Attachment A – Technical Specifications

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SECTION 01 20 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Methods of Measurement
- B. Description of Bid Items

1.02 METHODS OF MEASUREMENT

- A. Materials and items of work which are to be paid for on the basis of measurement shall be measured in accordance with the method stipulated in the particular sections involved. In determining quantities, all measurements shall be made in a horizontal plane unless otherwise specified.
- B. Measurements shall be in accordance with U.S. Standard Measures. A pound is an avoirdupois pound. A ton is 2,000 pounds avoirdupois. The unit of liquid measure is the U.S. gallon. The unit of length is feet. The unit of volume is cubic yards.
- C. Material not used from a transporting vehicle shall be determined by the ENGINEER and deducted from the certified tag.
- D. When material is to be measured and paid for on a volume basis and it would be impractical to determine the volume, or when requested by the CONTRACTOR in writing and approved by the ENGINEER in writing, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the ENGINEER and shall be agreed to by the CONTRACTOR before such method of measurement of pay quantities will be adopted.
- E. Full compensation for all expense involved in conforming to the above requirements for measuring and weighing materials shall be considered as included in the unit prices paid for the materials being measured or weighed and no additional allowances will be made therefore.
- F. Quantities of material wasted or disposed of in a manner not called for under the Contract; or rejected loads of material, including material rejected after it has been placed by reason of failure of the CONTRACTOR to conform to the provisions of the Contract; or material not unloaded from the transporting vehicle; or material placed outside the lines indicated on the plans or given by the ENGINEER; or material remaining on hand after completion of the Contract, will not be paid for and such quantities will not be included in the final total quantities. No compensation will be allowed for hauling rejected material.
- G. Bid items include all work necessary to complete the specific item described and not otherwise included in other bid items. The CONTRACTOR shall include in each bid item

all costs required to construct the work in accordance with the Contract Documents and as identified below.

1.03 DESCRIPTION OF BID ITEMS

- A. Bid Item 1: Construction Waste Management
 - 1. The lump sum bid price for this item shall constitute full compensation for construction waste management including but not limited to waste management, recycling, removal, off-hauling, trucking, disposal, disposal fees.
- B. Bid Item 2: Mobilization/Demobilization
 - 1. The lump sum bid price for this item shall constitute full compensation for mobilization/demobilization including but not limited to equipment shipping and delivery, equipment set up, materials shipping and delivery, utility coordination, permitting (City of East Palo Alto encroachment permitting), removal of equipment, and project closeout. The Mobilization/Demobilization bid item shall not be in excess of ten percent (10%) of the total bid schedule. Twenty-five percent (25%) of the total Mobilization / Demobilization bid price shall be considered the cost of Demobilization and will not be paid until completion of the work.
- C. Bid Item 3: Water Pollution Control

1. The lump sum bid price for this item shall constitute full compensation for all material, labor, equipment, tools, services for water pollution control.

D. Bid Item 4: Maintaining Traffic

1. The lump sum bid price for this item shall constitute full compensation for temporary striping, signage, delineators, cones, labor, flagmen for traffic control around work zones as required in encroachment permits.

E. Bid Item 5: Pothole and Protect Existing Utilities

1. The lump sum bid price for this item shall constitute full compensation for potholing to expose utilities, backfilling and protection measures for existing utilities.

F. Bid Item 6: Site Preparation, Clearing and Grubbing & SD Removal

1. The lump sum bid price for this item shall constitute full compensation for site preparation, clearing, grubbing, demolition, and storm drain removal, disposal of all debris and unsuitable material.

G. Bid Item 7: Excavation and Hauling

1. The lump sum bid price for this item shall constitute full compensation for excavation for utilities and structures, onsite hauling and offsite disposal of excavated material.

H. Bid Item 8: Excavation Protection (Sheeting and Shoring)

1. The lump sum bid price for this item shall constitute full compensation for sheeting, shoring, bracing, and protection of excavations per OSHA regulations.

I. Bid Item 9: Dewatering and Stormwater Management

1. The lump sum bid price for this item shall constitute full compensation for dewatering systems, all water control, equipment, permits, operation, maintenance, stormwater pollution prevention measures.

J. Bid Item 10: Backfill

1. The lump sum bid price for this item shall constitute full compensation for placement and compaction of backfill for utilities and structures.

K. Bid Item 11: 18" Bedding Stabilization Crushed Rock

1. The lump sum bid price for this item shall constitute full compensation for furnishing, placing, compacting crushed rock bedding under structure.

L. Bid Item 12: Geotextiles

1. The lump sum bid price for this item shall constitute full compensation for furnishing, placing geotextile fabrics and geogrids as specified under utilities and structures.

M. Bid Item 13: Trash Capture Device

1. The lump sum bid price for this item shall constitute full compensation for furnishing, offloading, and installation of trash capture device, associated piping, structures, risers, hatches and appurtenances.

N. Bid Item 14: Site Restoration

1. The lump sum bid price for this item shall constitute full compensation for final site grading, topsoil, landscaping, and restoration of disturbed areas.

O. Bid Item 15: Stop Logs

1. The lump sum bid price for this item shall constitute full compensation for furnishing and installing stop logs and frames.

P. Bid Item 16: Construction Staking

1. The lump sum bid price for this item shall constitute full compensation for construction layout and staking to establish lines and grades.

