can be checked by clenching your fist, when the mixture just stays together and the color just starts to transfer to your hand, it is ready to compact.

vi. Compaction: After proper moisture is achieved for compaction, hand tamp (with a 10” hand tamp) around benches, signposts, corners, boulders, et cetera. Pay particular attention to corners and edges to ensure tight compaction.

vii. Make several passes with a 36” lawn roller (filled with water), or for larger installations, a 36” walk-behind or drum roller in static position. Hand tamp out any imperfections with a 6” wooden masonry float.

viii. Make sure to keep your 10” hand tamp, lawn roller, and wooden floats clean at all times. Fill in any divots with fresh, loose material (removing any larger stone) and hand tamp with the wooden floats to match existing finish.

ix. When laying admixture in batches, be sure to use the cold joint method below to ensure a blemish-free installation.

x. Finishing: If desired, lightly sweep the finished surface in a perpendicular pattern with a medium-bristled push broom. Then make several more passes with the lawn roller until the desired surface texture is achieved. With larger installations, a roller in a static position can be used, making sure to keep the drum clean at all times. Remove spoils off the surface.

xi. DO NOT ALLOW MIXTURE TO DRY DURING INSTALLATION. MIST LIGHTLY WITH A HOSE END SPRAY HEAD AS NECESSARY OR COVER WITH A PLASTIC TARP.

xii. The final step for installation is a dampening with water of all newly installed and compacted materials. Using a shower head/spray hose attachment, moisten the entire newly installed area - avoid puddling. For the best results, moisten all newly installed paving a second time for the following 1 to 5 days, as practical. Slow curing is important to avoid cracking.

xiii. Make sure there is no direct application of uncontrolled water (e.g. irrigation or sprinkler water) prior to final curing.

G. WET METHOD INSTALLATION

i. After DG and admixture have been mixed but BEFORE installation has begun: Mix thoroughly and moisten with water until the mixture begins to marble or clump together. Squeeze the mixture in your fist and open your hand. When the color has just started to transfer onto your hand and the mixture just begins to stay together in a clump, it’s ready for installation.

ii. **Class II Base Rock:** Moisten and compact base rock on entire installation area to an even depth of 4-inch application. A vibratory plate can be used to compact the base rock; it should not be used to compact for residential installations.

iii. **Admixture:** Wheelbarrow the prepared admixture/DG to the installation site and spread the mixture over the compacted base rock.

iv. **Compaction:** Walking on the area is perfectly acceptable; initial compaction can be performed by walking on the edges and corners. Rake or grade area with the flat side of a landscape or asphalt rake (Do not use tine side), until the admixture is one inch above finish grade.

v. Once initial compaction has been completed, hand tamp (with a 10” hand tamp) around benches, signposts, corners, boulders, et cetera. Pay particular attention to corners and edges to ensure tight compaction.

vi. Make several passes with a 36” lawn roller (filled with water), or for larger installations, a 36” walk-behind or a dual-drum roller in static position. Hand tamp out any imperfections with a 6” wooden masonry float.

vii. Make sure to keep your 10” hand tamp, lawn roller, and wooden floats clean at all times. Fill in any divots with fresh, loose material (removing any larger stone) and hand tamp with the wooden floats to match existing finish.

viii. When laying in batches, be sure to use the cold joint method below to ensure a blemish-free installation.

ix. Finishing: If desired, lightly sweep the finished surface in a perpendicular pattern with a medium-bristled push broom. Then make several more passes with the lawn roller until the desired surface texture is achieved. With larger installations, a dual-drum roller in a static position can be used, making sure to keep the drum clean at all times. Remove spoils off the surface.

x. DO NOT ALLOW MIXTURE TO DRY DURING INSTALLATION. MIST LIGHTLY WITH A HOSE END SPRAY HEAD AS NECESSARY OR COVER WITH A PLASTIC TARP.

xi. The final step for installation is a dampening with water of all newly installed and compacted materials. Using a shower head/spray hose attachment, moisten the entire newly installed area - avoid puddling. For the best results, moisten all newly installed paving a second time for the following 1 to 5 days, as practical. Slow curing is important to avoid cracking.

xii. Make sure there is no direct application of uncontrolled water (e.g. irrigation or sprinkler water) prior to final curing.

H. The following information is applicable to BOTH installation methods.

i. You may walk on pathways immediately after installation. However, the pathway gets stronger with time. Ideally, stay off the newly installed areas for at least one day; after that, foot traffic is allowed. Vehicular traffic should avoid newly installed areas for 5 – 7 days.

ii. Newly installed paving surfaces will be fully cured in 28 days. At that time, the entire surface should be blown or swept off to eliminate loose surface materials. Minor cracking may take place. However, over time, the aggregate fines will fill in the minor cracks and they should disappear. Occasional blowing off the surface will help to minimize loose surface materials.

I. Cold Joint Methods

i. Cold joints can be used at the end of the workday.

ii. Place a 2”X4” or 2”X6” piece of wood or metal edging across the installation, loosely stake it, and finish compacting the material. Leave the board in place overnight.

iii. The next day, carefully lift the wood up and away.

iv. Continue with installation: Dampen the prior installation area. Place newly mixed admixture into the area, being careful not to overlap existing compacted material. Place a three foot length of 2"x4" carefully along the edge of the new

pour and compact by hitting/tapping the board with a single jack. Then, take a medium-bristled push broom and very lightly "feather" the two pours together.

J. Installing for Vehicular Traffic

i. Installing for vehicular traffic is nearly identical to the method above, EXCEPT you will use a vibratory plate or static dual-drum roller to compact the admixture after final compaction by a lawn roller. Make sure to keep the plate clean. If any ridges or ruts occur, fill in with a hand tamp, compact, and broom over it as the finishing instructions above.

K. Recommended Equipment

Tools	Materials
(3) Rounded point or flat edge shovels for moving product	Admixture bags (85 lbs.)
6 cubic foot cement mixer for mixing small installations	3/8” minus aggregate/ decomposed granite
Wheelbarrow for moving material	Class II Base Rock or Class II Permeable Base
8” or 10” hand-tamps for compacting edges and corners, step back fills, and small areas	Curbing or Header Board materials (if desired)
Hose with a shower spray nozzle for moistening dry product	Water source
Landscape and asphalt rake with flat edge for finish grading	
Heavy lawn roller filled with water to compact	
Medium bristled push broom for finishing	
(2-3) 6”-9” wooden masonry float for finishing (1) 6”-9” steel float for cleaning hand tamp and roller	

3.04. CURING PERIOD/PROTECTION

A. For Driveway Installations: Do not allow traffic on crushed aggregate blended with admixture surfacing for 5 days after placement or until compacted crushed aggregate blended with admixture surfacing has fully cured.

B. Protect crushed aggregate blended with admixture surfacing from damage until project completion. Repair damaged areas to match specified.

3.05. MAINTENANCE & REPAIRS

A. Follow manufacturer’s recommendations.

B. Maintenance: Depending on the end users desired finish surface, maintenance may require occasional blowing off or brooming of paved surface - DO NOT use a pressure washer to clean. Depending on quality of compaction at time of installation, a thin veneer of loose aggregate material is typical after the full 28 days cure period. If

cracking appears in a surface, broom loose aggregate “fines” into cracks and compact with a rubber mallet.

C. Repair: When repairing it is important to use the original aggregate/decomposed granite and the original Admixture color to match previously installed materials. If the paved surface has large areas of raveled material (loose aggregate/decomposed granite) the initial installation may not have been properly compacted, or blended materials did not have optimum moisture content during installation. The following are suggestions for repair of raveled materials:

    i. For the large loose areas, a minimum of a 3-inch admixture can be installed. The repair areas need to be saw-cut at the agreed length, removed, and re-installed. A portable concrete mixer or wheelbarrow can be used.

    ii. In areas that collapse/fail due to equipment weight, re-form and re-install with original materials as per specifications.

    iii. Cracks: Repair by brooming existing surface fines into the cracks. Compact with rubber mallet, moisten, and “feather” material into the final finish. This may have to be done several times. Another method is to sieve the existing decomposed granite to eliminate all aggregates higher than 1/16". Mix with Admixture to a 13 to 1 ratio, fill the crack. moisten and follow the above application. The third method of application is to get "playground" sand and proceed as with the above ratio and application.

END OF SECTION 31 21 00

SECTION 32 14 33
PERMEABLE PLASTIC PAVING

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. The work described in this specification is intended for the constructability and installation of TrueGrid (or approved equal) parking area.

B. Provide and install sub-base material as shown on drawings or per recommended sub-base alternatives as provided from additional manufacturer's information. See 'Materials'

C. Provide all products and installation per the manufacturer's instructions provided on this specification sheet and other available specification material.

D. Provide and install specified fill material for gravel fill option.

1.02 RELATED SECTIONS

A. SECTION 31 20 00, EARTHWORK

1.03 SITE CONDITIONS

A. Verify site conditions where the permeable pavers are to be installed and ensure constructability and installation access is free and clear of obstructions.

B. Review installation and coordinate permeable paver work with other work affected.

C. Notify project manager/site-supervisor of any open depressions and excavations made as part of the demolition/grading work for system installation and post warning signs if applicable.

D. Protect active sewer, water, gas, electric, drainage, and irrigation indicated or, when not indicated, found, or otherwise made known to the Contractor before or during installation work. If a utility is damaged, immediately notify the Twain Harte Community Services District (CSD) for corrective action.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:

a. Minimum of 10 years of experience of this Section.

b. Successful completion of three (3) previous projects of similar scope and complexity.

c. Manufacturer signed certificate stating the product is MADE IN THE US

B. Installer Qualifications:

a. Successful completion of (1) previous project of similar scope of complexity.

b. Maintains trained technicians on staff providing field service and warranty related work.

c. Minimum of (3) years of experience in work of this Section.

C. Installation and Excavation Safety: In accordance with OSHA requirements.

1.05 PRE-INSTALLATION CONFERENCE

A. Convene a conference approximately two weeks before scheduled commencement of the work in this Section. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.06 DELIVERY, STORAGE AND HANDLING

A. Do not deliver (unless otherwise specified) system components until time needed for installation and after proper protection can be provided for materials.