Q. Bid Item 17: Site Restoration: 6" Asphalt Concrete Paving

1. The lump sum bid price for this item shall constitute full compensation placement of asphalt concrete paving for site restoration, including subgrade preparation and compaction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01 30 00

CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A. Wherever submittals are required hereunder, all such submittals by the Contractor shall be submitted to the Engineer.
- B. Prior to receiving Notice to Proceed, the Contractor shall submit a Site Specific Safety Plan.
- C. Within 14 days after the date of commencement as stated in the Notice to Proceed or at Preconstruction Conference, whichever occurs earliest, the Contractor shall submit the following items to the Engineer for review:
 - 1. A preliminary schedule of Shop Drawings, Samples, and proposed Substitutes ("Or-Equal") submittals listed in the Bid.
 - 2. A list of all permits and licenses the Contractor shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.

1.02 PRECONSTRUCTION CONFERENCE SUBMITTALS

- A. At the preconstruction conference the Contractor shall submit the following items to the Engineer for review:
 - 1. A preliminary schedule of Shop Drawings, Samples, and proposed Substitute ("Or-Equal") submittals listed in the Bid.
 - 2. A list of all permits and licenses the Contractor shall obtain indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit.
 - 3. Construction schedule for entire project.
 - 4. A preliminary schedule of values for lump sum pay items.

1.03 SHOP DRAWINGS

A. Shop drawings shall be submitted electronically (.pdf format print or scan) via e-mail or through an on-line construction management system (to be determined). The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items. Whenever the Contractor is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an Engineer registered in the appropriate engineering branch and in the State of California, unless otherwise directed.

- B. Wherever hard copy original submittals are called for in the Contract Documents or required by the Engineer, the Contractor shall furnish to the Engineer for review, 8 copies of each shop drawing submittal.
- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the Engineer, if hard copies are requested.
- D. Except as may otherwise be indicated herein, the Engineer will return each submittal to the Contractor with its comments noted thereon, within 7 working days following their receipt by the Engineer. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item. The OWNER reserves the right to withhold monies due to the Contractor to cover additional costs of the Engineer's review beyond the second submittal. The Engineer's maximum review period for each submittal, including all resubmittals, will be 7 working days per submittal. In other words, for a submittal that requires two resubmittals before it is complete, the maximum review period for that submittal could be 14 working days. No extension of Contract Time will be granted for delays due to resubmittals that are reviewed within the number of days specified.
- E. If a submittal is returned to the Contractor marked "NO EXCEPTIONS TAKEN," no revisions are required.
- F. If a submittal is returned to the Contractor marked "MAKE CORRECTIONS NOTED," the noted revisions must be made but resubmission of said submittal will not be required.
- G. If a submittal is returned to the Contractor marked "REVISE AND RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the Engineer.
- H. If a submittal is returned to the Contractor marked "REJECTED-RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the Engineer.
- I. Submittals which are for information only or which must be reviewed and approved by a permitting jurisdiction will be marked "RECEIPT ACKNOWLEDGED" by the Engineer.
- J. Fabrication of an item shall be commenced only after the Engineer has reviewed the pertinent submittals and returned copies to the Contractor marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.
- K. All Contractor shop drawings submittals shall be carefully reviewed by an authorized representative of the Contractor, prior to submittal to the Engineer. Each submittal shall be dated, signed, and certified by the Contractor, as being correct and in strict conformance

with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the Engineer of any Contractor submittals will be made for any items which have not been so certified by the Contractor. All non-certified submittals will be returned to the Contractor without action taken by the Engineer, and any delays caused thereby shall be the total responsibility of the Contractor.

L. The Engineer's review of Contractor shop drawings submittals shall not relieve the Contractor of the entire responsibility for the correctness of details and dimensions. The Contractor shall assume all responsibility and risk for any misfits due to any errors in Contractor submittals. The Contractor shall be responsible for the dimensions and the design of connections between provided items (parts must fit together) and for the anchorage of supplied equipment when not detailed on the design drawings.

1.04 CONTRACTOR'S SCHEDULE

- A. Prepare construction schedule showing sequence of activities and proposed shutdowns.
- B. Submit a preliminary construction schedule not later than the Pre Construction Meeting.
- C. Update construction schedule on monthly basis and submit with request for Progress Payment.

1.05 RECORD DRAWINGS

- A. The Contractor shall keep and maintain, at the job site, one record set of Drawings. On these, it shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the WORK as actually constructed. These master record drawings of the Contractor's representation of as-built conditions, including all revisions made necessary by addenda and change orders shall be maintained up-to-date during the progress of the WORK. Copies of the modified record drawings shall be submitted on completion of WORK.
- B. Record drawings shall be accessible to the Engineer at all times during the construction period. Owner may hold a progress payment amount of \$5,000 until Contract Record Drawings are up-to-date.
- C. Final payment will not be acted upon until the Contractor's record drawings have been prepared and delivered to the Engineer. Said up-to date record drawings shall be in the form of a set of Contract Documents prints with any changes from the original Contract Documents carefully plotted on the prints in red ink.
- D. Upon substantial completion of the WORK and prior to final acceptance, the Contractor shall finalize and deliver a complete set of record drawings to the Engineer for transmittal to the OWNER, conforming to the construction records of the Contractor. This set of drawings shall consist of corrected drawings showing the reported location of the WORK. The information submitted by the Contractor and incorporated by the Engineer into the