B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

C. Protect from damage due to weather, excessive temperature, and construction operations.

D. Leave protective coverings in place until just prior to installation.

E. Protect materials during handling and installation to prevent damage.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within manufacturers limits for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. All hard surface paving adjacent to permeable paver areas, including concrete walks and asphalt paving should be completed prior to installation of permeable pavers.

C. In wet weather, do not build on wet, saturated, or muddy subgrade.

D. In cold weather, do not use frozen materials or materials mixed or coated with ice or frost, and do not build on a frozen base or wet, saturated, or muddy subgrade.

E. Protect partially completed paving against damage from other construction traffic when work is in progress.

1.08 TRANSITION FROM HARDSCAPE

A. When transitioning to an adjacent hardscape, create a clean edge with existing pavement and ensure permeable pavers are flush or slightly recessed below the surrounding grade.

B. In the case when permeable pavers are against broken asphalt, cut out a small section and pave a clean line. Then ensure permeable pavers are flush or slightly recessed below the surrounding grade.

1.09 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty (at least 10 years) against defects in materials and workmanship.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer(s) for Permeable Pavers:

   a. Airlite Plastics Co. DBA TRUEGRID Pavers or approved equal.

B. Substitutions: Not permitted unless approved by Owner's Rep.

2.03 PERMEABLE PAVER SYSTEMS

A. Permeable Pavers, TRUEGRID PRO PLUS for gravel applications.

B. AASHTO H20, HS20 Rated.

C. Manufactured in the USA.

D. High density polyethylene (HDPE): 100 percent post-consumer recycled materials

E. Recycled and recyclable content: 100 percent.

F. S-Flexural joints molded in for soil seasonal expansion and contraction.

G. Color: black- carbon black additive for long-term UV stabilization.

H. Paver size: 24 inches by 24 inches by 1.8 inches.

I. Pre-assembled: 4-foot by 4-foot sections.

J. Cylindrical cell design for column strength. Cell size: 3.30 inch inside diameter.

K. Co-joined cells at 48 places for strength.

L. Wall thickness: 0.150 inches /.250-inch nominal.

M. A minimum of 2 co-joined common walls per cell for structural integrity.

N. Connections:

   a. No clips or stakes necessary.

   b. No additional parts or tools needed.

   c. Integral male-female three-point locking system.

   d. Wall thickness at tabs: 0.290 inch.

O. Molded in X-anchors to stabilize pavers: no stakes necessary.

P. Nominal Coverage per Paver: 4 square feet.

Q. Weight per paver: 5.25 lbs.

R. Permeability of System: 100 percent.

S. Compressive Strength (filled): 17,729 psi.

T. Material Safety: Groundwater neutral, 100 percent inert.

U. Chemical Resistant: Excellent: highly resistant to hydrocarbons, oils.

2.04 PARKING DELINEATORS

A. TRUEGRID SnowSpots for gravel applications or approved equal.

2.05 ADA, Traffic, and Parking Identifiers: TRUEGRID Plates for gravel applications or approved equal.

2.06 Base Material:

A. TRUEGRID PRO PLUS was developed to accept multiple acceptable base materials. Locally sourced angular stone/clean for base material. Crushed granite, sandy gravel material, crushed concrete, limestone rock, and crushed lava are some of the acceptable materials. Common base materials include:

a. AASHTO #57 Stone.

b. Hard, clean, angular, and open-graded (uniform size) drain rock -- from 3/4" to 1-1/2".

c. Base Course: Graded aggregate base course conforming to the following sieve analysis and requirements:

i. Percent Passing: 100 - Sieve Size: 3⁄4 – 1 inch

ii. Percent Passing: 85 - Sieve Size: 3/8 inch

iii. Percent Passing: 60 - Sieve Size: #4

iv. Percent Passing: 30 - Sieve Size: #40

v. Percent Passing: <3 - Sieve Size: #200, or 3 to 8 Percent for Grass Infill

B. Gravel Fill: Obtain clean, washed angular rock to fill the 1.8-inch-tall TRUEGRID PRO PLUS cells and spaces between. TRUEGRID PRO PLUS can be filled to top of cells and exposed or overfilled to hide cells. Fill rock should be 5/8 inch to 3/4-inch diameter.

a. TRUEGRID PRO PLUS's design does not require anchors on level ground or slopes up to 10 degrees. TRUEGRID PRO PLUS is designed for slopes above 10 degrees. However, as a precaution, anchors/staking may be considered per each sloped install above 10 degrees.

b. Fill rock, level to the top of cells for ADA compliance.

PART 3 – EXECUTION

3.01 EXAMANATION AND PREPARATION

A. Place base course material over prepared subbase to grades shown on plans or from manufacturer's recommended depths per application type, in lifts not to exceed 6",

compacting each lift separately to 95% Modified Proctor. Leave minimum 1.8” for Permeable Paver unit. Fill to final grade.

B. When applicable, backfill and compact depressions caused by excavations, demolition, and removal in accordance with the requirements outlined in SECTION 31 00 00, EARTHWORK.

3.02 INSTALLATION

A. Install Permeable Paver units by placing cells face up. Sheets come preassembled in 4’x4’ sheets and connect with friction fit interlocking connectors. No tooling required to connect or disconnect paver units. (9) Individual 16”x16” pieces can be disconnected from each 4’x4’ sheet and reconfigured as needed.

B. Units can be cut around curves and organic shapes on the job site with any electrical handsaw.

C. Maintain 1” clearance to any pre-installed object or surface structure. Top of cells shall be between .25” to .5” below the surface of adjacent hard-surface pavements.

D. Rock or soil fill aggregate can be driven directly on pre-filled pavers to be dumped and spread.

E. Gravel-Fill Applications:

a. Install Gravel into paver cavities by back dumping directly from dump truck or from buckets mounted to tractors. Hand shoveling fill gravel into the cells is also acceptable for smaller jobs.

b. Direct exit the site by driving forward. Pavers can handle high load capacities while empty, avoid sharp turns over unfilled rings.

c. The gravel fill can then be spread from the pile using steer loaders, power brooms, blades, flat bottomed shovels, and/or wide “asphalt rakes” to fill the cells. The gravel should then be compacted when the cells are at capacity by using a roller for larger areas or a vibrating plate for smaller areas.

d. If fully covering pavers, typical coverage is .25” - .5” above cells.

3.03 FIELD QUALITY CONTROL

A. Any damaged sections of pavers during installation shall be removed and replaced with no evidence of replacement apparent.

3.04 DISPOSAL OF REMOVED MATERIALS AND DEBRIS

A. Remove all excess materials, debris, and equipment from site upon completion of installation.

B. Clean and protect products in accordance with manufacturer’s recommendations.

C. Touch-Up, repair or replace products before substantial completion.

D. Dispose of scrap materials, waste, trash, and debris from the installation of the rainwater harvesting system in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by the Twain Harte CSD.

E. Burying or burning trash and debris on site will not be permitted.

F. Scrap materials, trash, and debris shall become the property of the CONTRACTOR and shall be removed from the site and be disposed of in a legal manner. Location of the disposal site and length of haul shall be the CONTRACTOR's responsibility.

3.05 MAINTENANCE

A. Gravel Fill: If the installation is one that is initially a cell covered installation, raking gravel back over exposed cell tops may be necessary if over fill aggregate migrates.

B. When snow removal is required, keep the edged plow blade a minimum of 1" above the paver surface to avoid damage to the paver surface.

END OF SECTION 32 12 43

SECTION 32 16 00
CURBS AND SIDEWALK RAMPS

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. Concrete curb and sidewalk ramps shall be constructed per the dimensions indicated on the plans and the following section of the specifications.

1.02 CODES AND STANDARDS

A. Allowable Tolerances

a. The face, top, and back of the curb shall not deviate from the plans more than ¼-inch over 10 feet as tested with a 10-foot straightedge or curve template, longitudinally along the surface.

B. Specifications and standards:

a. Section 73, Concrete Curbs and Sidewalks, of CalTrans Standard Specifications

b. ASTM C1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method

c. ASTM C117 - Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing

d. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

e. ASTM D8139 - Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction

f. Americans with Disabilities Act Accessibilities Guidelines (ADAAG)

1.03 PART 2 – PRODUCTS

2.01. CONCRETE

A. The construction of curbs or minor concrete containing at least 463 pounds of cementitious material per cubic yard. For extruded or slip form curb construction, the maximum aggregate size must be from 3/8 to 1 inch. The cementitious material content must be at least 505 pounds per cubic yard if a maximum of 3/8-inch aggregate is used.

2.02. MORTAR

A. Mortar must comply with Section 51-1.02F of CalTrans Standard Specifications.

2.03. JOINT FILLER

A. Preformed expansion joint filler must comply with ASTM D1751. As an alternative, a semi-rigid, closed-cell polypropylene foam, preformed joint filler that complies with ASTM D8139 may be used.

2.04. DETECTABLE WARNINGS

A. Detectable warning materials shall be durable with a non-slip surface not subject to spalling, chipping, delamination, or separation. All detectable warnings shall be approved by the Owner's Representative.

B. The truncated dome dimensions and spacing for detectable warnings shall be in accordance with the guidelines defined by the ADAAG for optimal detect-ability and public safety. Detectable warnings shall consist of raised truncated domes aligned in a square grid pattern in conformity with the ADAAG. Truncated domes shall have the following nominal dimensions: base diameter of 1.0 inches (0.9 inches minimum), top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and a height of 0.2 inches. Dome center-to-center spacing of 2.35 inches, measured between the most adjacent domes on the square grid. Dome center-to-center spacing for radial installations shall be 1.6 inches to 2.4 inches with a base-to-base spacing of 0.65 inches minimum. Detectable warning edges shall be sized and installed so that dome spacing is maintained across adjoining edges. Each dome shall have a minimum static friction of coefficient of 0.8 as tasted per ASTM C1028.

C. Detectable warnings shall contrast visually with adjoining surfaces, either light-on-dark or dark-on-light. Specific colors to be used shall be approved by the Owner's Representative.

PART 3 – EXECUTION

3.01. GENERAL

A. The top and face of the finished curb must be true and straight. The top surface of the curb must be uniform in width and free from humps, sags, or other irregularities. Clean any discolored concrete by abrasive blast cleaning or other authorized method.