Record Drawings will be assumed to be correct, and the Contractor shall be responsible for the accuracy of such information, and for any errors or omissions which may appear on the Record Drawings as a result.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01 55 26

TRAFFIC CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Construction Parking Control
- B. Traffic Control Plans
- C. Traffic Control Devices (barricades, cones, signs, flashing arrow signs, etc.)
- D. Informational Construction signs
- E. Traffic Control Personnel

1.02 SUBMITTALS

- A. Traffic Control Plans
 - 1. A licensed or certified C-31 traffic control agency shall prepare the traffic control plans for each type of traffic control required in accordance with these project specifications and submit these plans for review by the City.
 - 2. The Contractor shall submit all traffic control plans at the Pre-construction conference for all work related to the critical path of completion. The City will review the traffic control plans within 21 calendar days of the submittal unless re-submittal is required.
 - 3. The Contractor is required to submit a traffic control plan for each type of traffic control required for each street project. This plan shall be designed to maintain traffic circulation to abutting streets within the limits of the project.
 - 4. These plans should show the following:
 - a. Signage and work area typical safety design for non-street closure situations (i.e.: pavement repair, patching);
 - b. Signage and detour design for partial/full street closure situations
 - c. Proposed detour routing.
 - 5. These traffic plans are required to detail all construction situations planned on a given street project. If adjustment to these plans is required by the Resident Project Inspector or Engineer due to safety concerns, it shall be considered as conforming to the requirements of this Contract and is included in the lump sum price of this Bid Item.
 - 6. All traffic control plans shall be prepared in conformance with the detailed requirements listed herein and shall cover the various phases of the work such as, but not limited to concrete work, milling paving, striping, utility adjustment, etc. These plans shall show a detailed layout of work areas and all traffic control devices required to control vehicular, pedestrian, and bicycle traffic.

PART 2 - PRODUCTS

2.01 CONES, DELINEATORS AND BARRICADES

- A. Cones, delineators and barricades used to direct traffic flow shall conform to Caltrans Standard Specifications, Sections 12-3.02, 3.04 and 12-3.10. They are to be in good condition and sufficiently clean to be easily visible to traffic.
- B. Type II barricades with working flashers shall be used in locations of grade changes, open pits, TCP plan signage and at non-controlled traffic intersections. Type II non flashing barricades shall be used for posting of "no parking" signs at a minimum of 50' intervals or at least one per household or property.
- C. At least one working flashing light must be installed on each barricade. Flashing lights must be maintained in good working order throughout the duration of the work.
- D. Crosswalk closing barricades shall be Type II with a 6" orange border at the base. The Contractor shall submit the method of securing this border to the base of the barricades to the Engineer for acceptance.
- E. All traffic control plans must utilize delineators when reducing traffic flow to one lane in each direction.

2.02 TRAFFIC CONTROL SIGNS

- A. Signs to be used for traffic control shall conform to the requirements of the Caltrans Traffic Manual.
- B. Signs that are attached to existing poles shall not cause any damage to the poles when they are attached or removed.
- C. All of the hardware that is used when attaching signs to existing poles shall be completely removed from the poles when the signs are removed.
- D. If a construction sign is required in an area where it cannot be attached to an existing pole, it shall be attached to a pole that is connected to a moveable concrete block. The distance from the ground surface to the bottom of the sign shall be seven (7) feet.
- E. For construction sign identification, refer to the "Work Area Traffic Control Handbook" published by the APWA, most recent edition.
- F. For regulatory sign identification, refer to the "Uniform Sign Chart", published by Caltrans, most recent edition.

2.03 FLASHING ARROW BOARDS

A. Flashing arrow boards shall be Type A or Type II as described in Section 5-06.9 of the Caltrans Traffic Manual.

2.04 TRAFFIC CONTROL CREW

- A. The Contractor shall provide a certified professional traffic control crew that is independent from the construction activity. This traffic control crew shall be responsible to the Contractor for implementing the traffic control measures detailed in this Contract.
- B. Traffic control crews are to be present as per the traffic control plan. The crew is subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 CONSTRUCTION PARKING CONTROL

A. The Contractor's employees are subject to all parking regulations in effect in the City.

3.02 TRAFFIC CONTROL REQUIREMENTS

- A. The Contractor shall supply, place, and maintain all necessary traffic control devices during construction in accordance with the applicable requirements of the Caltrans Traffic Manual and the traffic control plans approved by the City.
- B. All signs and other warning devices shall be provided by the Contractor and shall become his property after completion of the Contract. The cost of providing, installing and maintaining signs, lights, caution tape, delineators, flares, all temporary striping, barricades and other facilities as directed by the Engineer for the convenience and direction of public traffic shall be included in the lump sum price for the Traffic Control Bid Item.
- C. The Contractor shall conduct his operations and schedule cleanup so as to cause the least possible obstruction and inconvenience to traffic, pedestrians, bicyclists, and adjacent property owners. All work areas shall be swept clean at the end of the day's work and at other times when directed by the Engineer. A mobile street sweeper shall be used when directed by the Engineer. Dust shall be suppressed to the satisfaction of the Engineer. An additional street sweeper will be required along all arterial and collector roads during the project.
- D. The Contractor shall protect open excavations and trenches during construction with fences, non-skid type steel plates and railings, as required, together with signs, lights, and other warning devices sufficient to maintain safe pedestrian, bicycle and vehicular traffic to the satisfaction of the Engineer.
- E. Damage done by the Contractor during the course of his work to adjacent City or private property shall be replaced in kind, or as directed by the Engineer, at the Contractor's expense. This includes the repair of pavement, traffic loop detectors, striping, signs, markings, curb & gutter, landscape, fences, etc.
- F. The Contractor shall remove all forms, debris, and undesirable material from the job site at the end of each workday.
- G. The Contractor shall not remove the barricades in the street at any given location until the asphalt concrete patching adjacent to the gutter or the overlay has been done and a hazard to bicycles, pedestrians and motorists no longer exists.

- H. Until the permanent structural section is placed, pavement repairs and excavations shall be backfilled with temporary AC or covered with non-skid steel plates, with a minimum of eighteen (18") temporary AC at the edges of the plates, at the end of each workday.
- I. Spillage resulting from hauling operations along or across any public traveled way shall be removed immediately by the Contractor at his expense.
- J. Contractor shall keep the sidewalk open at all times unless a trench location makes closure unavoidable and unless otherwise stated in the Contract, in which case the sidewalk may be closed while working. However, an alternate pedestrian facility shall be provided for the duration of the closure.
- K. Contractor shall maintain access to all driveways except when actually completing construction within the driveway boundaries doing, at which time partial access will be maintained unless alternate arrangements can be made with the property owners or tenants in advance. If the driveway to any garage or parking area is to be closed for construction work, this notice shall state the approximate time it will be reopened. The notice will be posted 72 and 24 hours in advance. The Contractor shall post "No Parking Tow Away" signs as required.
- L. Each pedestrian crosswalk and/or ramp that, when crossed by construction excavation or demolition, is not accessible shall be provided with a safe pedestrian crossing platform. The Contractor shall submit the types of temporary ramps and temporary platforms for review and acceptance by the Engineer.
- M. Work shall not restrict visibility of any traffic control device and or restrict visibility at intersections without stop signs.
- N. Flashing arrow boards shall be used for lane reductions on all applicable streets (i.e. major collectors and arterials), or as directed by the Engineer.
- O. City Truck Routes for all hauling shall be used when possible.
- P. If complaints are received from the public regarding the performance of the traffic control measures, the Police Department will review the Contractor's operations. If the operations are determined to be unsafe and are not corrected after a warning by the Police Department, police personnel will take over the traffic control at the expense of the Contractor.
- Q. The Contractor assumes sole and complete responsibility for the job and site conditions during the course of construction, including the safety of all persons and property. This requirement shall apply continuously 24 hours/day and shall not be limited to normal work hours.
- R. If traffic is detoured to another street, it is the Contractor's responsibility to provide adequate control and signing through the detour route.
- S. Traffic control plans for concrete work shall not be utilized for asphalt paving replacement work. A new and different TCP shall be submitted and utilized.
- T. A specific and detailed TCP plan shall be submitted that details how roads that have been milled down to the PCC shall be left open overnight.

3.03 DETAILED TRAFFIC CONTROL REQUIREMENTS

A. TYPES OF TRAFFIC CONTROL REQUIRED

- 1. The Contractor's traffic control plans shall contain provisions to maintain access for emergency vehicles at all times throughout the project. The following list of potential detailed traffic control plans does not mean any particular Type of Control shall be approved but is merely a list of what would be expected for each. The Transportation Engineer will make the final determination and approval of any and all submitted traffic control plans.
- B. TYPE 1 -- FULL STREET CLOSURE

[NOT USED]

C. TYPE 2 -- $\frac{1}{2}$ STREET CLOSURE, MAINTAIN ONE-WAY TRAFFIC, PROVIDE FLAGMEN

[NOT USED]

- D. TYPE 3 -- PARTIAL STREET CLOSURE, MAINTAIN TWO-WAY TRAFFIC, PROVIDE FLAGMEN, ONE TRAFFIC LANE
 - 1. This type of traffic control may be used for partial closures extending either the full length or a portion of the length of a street. Street shall remain open during the construction operation. Part of the street shall be coned off, leaving a minimum width of 11-feet open for traffic. The Contractor shall maintain two-way traffic on this street by utilizing at least two flagmen (on cul-de-sacs and closures less than 100 feet in length, one flagman will be acceptable). The flagmen shall allow one direction of traffic at a time to travel in the one remaining 11-foot lane. Traffic control signs shall be placed in appropriate locations both at, and in advance of, the closure points, informing motorists of any detour and the presence of the flagmen. The Contractor shall use cones to separate the traffic from the construction operation.
- E. TYPE 4 -- PARTIAL STREET CLOSURE, MAINTAIN TWO-WAY TRAFFIC, PROVIDE TWO TRAFFIC LANES
 - 1. This type of traffic control may be used for partial closures extending either the full length or a portion of the length of a street. Street shall remain open during construction operation. Part of the street shall be coned off, and two-way traffic shall be maintained at all times by dividing the remainder of the street into two 11'-wide (minimum width) traffic lanes and directing traffic onto the detour with appropriate cones and traffic control signs. Traffic control signs and reduced speed limit signs shall be placed in appropriate locations both at and in advance of the closure points, informing motorists of any detour and directing them to the proper lane. The Contractor shall use cones to separate the traffic from the construction operation.