B. Except for curbs on structures, you may place curbs with an extrusion machine or a slip form paver if:

i. Finished curb is true to line and grade.

ii. Concrete contains the maximum quantity of water that maintains the curb's shape without surface.

iii. Required surface texture is attained.

C. Check the flatness of the top and face of the curb and the surface of the gutter with a 10-foot straightedge. The surfaces must be flat to within 0.01 foot except at grade changes or curves.

3.02. SUBGRADE PREPARATION

A. The subgrade shall be constructed and compacted true to grades and lines shown on the plans. All soft or unsuitable material shall be removed to a depth of not less than 6 inches below subgrade elevation and replaced with material satisfactory to the Owner's Representative and the Engineer. Removal and replacement of soft or unsuitable material will be paid for as extra work.

3.03. FORMWORK

A. Concrete curbs shall be constructed by the conventional use of forms, or may be constructed by means of an appropriate machine when approved by the Owner's Representative.

B. Forms conforming to the dimensions of the curb and sidewalk ramps shall be carefully set to line and grade, and securely staked in position. The forms and subgrade shall be watered immediately in advance of placing concrete.

C. Forms shall be thoroughly cleaned each time they are used and shall be coated with a light oil, or other releasing agent of a type which will not discolor the concrete.

    i. Form oil must be of commercial quality, allow for the ready release of forms, and not discolor the concrete.

3.04. DETECTABLE WARNINGS

A. Detectable warnings shall be either placed in freshly poured concrete (wet-set) or recessed into pre-formed concrete. Detectable warnings using wet-set placement shall have an anchoring method that assures constant contact of the detectable warning bottom surface with the concrete as it cures, thus rendering the ramp a single monolithic structure. The thicker and heavier detectable warnings lowered into pre-formed recesses in the concrete substrate must demonstrate a firm fitting into metal reinforced frames without gaps along the edges that can channel water, sand, or debris. They must also be able to resist movement (i.e., sliding, rocking, or lifting) once in service. All attachment systems shall be approved by the Owner's Representative.

3.05. JOINTS

A. Joints shall be constructed in a straight line, vertical plane and perpendicular to the longitudinal line of the single curb, except in cases of curved alignment, where they shall be constructed along the radial lines of the curve.

B. Construct contraction and expansion joints at right angles to the line of the curb. Space contraction joints at 20-foot intervals. For curbs adjacent to existing concrete, align the curb joints with the existing concrete's pavement joints.

C. Expansion joints shall be constructed to the full depth and width of the concrete. The expansion joint material shall extend fully through the concrete and one inch into the subgrade with the top of the expansion joint material one-quarter inch below the top surface. Expansion joint material shall be secured in place prior to placement of concrete.

D. Unless otherwise specified, the large aggregate in contraction joints shall be separated to either side of the joint for a minimum depth equal to 25% of the concrete thickness, the finished depth shall be a minimum of ¾ inch.

SECTION 32 84 00
IRRIGATION SYSTEM

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. The work described in this specification is intended for the constructability and installation of the Irrigation system per applicable codes and standards. This section includes specifications for the Irrigation system and its components, quality assurance and inspection.

B. Irrigation System:

a. Irrigation Materials and Components

b. Installation Codes and Standards

c. System Location and Layout

d. Installation of Pipe, Equipment and Components

e. Irrigation Controller

f. Field Quality Control

g. Plant Establishment Period

1.02 RELATED SECTIONS

A. SECTION 31 20 00, EARTHWORK

B. SECTION 32 90 00, PLANTING

1.03 APPLICABLE CODES AND STANDARDS

A. International Organization for Standardization (ISO):

a. ISO 9001 – Quality management systems requirements.

B. California Plumbing Code (CPC-2022)

a. Title 24, Part 5

b. Chapter 15: Alternate Water Sources for Non-Potable Applications

c. Chapter 16: Non-Potable Rainwater Catchment Systems

C. ASTM A53 – Specifications for Pipe, Steel

D. ASTM D1784 – Specification for Rigid Poly (PVC)

E. ASTM D1785 - Specification for Poly (PVC) Schedule 40, 80, and 120

F. ASTM D2241 - Specification for Poly (PVC) SDR-Series

G. ASTM D2464 - Specification for threaded Poly (PVC)

H. ASTM D2466 - Specification for Poly (PVC) Fittings

I. ASTM D2564 - Specification for Solvent Cements for Poly (PVC)

1.04 SITE CONDITIONS

A. Verify site conditions where the Irrigation system is to be installed and ensure constructability and installation access is free and clear of obstructions.

B. Notify project manager/site-supervisor of any open depressions and excavations made as part of the demolition/grading work for system installation and post warning signs if applicable.

C. Protect active sewer, water, gas, electric, drainage, and irrigation indicated or, when not indicated, found, or otherwise made known to the CONTRACTOR before or during installation work. If a utility is damaged, immediately notify the Twain Harte Community Services District (CSD) for corrective action.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:

   a. Minimum of 10 years of experience of this Section.

   b. Successful completion of previous projects of similar scope and complexity.

   c. Maintain ISO-9001 production facilities including quality management protocols for production.

B. Installer Qualifications:

   a. Successful completion of (3) previous projects of similar scope of complexity.

   b. Maintain trained technicians on staff providing field service and warranty related work.

   c. Minimum of (3) years of experience in work of this Section.

C. Installation and Excavation Safety: In accordance with OSHA requirements.

1.06 SUBMITTALS

A. Product Data: Submit manufacturer's product data of the following items:

   a. Irrigation Controller

   b. Master Shut-Off Valve

   c. Remote Controlled Valves

   d. Backflow Preventer Assembly

   e. Valve Boxes

   f. Irrigation Heads and Emitters

   g. Related Equipment

B. Operation and Maintenance (O&M) Manual: Provide an operations and maintenance manual for the following items:

   a. Remote Controlled Valves

   b. Irrigation Controller

c. Maintenance Schedule

C. Manufacturers Installation Instructions: Submit installation instructions for control valves, meters, and irrigation controllers.

D. Irrigation Map and Schedule: Provide an Irrigation Zone Map along with the watering schedule (O&M) Operations and Maintenance Manual.

1.07 EXISTING IRRIGATION SYSTEM

A. Not Applicable

1.08 PRE-INSTALLATION CONFERENCE, SEQUENCING AND SCHEDULING

A. Convene a conference before the scheduled commencement of the work in this Section. Attendees shall include Architect, Irrigation Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

B. Coordinate layout and installation of Irrigation Sleeves, conduits, and piping under paved areas and other features prior to their construction.

C. Coordinate installation of Irrigation System with excavation of planting areas. Refer to SECTION 32 09 00, Planting for requirements. Typically, the irrigation system shall be installed after planting areas have been excavated and graded.

D. The Irrigation System shall be installed and tested prior to installation of plant material. Coordinate layout and installation of irrigation system with location and installation of plant material to assure that there will be complete uniform irrigation coverage of plating as indicated.

E. Tree and shrub locations shall be staked in the field prior to installation of irrigation pipe and heads. Refer to the plant list on the construction drawings for plant setbacks and spacing requirements.

1.09 WRENCHES AND KEYS

A. Furnish and deliver to Twain Harte CSD, two each of the following items upon completion of the work of this Section:

a. Wrench for each type of valve

b. Keys for valve box covers, controller panels, enclosures and backflow preventer assembly enclosure.

1.10 DELIVERY, STORAGE AND HANDLING

A. Do not deliver (unless otherwise specified) system components until time needed for installation and after proper protection can be provided for materials.

B. Store and handle in strict compliance with manufacturer’s written instructions and recommendations.

C. Protect from damage due to weather, excessive temperature, and construction operations.

D. Leave protective coverings in place until just prior to installation.

E. Store irrigation components inline with manufacturers recommended handling during transportation and site construction. System components shall be protected from damage during delivery.

1.11 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within manufacturers limits for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.12 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard limited warranty against defects in materials and workmanship.

PART 2 – PRODUCTS

2.01 IRRIGATION MATERIALS, EQUIPMENT, AND FACILITIES

A. The CONTRACTOR shall furnish all materials, tools, equipment, devices, appurtenances, facilities, and services as required to perform the installation of the irrigation system as shown in the construction drawings and described in the specifications.

B. The landscape irrigation system shall consist of a completely automatic, electrically controlled drip emitter and spray irrigation system. The system shall be designed to provide complete coverage with minimum maintenance. The system shall be designed to prevent overspray.

C. The irrigation system shall be furnished and installed complete, including the following functions and features: connection to irrigation stub-out (point of connection), backflow preventer assemblies and enclosures, all pipe, fittings valves, electric automatic valves, irrigation heads and emitters, valve boxes, and any accessories required for a complete install.

D. Irrigation materials and equipment shall be new, non-corroded, non-defective, that meet the specified standards.

E. Piping: Above grade piping shall be galvanized steel or an approved equivalent. Below grade mains and laterals shall be rigid polyvinyl chloride (PVC).

a. Galvanized Steel Pipe: Galvanized steel pipe shall be Schedule 40, conforming to ASTM A53, Grade B, with 150 pound banded, galvanized malleable iron screwed fittings.

b. Plastic Pipe: Shall be solvent welded PVC 1120 or 1220 pressure-rated pipe. Supply lines shall be ASTM D1785, Class 12454-B, PVC1120 or PVC1120, Schedule 40.

c. Irrigation Laterals: Shall be ASTM D2241, Standard Dimension Ratio (SDR) 13.5 (Class 315), for ½ inch and smaller and ASTM D1785, Class 12454-B (schedule 40), for pipe ¾ inch and larger.

d. Fittings: Shall be molded PVC, Schedule 40, conforming to ASTM D2466, Class 1433. Fittings shall be capable of withstanding maximum pressure rating of the pipe with which it is used. Provide Schedule 80 fittings conforming to ASTM D2464 where indicated or required.

e. Pipe thread sealant compound: Shall comply with requirements of ASTM D1784 or ASTM D2564, as applicable.