SECTION 01 56 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Temporary facilities for the project including sanitary facilities, storage of materials, safety requirements, first aid equipment, fire protection, security measures, protection of the Work and property, access roads and parking, environmental controls, disposal of trash, debris and excavated material, and pest and rodent control.
- B. The facilities and controls specified in this section are considered minimum for the Project. The Contractor may provide additional facilities and controls for the proper execution of the Work and to meet Contractor's responsibilities for protection of persons and property.

1.02 CONTRACTOR'S RESPONSIBILITY

- A. Comply with applicable requirements as specified in other Sections.
 - 1. Maintain and operate temporary facilities and systems to assure continuous service.
 - 2. Modify and extend systems as Work progress requires.
 - 3. Completely remove temporary materials and equipment when their use is no longer required
 - 4. Restore existing facilities used for temporary services to specified or to original condition.

1.03 TEMPORARY UTILITIES

- A. Obtaining Temporary Service:
 - 1. Make arrangements with utility service companies for temporary services.
 - 2. Abide by rules and regulations of the utility service companies or authorities having jurisdiction.
 - 3. Be responsible for utility service costs until the Work is substantially complete. Included are fuel, power, light, hear, and other utility services necessary for execution, completion, testing, and initial operation of the Work.
- B. Water:
 - 1. Provide water required for and in connection with Work to be performed or for other use as required for proper completion of the Work.
 - 2. For water to be drawn from public fire hydrants or other points of connection designated by the City, obtain special permit and meter from the water supplier. All temporary connections shall be protected with an approved backflow prevention device or air-gap. Backflow prevention device must have proof of proper function (inspection certificate).
 - 3. Provide and maintain an adequate supply of potable water for domestic consumption by Contractor personnel and Engineer or his Representatives.

- C. Electricity and Lighting:
 - 1. Electrical power is not currently available at the site.
 - 2. Provide electric power service as required for the Work. Provide power for operation of the Contractor's equipment, or for any other use by Contractor.
- D. Sanitary Facilities:
 - 1. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction. Locate toilets near the Work site and secluded from view insofar as possible. Keep toilets clean and supplied throughout the course of the Work.
 - 2. Sanitary and Other Organic Wastes: The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.
- E. Rubbish
 - 1. During the progress of the Work, the Contractor shall keep the site of the Work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the Work site, and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.04 STORAGE OF MATERIALS

- A. Storage of materials not susceptible to weather damage may be on blocks off the ground.
- B. Store materials in a neat and orderly manner. Place materials to permit easy access for identification, inspection and inventory.
- C. Fill and grade site for temporary structures to provide drainage away from temporary and existing buildings.

1.05 SAFETY REQUIREMENTS

- A. Contractor shall prepare and implement a Site-Specific Health and Safety Plan. Prepare supplemental safety plans, if required, to address the Contractor's means and methods. Contractor shall keep a copy of this plan on-site at all times.
- B. Conduct operations in strict accord with applicable Federal, State and local safety codes and statutes and with good construction practice. The Contractor is fully responsible and obligated to establish and maintain procedures for safety of all work, personnel and equipment involved in the Project.

- C. Observance of and compliance with the regulations shall be solely and without qualification the responsibility of the Contractor without reliance or superintendence of or direction by the Engineer or the Engineer's representative. Immediately advise the Engineer of investigation or inspection by Federal Safety and Health inspectors of the Contractor or subcontractor's work or place of work on the job site under this Contract, and after such investigation or inspection, advise the Engineer of the results. Submit one copy of accident reports to Engineer within 10 days of occurrence.
- D. Protect areas occupied by workmen using the best available devices for detection of lethal and combustible gases. Test such devices frequently to assure their functional capability. Constantly observe infiltration of liquids into the Work area for visual or odor evidences of contamination, immediate take appropriate steps to seal off entry of contaminated liquids to the Work area.
- E. Safety measures, including but not limited to safety personnel, first aid equipment, ventilating equipment and safety equipment, in the specifications and shown on the Drawings are obligations of the Contractor.
- F. Maintain required coordination with the Police and Fire Departments during the entire period covered by the Contract.

1.06 FIRST AID EQUIPMENT

- A. Provide a first aid kit throughout the construction period. List telephone numbers for physicians, hospitals, and ambulance services in each first aid kit.
- B. Have at least one person thoroughly trained in first aid procedures present on the site whenever Work is in progress.

1.07 FIRE PROTECTION

A. Conform to specified fire protection and prevention requirements established by Federal, State or local governmental agencies and as provided in Contractor's Safety Program.

1.08 SECURITY MEASURES

- A. Protect all Work materials, equipment, and property from loss, theft, damage, and vandalism. Contractor's duty to protect property includes Owner's property used in connection with the performance of the Contract.
- B. If existing fencing or barriers are breached or removed for purposes of construction, provide and maintain temporary security fencing equal to existing.
- C. Provide temporary fencing as needed to secure the construction site.

1.09 PROTECTION OF PUBLIC UTILITIES

A. Prevent damage to existing public utilities during construction. Give owners of utilities at least 48 hours notice before commencing Work in the area, for locating utilities during construction, and for making adjustments or relocation of utilities when they conflict with the proposed Work.