F. Conduit: Provide rigid non-metallic conduit conforming to UL Standard No. 651 for rigid non-metallic conduit, such as Schedule 40 PVC conduit, unless otherwise indicated.

G. Remote Control Valves: Remote control valves shall be Rainbird Series or approved equivalent for 2" and 1" sizes.

a. Valves shall have a contamination proof (CP) self-flushing nylon screen located at the valve inlet to filter out grit and prevent clogging of hydraulic control ports and assure reliable operation.

b. Valves shall be normally closed and be of the size indicated.

c. Valves shall be serviceable from the top without removing the valve body from the system.

d. Valves shall be equipped with a device that will regulate and adjust the flow of water, and with a manual shut-off.

e. The automatic closing time shall not be less than 5 seconds.

f. Valves shall be compatible with the electric automatic controllers.

g. Valve solenoid shall be designed for operation at 24-volts, AC, at 0.41 amps maximum in-rush current.

H. Unions: Unions shall be a minimum of 150-pound galvanized malleable iron with ground joints for above grade locations, and PVC schedule 80 threaded for below grade locations, and shall be provided on both sides of the wye strainer, control valves, and pressure reducing valve. Valves or strainers having integral union(s) are acceptable substitutes for union(s).

I. Irrigation Controller: Controller shall be having the following features:

a. Independent control over each station start and stop time (dwell time), and number of cycles per day.

b. 24-hour timer; 14-day minimum calendar period; dwell times adjustable in one minute increments for 1 to 360 minutes and cycles of minimum 4 starts in 24 hours.

c. 24-volt, 1.5-amp minimum output capacity with circuit breaker and with automatic reset and controller and valve surge protection.

d. Number of stations as indicated.

e. Six repeat watering program (cycles, windows) per day capability.

f. Two-minute dwell time for each station in event of power interruption.

g. Simple “user friendly” keyboard programming with messages flashed on display screen to prompt entries by user.

h. Retention of volatile program memory setting, time, and date for up to 18 hours in event of power failure with rechargeable battery and trickle charger provided. Non-volatile, entry erasable programmable memory (EEPROM) is preferred.

i. Shutdown and bypass of station in event of excess flow.

j. Manual actuation of each valve locally at the controller. This is in addition to the capability requirements for valve control by transceiver and remote control, statistical reporting to, and random access and reprogramming from the central computer.

J. Control, Common and Spare Wires:

a. Low voltage control wire shall be Type UF, 600-V size as recommended by the manufacturer of the controller furnished for this project, but not smaller than No. 14 AWG. Common wire shall not be smaller than No. 12 AWG. Insulation shall be of a type approved by the California Electrical Code for underground direct burial, Class 2 wiring, 24-volt, 60 cycle, A.C. service.

b. Controller valve main wire insulation shall be black or red. Furnish different color control wire for each controller. Each common line shall be white with a color stripe to match the color of control wires it serves. Spare wire shall be a color different from control and common wires.

c. Control wire identification tags shall be 2-1/4 inches by 2-3/4 inches in size.

d. All splices made to electrical wires shall utilize waterproof connectors. This includes a twist-on connector for making a UL-listed mechanical connection. Once the mechanical connection is made, it shall be inserted into a gel-filled tube and the twist-on connector shall lock in place when it reaches the bottom of the tube. The lid of the tube shall then be closed such that it applies pressure on the insulation of the wires and creates strain relief. Splices shall be capable of satisfactory operations under continuous submersion in water.

K. Shut Off Valves: Valves for underground service shall be, at a minimum, 125-pound rating with non-rising stem. Valves shall be easily accessible, housed in a valve box as specified.

L. Valve Boxes and Control Wire Junction Boxes: Commercial grade valve boxes shall be sized adequately to house the specific irrigation components indicated, including the electric remote-control valve, shut off valves furnished with a lockable cover with lift handle.

M. Valve Boxes for flush and air relief valves: Commercial grade round boxes shall be sized adequately to house the specific valves indicated.

N. Backflow Assembly Enclosure:

a. A vandal-resistant solid aluminum cover shall enclose the backflow preventer, filter unit, and pressure-reducing valve. The filter shall be mounted upstream of the backflow

preventer and provide 9-inches clearance between the filter drain valve and pad surface. The pressure reducing valve shall be provided downstream of the filter. Unions shall be provided on both sides of each component.

b. The cover shall be equipped with all stainless steel hardware and flush-mounted lockable hatch assembly designed for ease in handling. The cover shall be 3 inches clear of valve operating handles and appurtenances and shall be constructed of aluminum, with rigid, reinforced construction having a minimum corner angle, mid-section reinforcement and pre-punched viewing ports with rolled or relieved edges. The cover shall be bolted to a 4-inch thick reinforced poured-in-place concrete pad that shall extend a minimum of 3 inches beyond the cover. The cover shall be anchored to the pad at each corner using minimum 1/4 x 2-1/2-inch anchor bolts of galvanized steel.

c. The padlock will be furnished by Twain Harte CSD.

O. **Filters:** The filter unit shall have a removable cylinder and integral resilient seat ball type drain valve. The free flow principle shall be intrinsic in the unit design, causing the water flowing along the cylinder to seep through the cylinder perforations, allowing particles to drop to the bottom for accumulation. The filter shall be suitable for 75 psi operating pressure and equipped with 155 mesh media. The unit shall have a factory-applied label affixed to the housing indicating media size and a flow arrow cast on the housing. The filter inlet and outlet for 2-inch and smaller units shall be male pipe thread and for 3-inch and larger units shall be 150 psi flanged.

P. **Sleeves for Conduit and Water Lines:** For pipe 3/4 inch through 4 inches in diameter, provide PVC Schedule 40 pipe, two pipe sizes larger than the water line and two pipe sizes larger than conduit. For pipe 6 inches in diameter and larger, provide corrugated metal pipe (galvanized) a minimum of one pipe size larger than the sleeved pipe.

Q. Irrigation Heads and Drip Emitters: The sprinkler body, stem, nozzle and screen shall be constructed of heavy-duty, ultraviolet resistant plastic.

a. **Sprinkler Heads and Bodies:** Sprinklers shall be as specified on Irrigation Plans. Sprinkler shall have a 12-inch popup height, an integral check valve that holds up to 8 feet of head (3.50 psi), a heavy-duty stainless steel retraction spring, pressure regulation capability, flow shield build into the stem, a soft elastomer pressure-activated wiper seal, and a ratcheting system for easy alignment of the pattern. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body. Or approved equal determined by the Owner's Representative.

b. Drip Emitters shall be 0.5 GPH pressure compensating and installed on 1/2 inch poly drip line as specified. Tubing shall be 1/2 inch minimum nominal diameter with a minimum wall thickness of 0.050. Or approved equal determined by the Owner's Representative.

c. **Line Flushing Valves:** 1/2 inch PVC.

R. **Backflow Preventer:** 1" Zurn 375-XL Reduced Pressure Backflow Preventer. Or approved equal determined by the Owner's Representative.

S. **Water Flow Meter:** The water flow meter shall be a line-mounted, corrosion-resistant construction.

2.02 MANUFACTURERS

A. Acceptable Manufacturer(s) for Irrigation System:

a. DripWorks USA

b. Rainbird

c. Hunter

B. Substitutions: Any substitutions shall be equal to the equipment specified, as determined by the Owner's Representative.

PART 3 – EXECUTION

3.01 EXAMANATION AND PREPARATION

A. Do not proceed with installation until project site have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

C. When applicable, backfill and compact depressions caused by excavations, demolition, and removal in accordance with the requirements outlined in SECTION 31 20 00, EARTHWORK.

3.02 INSTALLATION STANDARDS

A. The landscape irrigation system shall be installed in accordance with applicable requirements of the California Plumbing Code and California Electrical Code, and the requirements of the jurisdictional water company or utility district.

B. Manufactured materials and equipment shall be installed in accordance with the respective manufacturer's instructions for the location and conditions.

C. Electric automatic controller, electric remote control valves, electrical wiring, and the installation thereof shall conform with applicable provisions and codes.

3.03 SYSTEM LAYOUT

A. It shall be the Contractor's responsibility to lay out the irrigation system. Location of facilities indicated on Contract Drawings are approximate and diagrammatic and may require adjustment. Work shall be laid out as accurately as possible to conform with the construction drawings. Provide additional offsets, fittings, sleeves, and other devices that are required to complete the installation.

B. Irrigation system shall avoid conflicts with plant materials, lighting standards, signposts, architectural features, above and below ground utilities, and drainage system. Irrigation piping layout is schematic, showing location of pipes and fittings approximately. For example, where pipe is shown parallel or close to planting bed areas, it is intended that pipe be located inside the planting bed area.

C. Minimum flow through any spray valve shall be eight gallons per minute with 30 psi at the downstream side of the remote-control valve and pressure-reduce valve.

D. Minimum flow through any drip circuit valve shall be 3 gallons a minute with 25 psi at the downstream side of the remote-control valve and pressure valve.

E. Sprinkler head spacing shall be in accordance with manufacturer's recommendations for overlapping coverage. All sprinkler heads shall provide head-to-head coverage with a minimum of one foot overlap.

F. Laterals shall be installed not less than 12 inches from fences, curbs, sidewalks, and pavement, unless otherwise indicated.

G. Modifications: Provide modifications to the irrigation system to avoid blockage of sprinkler irrigation patterns, to prevent overspray and excessive runoff onto walkway and parking areas, and to provide full irrigation coverage to the planted areas. Such modifications also include trimming and adding heads as required to spray around trees, light poles, sign posts, other objects that obstruct spray pattern, and adjustments required as a result of trees being relocated or removed due to underground utility or drainage problems.

3.04 TRENCHING AND BACKFILL

A. Trenches shall be only wide enough to provide sufficient working space on each side of the pipe for making joint and compacting bedding materials and backfill. The bottom of trench shall be graded and prepared to provide a firm and uniform bearing throughout the length of the pipe, sleeve, or conduit.

   a. Trenches for lateral piping shall provide for a minimum of 12 inches of cover.

   b. Trenches for mains and conduits shall provide for a minimum of 18 inches of cover.

   c. Trenches under paving shall provide for a minimum of 24 inches of cover.

   d. Trenches for subsurface drip lines/tubes shall be 6 inches deep, or as recommended by the drip line manufacturer.