1.10 PRE-CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs and video of the condition of the entire site, including each area of the Work and temporary work, equipment storage and laydown areas prior to the start of the Work.
 - 1. Areas to be photographed and videoed shall include the site of the Work and all existing facilities either on or adjoining the Project site, including the interior of existing structures that could be damaged as a result of the Contractor's work.
 - 2. Include general condition, structures and vegetation in all staging, storing, working, parking and excavation areas.
 - 3. Pre-construction video of pipeline alignments shall be performed in each direction with a continuous video for each alignment. Videoing the alignment in a slow-moving (20 mph) vehicle with a Go-Pro or similar camera is acceptable.
- B. Submit photographs and videos per Section 01 30 00
 - 1. Submittal media may be:
 - a. PC-compatible DVD
 - b. PC-compatible flash (USB) drive
 - c. Web-based file sharing system (download from Contractor's site or upload to owner's site)
- C. Provide photos as individual, indexed JPG files with the following characteristics:
 - 1. Compression shall be set to preserve quality over file size
 - 2. JPG image resolution shall be 5 megapixels at 2400 x 1800 or higher.
 - 3. Images shall have rectangular clean edges.
 - 4. Images shall have time/date stamp
 - 5. Images or image index shall include:
 - a. Project name
 - b. Description of vantage point, indicating location and direction by compass point.
- D. Provide videos as MPG, MP4 or AVI files with the following characteristics:
 - 1. Video quality shall be 1080p or greater.
 - 2. Digital video color format
 - 3. Audio, if used, shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.
 - 4. Label video with project name, location and date of recording.

1.11 PROTECTION OF THE WORK AND PROPERTY

- A. Preventive Actions:
 - 1. Take precautions, provide programs, and take actions necessary to protect the Work and public and private property from damage.
 - 2. Take action to prevent damage, injury or loss, including, but not be limited to, the following:
 - a. Store apparatus, materials, supplies, and equipment in an orderly, safe manner that will not unduly interfere with progress of the Work or the Owner's operations.

- b. Provide suitable storage for materials which are subject to damage by exposure to weather, theft, breakage, or otherwise.
- c. Place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work.
- d. Frequently clean up refuse, rubbish, scrap materials, and debris caused by construction operations, keeping the Project site safe and orderly.
- e. Provide safe barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways, and other hazardous areas.
- 3. Obtain written consent from proper parties before entering or occupying with workers, tools, materials or equipment, privately owned land.
- 4. Assume full responsibility for the preservation of public and private property on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect, or misconduct in execution of the Work by the Contractor, it shall be restored by the Contractor to a condition equal to or better than that existing before the damage was done.
- B. Barricades and Warning Signals: Where Work is performed on or adjacent to any roadway, right of way, or public place, furnish and erect barricades, fences, lights, warning signs, and danger signals; provide watchmen; and take other precautionary measures for the protection of persons or property and protection of the Work. Use barricades painted to be visible at night. From sunset to sunrise, furnish and maintain at least one light at each barricade. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction. Furnish watchmen in sufficient numbers to protect the Work. Maintain barricades, signs, and lights, and provide watchmen until the Project is accepted by the Owner.
- C. Protection of Existing Structures:
 - 1. Underground Structures:
 - a. Underground structures are defined to include, but not be limited to, sewer, water, gas, and other piping, and manholes, chambers, electrical and signal conduits, tunnels, and other existing subsurface installations located within or adjacent to the limits of the Work.
 - b. Known underground structures, including existing siphons are shown on the Drawings. This information is shown for the assistance of the Contractor in accordance with the best information available, but is not guaranteed to be correct or complete.
 - c. Explore ahead of trenching and excavation work and uncover obstructing underground structures sufficiently to determine their location, to prevent damage to them and to prevent interruption of utility services. Restore to original condition damages to underground structure at no additional cost to the Owner.
 - d. d. Necessary changes in location of the Work may be made by the Engineer to avoid unanticipated underground structures.
 - e. e. If permanent relocation of an underground structure or other subsurface installations is required and not otherwise provided for in the Contract Documents, the Engineer will direct Contractor in writing to perform the Work, which shall be paid for under the provisions for changes in the Contract Price.
 - 2. Surface Structures: Surface structures are defined as existing buildings, structures and other constructed installations above the ground surface. Included with such structures

are their foundations or any extension below the surface. Surface structures include, but are not limited to buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, wires, posts, signs, markers, curbs, walks, guard cables, fencing, and other facilities that are visible above the ground surface.

- 3. Protection of Underground and Surface Structures:
 - a. Support in place and protect from direct or indirect injury underground and surface structures located within or adjacent to the limits of the Work. Install such supports carefully and as required by the party owning or controlling such structure. Before installing structure supports, Contractor shall satisfy the Engineer that the methods and procedures to be used have been approved by the owner of the structure.
 - b. Avoid moving or in any way changing the property of public utilities or private service corporations without prior written consent of a responsible official of that service or public utility. Representatives of these utilities reserve the right to enter within the limits of this project for the purpose of maintaining their properties, or of making such changes or repairs to their property that may be considered necessary by performance of this Contract.
 - c. Notify the owners and/or operators of utilities and pipelines of the nature of construction operations to be performed and the date or dates on which those operations will be performed. When construction operations are required in the immediate vicinity of existing structures, pipelines, or utilities, give a minimum of 5 working days advance notice. Probe and flag the location of underground utilities prior to commencement of excavation. Keep flags in place until construction operation reach and uncover the utility.
 - d. Assume risks attending the presence or proximity of underground and surface structures within or adjacent to the limits to the Work including but not limited to damage and expense for direct or indirect injury caused by his Work to any structure. Immediately repair damage caused, to the satisfaction of the owner of the damaged structure.
- D. Protection of Installed Products:
 - 1. Provide protection of installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed, prior to completion of Work.
 - 2. Control traffic to prevent damage to equipment, materials, and surfaces.
 - 3. Provide coverings to protect equipment and materials from damage.