B. After trenches have been excavated, pipe shall be installed, tested, and inspected, and the trench shall be backfilled without undue delay.

C. Before pipeline trenches are backfilled, the irrigation system shall be pressure tested and the location of irrigation heads modified as required to obtain complete and uniform coverage of each plant's root ball.

3.05 FIELD QUALITY CONTROL

A. **Field Inspection:** Coordinate filed inspection in accordance with appropriate sections and the California Plumbing Code.

B. System Testing:

   a. Installation oversight and technical support.

   b. Terminate and test control system wiring and operation of electrical components.

   c. Demonstrate proper pump and controls operation.

d. Make adjustments to meet user-defined system performance.

e. Review operation and maintenance procedures with Twain Harte CSD.

C. Each system shall be tested and approved by Owner's Representative before backfilling trenches. Electrical circuits shall be tested and operative prior to backfilling of trenches. Leaks in the irrigation system shall be repaired, defective materials replaced, and the test shall be performed again.

D. Prior to testing, sufficient backfill materials may be placed on pipes between fittings, couplings, and connections to ensure stability of the line. Fittings, couplings, and connections shall remain visible for the full period of the test. Before pressure testing, the system shall be flushed with control valves open. Pipe shall be plugged or capped where irrigation heads are to be installed, while testing the system.

E. The entire system shall be checked for uniform and complete coverage after installing and testing.

F. Mains, laterals, valves, fittings, and automatic electrical control valves shall be pressure tested. After assembly and installation, and after joints have cured for 24 hours, test main first, then capped laterals (before installation of heads). For mains, pump to 100 psi static pressure, then disconnect pump. Pressure gages shall be located at two points in the system and shall show no loss after a period of six hours. Laterals shall be tested at line pressure.

G. Pipes, where pavement will be installed above, shall be retested, after subbase and base course material have been installed.

H. Irrigation System Function Test: Function tests shall be performed for each electric automatic controller and associated automatic irrigation system. The function test shall consist of not less than five consecutive working days during which time each controller shall have completed at least ten complete cycles automatically for each station controlled by said controller. If unsatisfactory performance of the system develops, the condition shall be corrected, and the test repeated until continuous satisfactory operation for five consecutive working days is obtained.

I. Backflow Preventer Test:

a. Testing of back flow preventers shall be conducted by a certified back flow preventer tester. The tester shall hold a valid certification as a back flow preventer tester from the county or other jurisdictional authority in which the device to be tested is located.

b. Test for back flow preventers shall be satisfactorily completed after installation of the back flow preventer assemblies and before operation of the irrigation system. Back flow preventers that fail the required tests shall be repaired or replaced and retested.

J. Final Inspection: Prior to acceptance of the work, clean and adjust all systems. Operate all systems under the observation of the Architect. Irrigation heads shall be visually inspected for coverage. Remote control valves shall be properly balanced.

3.06 PLANT ESTABLISHMENT PERIOD

A. The plant establishment period shall be as specified in Section 32 90 00, Planting.

B. Timing of irrigation controllers shall be adjusted for optimum performance and, to prevent flooding, on a cycle to end not later than 6:30 a.m.

C. Upon completion of landscape planting and clean-up operations, the Contractor shall request a final inspection by the Architect. The Contractor will not be permitted to begin the plant establishment period until after the Engineer has approved the landscape irrigation system installation in writing.

D. The Contractor shall maintain electrical and irrigation systems throughout the plant establishment period. Defective equipment shall be replaced.

E. The Contractor shall provide a summary of the recommended irrigation schedule after completion of the establishment period.

3.07 DISPOSAL OF REMOVED MATERIALS AND DEBRIS

A. Clean and protect products in accordance with manufacturer's recommendations.

B. Touch-Up, repair or replace products before substantial completion.

C. Dispose of scrap materials, waste, trash, and debris from the installation of the irrigation system in a safe, acceptable manner, in accordance with applicable laws and ordinances and as prescribed by the Twain Harte CSD.

D. Burying of trash and debris on site will not be permitted. Similarly, burning of trash and debris at the site will not be permitted.

E. Scrap materials, trash, and debris shall become the property of the CONTRACTOR and shall be removed from the site and be disposed of in a legal manner. Location of the disposal site and length of haul shall be the CONTRACTOR's responsibility.

END OF SECTION 32 84 00

SECTION 32 90 00
PLANTING

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. The work of this Section consists of:

I. Providing labor

II. Equipment and materials for the acquisition and installation of:

i. Soils

ii. Plant materials

iii. Plant establishment maintenance.

1.02 RELATED SECTIONS

A. SECTION 31 23 00, EARTHWORKS

1.03 CODES AND STANDARDS

A. All local, municipal, and state laws, codes and regulations relating to all portions of this work are to be incorporated as part of these Specifications. These specifications shall not be construed to conflict with any of the below codes, regulations, or requirements. The Specifications and Drawings shall take precedence when they call for materials, workmanship or construction of a better quality or higher standard than required by the above-mentioned codes and regulations. Furnish without extra charge additional materials and labor required to comply with above rules and regulations.

B. State of California Model Water Efficient Landscape Ordinance (MWELO)

C. Public utility agency having jurisdiction over the project work.

D. "Sunset Western Garden Book," current edition.

E. "American Standards for Nursery Stock," American Association of Nurseryman, 230 Southern Building, Washington, D.C. 20005.

F. International Society of Arboriculture, Guide for Plant Appraisal, latest version.

G. United States Composting Council Compost Analysis Program (CAP)

H. United States Composting Council (USCC) Seal of Testing Assurance (STA) program.

I. Test Methods for the Evaluation of Composting and Compost (TMECC)

J. Manufacturer's recommendations.

1.04 QUALIFICATIONS:

A. **Labor Force:** Provide a foreperson and landscape installation and maintenance force thoroughly familiar with, and trained in, the work necessary to complete the tasks described herein in a competent, efficient manner acceptable to the Owner.

1.05 REQUIREMENTS

A. **Site Visit:** At beginning of work, visit and walk the site with the Owner's Representative and all sub-consultants to clarify scope of work and understand existing project/site conditions.

B. **Supervision:** The foreperson shall directly supervise the work force at all times and be present during the entire installation. Foreperson shall notify Owner's Representative of all changes in supervision.

C. **Identification:** Provide proper identification at all times for landscape maintenance firm's vehicles and a labor force uniformly dressed in a manner satisfactory to Owner's Representative.

D. Protect all existing and new plants from construction activities, deer, and rodents: Contractor shall be responsible for protection of all planting per Part 3.

E. All material substitutions shall be reviewed and approved by the Owner's Representative.

1.06 SITE PREPERATION FOR PLANTING AREAS

A. Prior to digging for the purpose of soil amending and planting, Contractor shall be aware of all underground utilities, pipes and structures. Contractor shall contact all utility companies for field location of underground utility lines prior to any excavation. Contractor shall take sole responsibility of any cost.

B. Do not proceed with planting installation as designed if obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of Owner's Representative. The Contractor shall assume full responsibility for all necessary revisions due to failure to give such notification.

C. Contractor shall be responsible for any coordination with subcontractors as required to accomplish planting operations.

D. Coordinate installation of large plant material with installation of structures such as wall footings, pavements, and curb and gutter.

1.07 PLANT MATERIAL STANDARDS

A. Quality and Size of Plants: Conform to the State of California Grading Code of Nursery Stock, No. 1 grade.

B. The contractor shall provide healthy, vigorous plant stock grown under climatic conditions similar to the conditions in the locality of the project.

C. Contractor shall furnish plant material free of insect pests or plant diseases. The Contractor shall comply with federal and state laws requiring inspection for plant diseases and infestations. The Contractor shall submit inspection certificates required by law with each shipment of plants, and deliver certificates to the Owner. Finally, the Contractor shall obtain clearance from the County Agricultural Commissioner as required by law, before planting plants delivered from outside the County in which planted.

D. Contractor shall warranty all plant materials per the specifications.

E. Contractor shall do their own quantity take-offs for all plant materials and sizes shown on plans.

F. See details and specifications for staking method, plant pit dimensions and backfill requirements.

G. Plant crown elevations relative to finish grade are shown on planting details and shall be strictly adhered to. Proper compaction of backfill to prevent settlement shall be required.

H. Trees and shrubs shall be installed prior to planting groundcover.

1.08 SOIL AMENDMENTS

A. Remove rocks larger than three inches from planting areas.

B. For soils less than six percent organic matter in the top six inches of soil, compost at a rate of a minimum of four cubic yards per 1,000 square feet of permeable area shall be incorporated to a depth of six inches into the soil.

C. On-site soils with an organic content of at least five percent can be properly stockpiled (to maintain organic content) and reused.

D. Contractor to loosen compacted soils and mix soil amendments and conditioners to a minimum depth of 12 inches in planting areas.

1.09 FINISHED GRADES IN PLANTING AREAS

A. The Contractor shall allow for the addition of specified quantities of soil amendments and conditioners in soil preparation and finish grading.

B. The Contractor shall be responsible to establish the specified finished elevation, including importing soil or excavation, removal and disposal at an approved location. The Contractor shall furnish and install supplementary amended import soil in any planting areas as necessary to achieve the specified finish planting grades. Imported soil shall be free of unwanted seeds.

1.10 WARRANTY AND REPLACEMENT

A. Maintenance Period: See Part 3.

B. Warrant all plants to be in a healthy, thriving condition until the end of the maintenance period, and deciduous trees, shrubs and vines beyond that time until active growth is evident.

C. Replace all dead and damaged plants and plants not in a vigorous condition immediately upon discovery and as directed by the Owner's Representative and at no cost to the owner. Install replacement plants before the final acceptance of the maintenance period in the size specified.

PART 2 – PRODUCTS

2.01. EXISTING PLANTING SOIL (TOPSOIL)

A. Existing Planting Soil is defined as on-site topsoil that is either to be removed and stockpiled for reuse or to remain in place during construction. Satisfactory planting soil shall be free of subsoil, clay, lumps, stones, and other objects over 4" in diameter, and without weeds, roots, and other objectionable material. The soil shall be fertile, friable, natural, productive soil containing a normal amount of humus, and shall be capable of

sustaining healthy plant life. Soil shall not be infested with nematodes or with other noxious animal life or toxic substances. Soil shall be obtained from well-drained, arable land, and shall be of an even texture. Soil shall not be taken from areas on which are growing any noxious weeds listed in Cal IPC (California Invasive Plant Council) such as morning glory, equisetum, or Bermuda grass, etc.

B. Minimize the extent of disturbance activities to minimize impacts to soil outside the project's construction limits.

C. Mitigate construction-related soil compaction in vegetation areas.

D. Stockpile and reuse native soils in construction impact areas. When stockpiling topsoil, store on a flat site, mound soil no higher than 4 feet high for less than 12 months, ideally 6 months. Regardless of time stockpiled onsite, cover to prevent soil erosion and contamination by weeds.

E. Mitigate construction-related soil compaction in vegetation restoration areas by ripping the soil to loosen its structure. After final slope grading and prior to placement, cut slopes should be cross-ripped horizontal to the slope to assist in anchoring the topsoil. The spacing of the ripping shanks should be three feet and penetration should not exceed 12 inches in depth. Where embankments are constructed, offsetting lifts of material to create an uneven surface prior to topsoil placement should be considered. Smooth slopes are not acceptable. Alternative approaches to soil ripping will be considered for terrain which is inaccessible by machine. Proposed alternate methods must be submitted to Owner's Representative for approval prior to implementation.

F. Use only well composted soil amendments and incorporate them per manufacturer recommendations unless otherwise specified by soil lab.

G. Following construction, stockpiled topsoil should be uniformly redistributed (placement) to a depth of six inches. Placed topsoil should be cat tracked vertically to the slope to compact the topsoil and to create horizontal pockets (safe sites) to hold seed and water.

H. The contractor shall avoid walking, operating equipment or driving vehicles on planting areas after soil preparation is complete.

2.02. COMPOST AMENDMENT FOR PLANTING SOILS

A. Compost shall be well decomposed, stable and weed free. It shall be derived from one or more locally sourced organic materials such as: food waste or urban plant debris, agricultural crop residue or herbivore animal manures with a preference for urban plant debris and food waste. It shall not contain mixed solid waste. The product shall contain no substances toxic to plants and will possess no objectionable odors.

B. The composted yard waste amendment shall be a mixture of feedstock materials including green material consisting of chipped, shredded, or ground vegetation and mixed food waste, or clean processed recycled wood products. Single source, biosolids (sewage waste) compost will not be acceptable.

C. Composted Yard Waste Soil Amendment properties to conform to the following:

1. Soluble Salts: See above.

2. Moisture Content: 35-60%.
3. Contaminants: The compost shall be free of contaminants such as glass, metal and visible plastic. Heavy meals, fecal coliform and Salmonella shall not exceed levels outlined as acceptable in the California integrated waste management regulations.
4. Maturity: Physical characteristics suggestive of maturity include:
    i. Color: Dark brown to black.
    ii. Acceptable Odor: None, soil-like, or musty.
    iii. Unacceptable Odor: Sour, ammonia or putrid.
    iv. Particle Characterization: Identifiable wood pieces are acceptable, but the balance of the material shall be soil-like without recognizable grass or leaves.

2.03. PLANTS

A. Plant the variety, quantity and size indicated on drawings. The total quantities indicated on the drawings are considered approximate and furnished for convenience only. Contractor shall perform plant quantity calculations and provide all plants shown on the drawings.

B. Take precautions to ensure that the plants will arrive at the site in proper condition for successful growth. Protect plants in transit from windburn and sunburn. Protect and maintain plants on site by proper storage and watering.

C. Install healthy, shapely and well rooted plants with no evidence of having been root-bound, restricted or deformed.

D. Tag plants of the type or name indicated and in accordance with the standard practice recommended by the American Association of Nurserymen.

E. If plant species shown on drawings are not obtainable, proposed substitutions of nearest equivalent size or variety and with an equitable adjustment of contract price must be submitted in writing to and approved by Owner's Representative in writing.

F. Tree Form – Large Container

1. Trees shall have a symmetrical form as typical for the species/cultivar and growth form.
2. Central Leader for Single Trunk Trees: Trees shall have a single, relatively straight central leader and tapered trunk, free of co-dominant stems and vigorous, upright branches that compete with the central leader. Preferably, the central leader should not have been headed; however, in cases where the original leader has been removed, an upright branch at least ½ the diameter of the original leader just below the pruning point shall be present.
3. Potential Main Branches: Branches shall be evenly distributed radially around and appropriately spaced vertically along the trunk, forming a generally symmetrical crown typical for the species.
4. Headed temporary branches should be distributed around and along the trunk as noted above and shall be no greater than 3/8" diameter, and no greater

than ½ diameter of the trunk at point of attachment.

5. Measure trees with branches in normal position. Height and spread dimensions indicated refer to the main body of the plant, and not from branch tip to tip.

G. Tree trunk – Large Container

1. Trunk diameter and taper shall be sufficient so that the tree will remain vertical without the support of a nursery stake.
2. Trunk shall be free of wounds (except properly made pruning cuts), sunburned areas, conks (fungal fruiting-bodies), wood cracks, bleeding areas, signs of boring insects, galls, cankers and/or lesions.
3. Tree trunks shall be undamaged and uncut with all old abrasions and cuts completely callused over. Do not prune plants prior to delivery.

H. Tree Rots – Large Container

1. Trunk root collar (root crown) and large roots shall be free of circling and/or kinked roots. Contractor may be required to remove soil near the root collar to verify that circling and/or kinked roots are not present.
2. The tree shall be well rooted in the container. When the trunk is lifted the trunk and root system shall move as one and the root ball shall remain intact.
3. The top-most roots or root collar shall be within one inch above or below the soil surface. The soil level in the container shall be within the limits shown in above table.
4. The root ball periphery shall be free of large circling and bottom-matted roots.
5. On grafted or budded trees, there shall be no suckers from the root stock.

I. All seed shall conform with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test.

2.04. TREE STAKES

A. Provide three-inch (3") diameter by ten feet (10') long for trees greater than 8' high and 1" caliper.

2.05. MULCH

A. A minimum 3-inch layer of organic wood chip mulch shall be applied on all exposed soil surfaces of planting areas except grass areas, creeping or rooting ground covers, or direct seeding applications where mulch is contra-indicated.

PART 3 – EXECUTION

3.01. PREPARATION

A. If project timeline allows, planting shall occur during the wet season to maximize the benefit of seasonal rains. Avoid planting during extreme heat or freezing temperatures.

3.02. PLANT PROTECTION AND REPLACEMENT

A. Inspect and protect all existing and new plants and trees against damage from construction activities, erosion, trespass, insects, rodents, deer, disease, etc. and provide proper safeguards, including trapping of rodent and applying protective sprays and fencing to discourage deer browsing. Maintain and keep all temporary barriers (Tree Protection Fencing) erected to prevent trespassing.

3.03. GENERAL PREPARATION OF PLANTING SOIL

A. All planting soils to be amended as specified in soil laboratory analysis report(s).

B. Provide a minimum of three-inch depth of amended planting soil in all planting areas, or more where shown or specified otherwise. Install soil in maximum six-inch to nine-inch lifts. Compact each lift prior to installing subsequent lifts.

C. Thoroughly wet down the planting areas to settle the soil and confirm irrigation coverage and operation. Allow soil to dry to be workable as described herein.

D. Prior to planting, soil shall be loose and friable to a minimum depth of 12 inches with a relative maximum compaction of 85%.

E. Prior to planting, soil shall be moist, but not so moist that it sticks to a hand shovel. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.

F. Finish Grade: Hold finish grade surface in planting areas 1/2-inch below adjacent pavement surfaces, tops of curbs, manholes, etc. Drag finish grade to a smooth, even surface. Grade to form all swales and berms. Pitch grade with uniform slope to catch basins, streets, curb, etc., to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas that shall be uniformly sloped between finish elevations. Slope surface away from walls so water will not stand against walls or buildings. Control surface water to avoid damage to adjoining properties or to finished work on the site. Take required remedial measures to prevent erosion of freshly graded areas.

G. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.

3.04. PLANT DELIVERY

A. If plant materials are not acquired from a local nursery, they shall be delivered to a temporary nursery/ staging area at the project site up to one month prior to implementation. This will facilitate proper acclimatization and “hardening off” of plants to local conditions prior to planting. Staging/nursing area location will be as instructed by the Owner’s Representative.

B. Temporary nursery shall have adequate space to stage all the plant materials in one location. The temporary nursery shall be equipped with sufficient water for irrigation,

fencing to exclude herbivory and tampering, and frost blanket to protect against temperature extremes.

3.05. TREE, SHRUB AND PERENNIAL PLANTING

A. Layout plants per the planting plan for approval by Owner's Representative prior to planting.

B. Tree and Shrub Planting:

1. Plants are to be hand planted with the planting hole excavated to 1-1/2 times the depth and 3 times the diameter of the plant container. Fill holes with water to saturate the surrounding soil.

2. The plant shall be centered in the hole and placed to a depth equal to the soil level within the container. Previously excavated native subsoil may be properly amended and used as planting soil, then backfilled into the planting hole prior to placing the plant in order to achieve proper planting depth and to center the plant within the hole. Once the plant is properly placed within the planting hole, the remainder of the planting soil shall be placed back into the hole. The soil shall be lightly tamped and firmed into place, such that voids and air pockets do not exist within the planting hole. Soil shall be replaced only to the level of the surrounding undisturbed soil and shall not be mounded around the stem of the plant.

3. Create a shallow watering basin for each plant (1 to 2 inches deep x 12 inches wide), except in Riparian Corridor planting areas.

4. ADD ALT: Protect each plant with a cage. Add stakes or staples to ensure cage will be stable and secure.

3.06. MULCH

A. Mulch all new planting with organic wood chip mulch to a minimum 3-inch depth.

B. Keep mulch away from base (trunk) of plant by a minimum of four inches.

3.07. WATERING

A. Water all plantings immediately after planting. Apply water to all plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering through the plant establishment maintenance period.