1.12 ROADS AND PARKING

- A. Prevent interference with traffic on existing roads.
- B. Designate temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking. Locate as approved by Engineer.
- C. Minimize use by construction traffic of existing streets and driveways.
 - 1. Do not allow heavy vehicles or construction equipment in existing parking areas.

1.13 ENVIRONMENTAL CONTROLS

A. Provide and maintain methods, equipment, and temporary construction as necessary for controls over environmental conditions at the construction site and adjacent areas.

- B. Comply with statutes, regulations, and ordinances which relate to the proposed Work for the prevention of environmental pollution and preservation of natural resources, including but not limited to the National Environmental Policy Act of 1969, PL 91 190, Executive Order 11514.
- C. The construction of projects should have minimum impact to the surrounding environment. The Contractor shall adopt construction procedures that do not cause unnecessary excavation and filling of the terrain, indiscriminate destruction of vegetation, air or stream pollution, nor the harassment or destruction of wildlife.
- D. Recognize and adhere to the environmental requirements of the Project. Disturbed areas shall be strictly limited to boundaries established by the Contract Documents. Particularly avoid pollution of "on site" streams, wells or other water sources.
- E. Burning of rubbish, debris or waste materials is not permitted.

1.14 POLLUTION CONTROL

- A. Prepare a Spill Response and Prevention Plan, specific to the Contractor's means and methods. Submit prior to mobilization per Section 01 30 00, Contractor Submittals.
- B. Provide methods, means, and facilities required to prevent contamination of soil, water or atmosphere by discharge of noxious substances from construction operations.
- C. Provide equipment and personnel to perform emergency measures required to contain any spillage, and to remove contaminated soils or liquids. Excavate and dispose of any contaminated earth off-site, and replace with suitable compacted fill and topsoil.
- D. Take special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.
- E. Prevent toxic concentrations of chemicals.
- F. Prevent harmful dispersal of pollutants into the atmosphere.
- G. Use equipment during construction that conforms to current Federal, State and local laws and regulations.
- H. Dispose of all trash and debris in permitted landfills or recycling facilities, as applicable, in accordance with state and local laws and regulations.

1.15 PEST AND RODENT CONTROL

- A. Provide rodent and pest control as necessary to prevent infestation of construction or storage areas.
- B. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

1.16 NOISE CONTROL

- A. Provide vehicles, equipment, and construction activities that minimize noise to the greatest degree practicable. Noise levels shall conform to the latest OSHA standards and local ordinances.
- B. Conduct construction operations during daylight hours except as approved by Engineer.
- C. Select construction equipment to operate with minimum noise and vibration. If in the opinion of the Engineer, objectionable noise or vibration is produced by equipment, rectify such conditions without additional cost to the Owner. The Sound Power Level (PWL) of any equipment shall not exceed 85 dbA (re: 10-12 watts) measured 50 feet from the piece of equipment, or the levels prescribed by local ordinances, whichever is lower. Explicit equipment noise requirements are specified with equipment specifications.

1.17 EXPLOSIVES AND BLASTING

A. The use of explosives on the Work will not be permitted.

1.18 DUST AND MUD ABATEMENT

A. The Contractor shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust and/or mud in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The Contractor shall be responsible for any damage resulting from any dust and/or mud originating from its operations. The dust or mud abatement measures shall be continued until the Contractor is relieved of further responsibility by the Engineer.

1.19 CHEMICALS

- A. All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer.
- B. All chemicals used during the project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, fertilizer, disinfectants, polymers, reactants, fuel, oil, hydraulic fluid, detergent, paint, solvent, glue, or any other classification, shall be stored within a containment area that minimizes contact of the chemicals and the storage containers with surface waters. The Contractor shall notify the Engineer to determine if the surface water has been contaminated or may be allowed to be discharged to the storm drains or stream channels. If the surface water flows have become contaminated due to contact with the chemicals or the storage containers, the Contractor shall provide for removal and/or treatment of the surface water flows at no additional costs to the Owner. If spills occur in the containment area, the Contractor shall immediately notify the Engineer and contain and cleanup the spill to prevent spilled material from entering storm drains, stream channels, or groundwater or from being absorbed by the underlying pavement or soil.

1.20 TRENCH SPOILS DISPOSAL

- A. All trench spoils shall be hauled in trucks fitted with tarps and tailgates.
- B. All trench spoils shall be disposed of at suitable sites retained by the Contractor and in compliance with fill and grading permits, copies of which shall be provided to the Engineer.
- C. If disposing of trench spoils on private property, Contractor shall provide a release of liability from property owner upon construction completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01 60 00

PRODUCTS, MATERIALS, EQUIPMENT, AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 DEFINITIONS

A. The word "Products," as used herein, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of work. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying and erection of the WORK.

1.02 QUALITY ASSURANCE

A. Source Limitations: To the greatest extent possible for each unit of work, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.