3.08. MAINTENANCE OF PLANTING

A. Maintain plants from time of delivery to site until final acceptance of landscape installation.

3.09. PRE-MAINTENANCE PERIOD REVIEW AND APPROVAL OF PLANTING

A. Receive approval of the installed planting prior to commencement of planting establishment maintenance period. Notify the Owner's Representative a minimum of

seven (7) days prior to requested review. Before the review, complete the following.

1. Complete all construction work.
2. Present all planted areas with all plants installed and appearing healthy.

3.10. PLANTING ESTABLISHMENT MAINTENANCE

A. Approach

1. Plantings shall be maintained in a manner consistent with the establishment and long-term sustainability of native vegetation.
2. Plantings are intended to be informal in appearance, to promote a naturalized setting, and to help blend the facilities in with the surrounding landscape. Excessive manicuring or tidying is inappropriate and not required.

B. Method

1. Plant establishment maintenance period shall be for a period of 120 days from approval of plant installation.
2. Pruning of planted materials shall be avoided, except where stems and branches interfere with pedestrian or vehicular circulation, walls, and eaves of buildings, or where a line-of- sight needs to be maintained.
3. Raking and leaf removal within planted areas shall be avoided. Accumulated litter and duff will create a more natural appearance, help to build soil fertility, retain soil moisture and help preclude the establishment of weeds. However, litter and duff materials removed from other areas (after planting and during regular maintenance) shall not be applied to planted areas to avoid over-accumulation and deleterious effects to planted materials.
4. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work or maintenance.
5. Keep watering basins in good condition.
6. Remove non-native weeds by hand only.

C. General Requirements

1. Maintenance Period: The planting establishment maintenance period required shall be 120 calendar days after all planting and irrigation is complete, seed is installed/seeded, and as approved by Owner's representative. A longer period may be required if the plants are not thick, vigorous and even, or if the plant material is not acceptably maintained during the maintenance period. The start of the maintenance period to be confirmed by Owner's Representative. Contractor to notify Owner's Representative of start and end dates of maintenance period.
2. Planting establishment maintenance immediately follows, coincides with, and is continuous with the planting operations, and continues through seed installation, and after all planting is complete and accepted; or longer where necessary to establish acceptable stands of thriving plants.

3. Protect all areas against damage, including erosion, trespass, insects, rodents, disease, etc. and provide proper safeguards. Maintain and keep all temporary barriers erected to prevent trespass.
4. Keep all walks and paved areas clean. Keep the site clear of debris resulting from construction or maintenance activities.
5. Repair all damaged planted areas and replace plants and reseed immediately upon discovery of damage or loss, except during periods of extreme heat or freezing, in which case replanting shall resume once conditions improve.
6. Keep contract areas free from weeds by cultivating, hoeing or hand pulling. Contractor shall not use chemical weed killers or line trimmers.

D. Tree and Plant Maintenance

1. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the Owner's Representative.
2. Keep watering basins in good condition and weed-free at all times. Replace all damaged, unhealthy or dead trees, shrubs, and grasses with new stock immediately; size as indicated on the drawings.

3.11 PLANT REPLACEMENT

A. Approach

1. Plant Replacement shall occur during the planting establishment maintenance period.
2. Dead plants shall be replaced in roughly the same location and species selection as originally planted, as informed by monitoring activities and site observations.
3. Replacement plants shall be provided at the Contractor's expense. Coordinate with the Owner's Representative.

3.12 FINAL PLANTING REVIEW AND ACCEPTANCE

A. At the conclusion of the planting establishment period, schedule a final review with the Owner's Representative. On such date, all project improvements and all corrective work shall have been completed. If all project improvements and corrective work are not completed, continue the planting establishment, at no additional cost to the Owner, until all work has been completed. This condition will be waived by the Owner's Representative under such circumstances wherein the Owner has granted an extension of time to permit the completion of a particular portion of the work beyond the time of completion set forth in the Agreement.

B. Submit written notice requesting review at least 10 days before the anticipated review.

3.13 CLEANUP AND PROTECTION

A. Contractor shall exercise caution to avoid washing or sweeping dirt and debris into the storm drain system.

3.14 DISPOSAL

A. Recycle all waste. Reuse or return unused items such as palettes, flats and pots. All plant debris shall be separated from other refuse and taken to a facility where it will be recycled i.e., to produce compost or mulch.

END OF SECTION 32 90 00

SECTION 33 14 00
SITE WATER DISTRIBUTION

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. On-site potable water distribution systems, including connections to existing systems, sterilization, testing of water mains, and all appurtenances required for the complete systems. Refer to Section 22 14 53 for the piping and plumbing specifications associated with the rainwater conveyance system.

B. System design pressure is 125 psig.

1.02 REQUIREMENTS

A. Comply with all requirements of the District, including:

a. No connection shall be made to potable, fire, or industrial water lines without written approval from the District.

b. If construction water is needed by the Contractor, no connection to the existing main shall be used until an approved backflow prevention device is installed by the Contractor.

c. Valves of existing public systems shall not be operated by any person other than District personnel.

d. No connection will be allowed from new to existing water mains until a pressure test has been conducted successfully.

e. All new potable water and/or fire systems shall be sterilized (chlorinated) by the Contractor.

1.03 SPECIFICATIONS AND STANDARDS

A. Twain Harte Community Services District (CSD) Water Standard Specifications and Details, November 2006

B. AWWA C900 - High Pressure Water Pipe

C. ASTM D1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120

D. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

E. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F. AWWA C111/A21.11 – Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings

G. AWWA C110/A21.10 – Ductile-Iron and Gray-Iron Fittings

H. AWWA C153/A21.53 – Ductile-Iron Compact Fittings

I. AWWA C104/A21.4 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings

J. AWWA C601-68 – Standard for Disinfecting Water Mains

1.04 SUBMITTALS

A. Submit brochures and shop drawings. Allow ample time for review and correction procedures.

B. Shope drawings and detailed descriptions for items which are not manufactured, and which have to be specially fabricated for work associated with this Contract.

C. Provide product data to the Owner's Representative. Specifically, provide the name or other identification of each item to be provided as part of work of this Contract. The assembled brochures shall show saw cuts and fully detailed descriptions of all manufactured items furnished.

PART 2 – PRODUCTS

2.01. ACCEPTABLE MANUFACTURERS

A. Ductile Iron Pipe shall be a US pipe as specified or equivalent by American.

B. Shut-off valves: Mueller as specified or equivalent by Clow, Dresser, Kennedy, or Stockham.

2.02. MATERIALS AND METHODS

A. Water Piping

a. 4 inches and larger: Polyvinyl chloride (PVC) pipe in conformance with all requirements of AWWA C900, Class 200.

b. 3 inches and smaller: Schedule 80 PVC pipe in conformance with requirements of ASTM D1785, Type 1, Grade 1.

B. Fittings

a. For all ductile iron pipe and PVC pipes that are four inches and larger: Cement-lined ductile or cast iron, 250 lb.

i. Use tapped tees or flanged adapters at connections of copper piping to ductile iron or PVC piping.

b. For PVC pipe 3 inches and smaller, use PVC socket fittings for solvent welding.

C. Joints for pipe and fittings:

a. PVC piping:

i. 4 inches and larger: integral bell containing a lock-in ring and spigot.

1. Pipe joints shall be push-on as specified as ASTM D3139.

2. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling installation.

3. Gaskets for push-on joints for pipe shall conform to ASTM F477.

4. Gaskets for push-on joints and compression type joints or mechanical joints for connections between pipes and metal fittings, valves, and other accessories shall be as specified in AWWA C111/A21.11.

5. Polyvinyl chloride (PVC) Water Main Fittings shall be gray-iron or ductile iron conforming to AWWA C110/A21.10 or AWWA C153/A21.53 and

shall have cement mortar lining conforming to AWWA C104/A21.4, standard thickness unless otherwise indicated on Drawings. Fittings shall be mechanical joints.

6. 3 inches and smaller: Solvent welded per manufacturer's recommendations.

b. Flanges

   i. For ductile iron pipe: 125 lb., ductile or cast iron, threaded, ASTM A126 and ANSI B16.1.

   ii. Gaskets: Non-asbestos type composition, 1/16-inch thick, equivalent to Garlock Style 3000.

   iii. Bolting Materials: Carbon steel heavy hex bolts and nuts, ASTM A307, Type B.

c. Valves, hydrants, and accessories:

   i. Shut-off valves: Mueller as specified or equivalent by Clow, Dresser, Kennedy, or Stockham.

      1. Valves 4 inches and larger: AWWA approved, 200 lb.

      2. Valves 14 inches and larger: AWWA approved, 150 lb.

         a. Buried: Mueller #A-2360-23, with 2-inch square operating nut, and mechanical joint ends provided with retainer glands as specified under paragraph "Joints for pipe and fittings" section for ductile iron piping. Provide concrete support block under buried valve.

            i. Provide cast iron adjustable type valve box with proper extension to six inches below bottom of grade and cast-iron collar and cover. Cast "WATER" in cover.

         b. Above grade: Mueller #A-2380-6, with wheel handles and flanged ends.

      3. Valves less than four inches in size: Federal Specifications WW-V-54, Class A, Type III, bronze, double wedge, non-rising stem, screwed bonnet, 200 psi W.O.G working pressure, stuffing box repackable under pressure, all parts renewable.

   ii. Provide backflow preventers where indicated on the plans.

   iii. Pressure regulating valve: Applies to valves that are pressure reducing, pressure sustaining, and check valves. Size shall be 8-inch, 125 lb., flanged, rated for 15 to 75 psi downstream and 20 to 200 psi upstream.

d. Pipe guards shall be 4-inch Schedule 40 galvanized steel pipe filled with concrete. Pipe guards shall be seven feet long, extending four feet above finished grade, and set in a concrete footing (1.5 feet in diameter by 3.5 feet deep).

e. Corrosion protection: All buried, uncoated, and/or otherwise unprotected valves, clamps, flanges, bolts, nuts, etc., shall be cleaned, primed, and coated with a coal tar

base protective coating (1/32 inch thick). Apply protective coating in accordance with the manufacturer's instructions.

PART 3 – EXECUTION

3.01. EXCAVATION, TRENCHING, BACKFILL, AND COMPACTION

A. Perform in accordance with the requirements outlined in Section 31 20 00.

3.02. INSTALLATION

A. Coordinate the installation at this part of the work with the overall construction schedule.

B. Provide concrete thrust blocks at all buried fittings and stub ends on 4-inch and larger PVC lines and as indicated on the Drawings.

C. Repair all damaged lines according to AWWA C104.

D. Connect to existing system where indicated.

E. Test the entire system at 1.5 times system design pressure. Maintain test pressure for at least four hours or longer as directed by Owner to prove tightness without leaks.

F. Install pipes and fittings in accordance with manufacturer’s recommendations. Provide 30 inches cover from top of pipe to finish grade.

3.03. DISINFECTION

A. Thoroughly clean, chlorinate, drain, and flush all pipes, fittings, valves, and appurtenances which have been exposed to contamination by construction in accordance with AWWA Specification C601-68.

B. Owner’s Representative should be notified 24 hours in advance of disinfection of all new potable water lines.

i. Flush line prior to disinfection. Flushing shall produce minimum velocity of 2.5 feet per second in pipe.

ii. Disinfect pipe using sodium hypochlorite to produce a dosage of 50 mg/L for a 24-hour contact period.

iii. Open and close all valves several times during disinfection period.

iv. After a 24-hour retention period, flush chlorinated water from the line until chlorine concentration of water leaving the main is no higher than that generally prevailing in the existing system, or less than 1.0 mg/L.

v. Provide corporation stoop or similar connection and obtain sample for bacteriological analysis.

vi. Repeat disinfection procedure until bacteriological analysis results are acceptable to Owner.

SECTION 33 31 11
SANITARY SEWER LINE CONSTRUCTION

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. Gravity Sanitary Sewer Pipe.

B. Cleanouts.

C. Testing.

1.02 CODES AND STANDARDS

A. Tests and Inspections:

a. Conduct leakage tests before flows are allowed in the line.

b. Test the entire system for exfiltration in the presence of Owner's Representative. Limit leakage to 100 gallons per inch of pipe diameter per mile of length in 24 hours.

B. Allowable tolerance:

a. The horizontal location of inlets and cleanouts should be within ±3 inches, in any direction.

C. Specifications and standards:

a. Twain Harte Community Services District Sewer Standard Specifications and Details, November 2006.

b. Chapter 7 of the California Plumbing Code (CPC).

c. AASHTO M198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets.

d. ASTM A48 Gray Iron Castings.

e. ASTM A746 (ANSI/AWWA C151/21.51) Ductile Iron Pipe.

f. ASTM C94 Ready-Mixed Concrete.

g. ASTM C150 Portland Cement.

h. ASTM C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

i. ASTM C478 Precast Reinforced Concrete Manhole Sections.

j. ASTM C923 Watertight Resilient Connectors for Manhole to Pipe Seal.

k. ASTM D1248 Polyethylene Plastics Molding and Extrusion Materials.

l. ASTM D1784 Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.

m. ASTM D2122 Determining Dimensions of Thermoplastic Pipe and Fittings.

n. ASTM D2321 Underground Installation of Flexible Thermoplastic Sewer Pipes.

o. ASTM D2412 Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

p. ASTM D3034 Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.

q. ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

r. ASTM F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

s. ANSI/AWWA C105/A21.5 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.

t. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

u. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe.

v. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids.

1.03 SUBMITTALS

A. Product data, including the manufacturer's detailed technical materials, fabrication, and installation data, including technical bulletins, drawings, specifications, guides, or manuals that may be applicable to this project.

B. The manufacturer's certification that the pipe and fittings have been inspected and tested at the point of origin and are in compliance with specified requirements.

PART 2 – PRODUCTS

2.01. PIPE AND FITTINGS

A. PVC pipe and fittings for main lines 15 inches or small shall conform to ASTM D3034 and SDR 26.

B. Manufacture pipe from approved, Type 1, Grade 1, PVC 12454-C conforming to ASTM D1784 and meeting requirements of ASTM D2122 and ASTM D2412. Pipe shall have integral wall thickened bells or extruded couplings with gasket seals. Solvent weld joints will not be permitted.

C. Pipe joints shall be gasket push-on type complying with ASTM D3212 and ASTM F477.

D. Pipe shall be UL/FM approved.

E. Fittings shall conform to the same specifications as pipe in which they are installed.

F. Pipe shall be identified on the exterior of the pipe with the following information:

a. Nominal pipe size and outside diameter (O.D.) base.

b. Material code designation number (12454C)

c. Dimension ratio number (SDR 35).

d. Pipe Stiffness Designation (PS 46).

e. ANSI/ASTM Designation (D3034).

f. Pipe's manufacturer's name and production code.

G. Cast iron pipe and fittings. Conform to ASTM A74, service weight bell and spigot pipe with the following acceptable gasket types:

   a. Dual Tite.

   b. Rich-Seal.

   c. Ty-Seal.

PART 3 – EXECUTION

3.01. INSTALLATION PERFORMANCE

A. Excavating, trenching, backfilling, and compacting should be performed in accordance with Section 31 20 00, “Earthwork.”

3.02. PIPE LAYING

A. Lay pipe as indicated on the plans, as specified herein, and in compliance with applicable portions of ASTM D2321.

B. Grade trench bottom to elevations indicate elevation of pipeline and shape bottom to fit lower quadrant of pipe. Excavate holes at each bell hub such that the pipe will be uniformly supported the entire length of the barrel only.

C. Pipe installation and jointing shall be performed in accordance with the pipe manufacturer’s specifications and instructions for type of pipe used and applicable requirements specified herein. All pipe having a defective joint, bell, or spigot is unacceptable, shall be rejected, removed from site, and replaced with an acceptable unit.

D. Commence pipe laying at the lowest point of the finished trench, or from a point designated by the Owner’s Representative. Lay the pipe upgrade from the point of connection with all bell ends forward.

E. Install pipe to homing mark on spigot. On field cut pipe, provide a homing mark on the spigot end in accord with manufacturer’s recommendations.

F. Maintain pipe alignment and joint closure until sufficient haunching and backfill is in place such that it can adequately hold pipe in position.

G. Prevent foreign materials from entering the pipe when it is being placed in the trench. Do not place debris, tools, or other material in the pipe at any time.

H. For each length of pipe that is placed in a trench, assemble joints and bring pipe to the intended line and grade. Bed and secure pipe in place. When pipe laying is delayed for 10 minutes or longer, close the open ends of the pipe using a watertight plug or other means approved by the Owner’s Representative to ensure the inside of the pipe remains clean and free of debris.

3.03. PIPE JOINTING

A. Pipe installation and other jointing shall be in accordance with the manufacturer's specifications, instructions, and the applicable requirements specified herein.

B. Ensure that the interior of the pipe and jointing seal is free of sand, dirt, trash or other foreign materials prior to installation. All pipe and fittings that have been installed with dirt or other deleterious material shall be removed, cleaned, and re-laid. Furthermore, the bells

of pipe shall remain free of sand, dirt, or rocks so that the joints may be properly assembled without overstressing the bells.

3.04. FIELD QUALITY CONTROL

A. Inspect sanitary sewer lines to determine if displacement of pipe has occurred during backfilling and compaction.

B. Correct, at no additional cost, sections of piping that are deficient in material, alignment, grade, or joints.

SECTION 33 42 00
STORM DRAIN SYSTEM

PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

A. This section covers pipeline construction used for the conveyance of irrigation water and storm drainage. The size and type of pipe shall be as shown on the plans. Pipe stronger than that specified in the following section may be furnished at the Contractor's option at no additional cost to the District.

1.02 CODES AND STANDARDS

A. Allowable tolerance:

a. Variations from the alignment shown on the plans shall not exceed 0.10 feet and the rate of departure from or return to established grade or alignment shall be no more than 1 inch in 10 feet of pipe line unless otherwise approved by the Engineer.

B. Specifications and standards:

a. CalTrans Standard Specifications, Division VII Drainage Facilities

b. ASTM F894 – Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe

c. AASHTO M-252 – Standard Specification for Corrugated Polyethylene Drainage Pipe

d. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Material

e. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

f. ASTM D2837 – Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

1.03 SUBMITTALS

A. Product data, including the manufacturer's detailed technical materials, fabrication, and installation data, including technical bulletins, drawings, specifications, guides, or manuals that may be applicable to this project.

B. The manufacturer's certification that the pipe and fittings have been inspected and tested at the point of origin and are in compliance with specified requirements.

PART 2 – PRODUCTS

2.01. PIPE MATERIAL

A. Pipe material and fittings shall, in accordance with ASTM F894, be made from polyethylene (PE) plastic compound meeting the requirements of Type III, Class C, Category 5, Grade P34 as defined in ASTM D1248 and with established hydrostatic design basis (HDB) of not less than 1,250 psi for water at 73.4 degrees Fahrenheit as determined in accordance with ASTM D2837. Materials meeting the requirements of cell classification PE 334433 C or higher cell classification, in accordance with ASTM D3350 are also suitable. Corrugated pipe

base material shall comply with the requirements of AASHTO M-252 (Type S) and have a minimum cell classification PE 335420C.

2.02. RISER INLET

A. The riser inlets attached to the inlet side of the storm pipes shall be comprised of polypropylene or alternative approved by the District. The riser inlet material will contain an ultraviolet (UV) inhibitor. Riser inlets shall be installed in accordance with manufacturer recommendations and specifications.

2.03. CARE OF PIPE MATERIAL

A. Pipe in shipping and/or storage shall be stacked in accordance with manufacturer's instructions. Pipe that is gouged, marred, or scratched forming a clear depression shall not be installed and shall be removed if damaged during the installation process.

PART 3 – EXECUTION

3.01. INSTALLATION PERFORMANCE

A. Excavating, trenching, backfilling, and compacting should be performed in accordance with Section 31 20 00, "Earthwork."

3.02. FIELD QUALITY CONTROL

A. Inspect storm drainage lines to determine if displacement of pipe occurred during installation and compaction.

B. Correct, at no additional cost, sections of piping that are deficient in material, alignment, grade, or joints.