B. Compatibility of Options: Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.03 PRODUCT DELIVERY AND STORAGE

A. The CONTRACTOR shall deliver and store the WORK in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.

B. The CONTRACTOR shall provide a certificate of compliance for all materials to be incorporated in the Work.

1.04 TRANSPORTATION AND HANDLING

A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturers unopened containers and packaging.

B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment, including those provided by OWNER, by methods to prevent soiling and damage.

C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.05 STORAGE AND PROTECTION

A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.

B. For exterior storage of fabricated products including pipe, products shall be placed on sloped supports above ground. Products subject to deterioration, including all ferrous metals, shall be covered with impervious sheet covering and heat and ventilation shall be provided to avoid condensation. PVC pipe shall be stored to avoid prolonged exposure to sunlight.

C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.

D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.

E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

F. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.

G. The CONTRACTOR shall maintain manufacturer-required environmental conditions continually.

H. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.

I. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.

J. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to acceptance by the OWNER in accordance with the Contract Documents.

1.06 PROPOSED SUBSTITUTES OR "OR-EQUAL" ITEM

A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other suppliers may be accepted if sufficient information is submitted by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

B. The burden of proof as to the type, function, and quality of any such substitute product, material or equipment shall be upon the CONTRACTOR.

C. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitute and the ENGINEER'S decision shall be final.

D. The ENGINEER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense additional data about the proposed substitute.

E. The OWNER may require the CONTRACTOR to furnish at the CONTRACTOR'S expense a special performance guarantee or other surety with respect to any substitute.

F. Acceptance by the ENGINEER of a substitute item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute.

G. The CONTRACTOR shall be responsible for resultant changes including design and construction changes and all additional costs resulting from the changes which the accepted substitution requires in the CONTRACTOR'S WORK, the WORK of its subcontractors and of other contractors, and shall effect such changes without cost to the OWNER.

H. The procedure for review by the ENGINEER will include the following:

I. If the CONTRACTOR wishes to provide a substitute item, the CONTRACTOR shall make written application to the ENGINEER on a "Substitution Request Form."

J. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 14 days after award of the Contract.

K. Wherever a proposed substitute item has not been requested as specified herein, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.

L. The CONTRACTOR shall certify that the proposed substitute will perform adequately the functions and achieve the results called for by the general design and be similar and of equal substance to that indicated, and be suited to the same use as that specified.

M. The ENGINEER will evaluate each proposed substitute within a reasonable period of time.

N. As applicable, no shop drawing submittals shall be made for a substitute item nor shall any substitute item be ordered, installed, or utilized without the ENGINEER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."

O. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby. Whether or not the ENGINEER accepts a proposed substitute, the CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitute.

P. The CONTRACTOR's "Substitution Request Forms" shall contain the following statements and information which shall be considered by the ENGINEER in evaluating the proposed substitution:

Q. The evaluation and acceptance of the proposed substitute will not prejudice the CONTRACTOR's achievement of substantial completion on time.

R. Whether or not acceptance of the substitute for use in the WORK will require a change in any of the Contract Documents to adopt the design to the proposed substitute.

S. Whether or not incorporation or use of the substitute in connection with the WORK is subject to payment of any license fee or royalty.

T. All variations of the proposed substitute from the items originally specified will be identified.

U. Available maintenance, repair, and replacement service will be indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.

V. Itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other contractors affected by the resulting change.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01 71 13

MOBILIZATION AND DEMOBILIZATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Mobilization includes operations necessary for the long-term assignment and allocation of labor, equipment and materials necessary to complete the work. The work in this section consists of obtaining of all bonds, insurance, and permits; moving onto the site; and the furnishings and other facilities required for the performance and completion of the work. Mobilization and demobilization shall include, but not be limited to, the following principal items:
 - 1. Arranging for and setting up Contractor's storage area and obtaining all letters/permits/right-of-entry for such locations.
 - 2. Posting all OSHA-required notices and establishment of safety programs.
 - 3. Posting of all prevailing wage requirements.
 - 4. Obtaining and submitting Certificates of Compliance.
 - 5. Providing on-site sanitary facilities which comply with State and local governing authorities.
 - 6. Final clean up.
 - 7. Mobilization and demobilization of equipment.

PART 2 - MATERIALS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 02 41 00

CLEARING AND DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all clearing and demolition and related work as shown on the plans and/or specified herein.
- B. Work Included: All work necessary for construction staking and to move or remove and legally dispose of all interfering or objectionable material from the project site, including but not necessarily limited to tree branches, brush, shrubs, weeds, debris, roots, rocks, concrete rubble, concrete masonry units, pipe, concrete curbs and gutters, asphalt pavement, concrete structures, and concrete slabs, but only as required.

1.02 REFERENCES

A. California Department of Transportation, Standard Specifications, 2023 Edition.

1.03 DEFINITIONS

- A. Clearing: Clearing shall consist of cutting, removing, and disposing of trees, shrubs, brush, limbs, and other vegetative growth. Clearing shall also include the removal and disposal of trash piles, rubbish and fencing, and the preservation of trees, shrubs, and vegetative growth which are not designated for removal.
- B. Grubbing: Grubbing is the removal and disposal of wood or root matter below the ground surface remaining after clearing.
- C. Stripping: Stripping refers to the removal and disposal of all organic sod, topsoil, grass, and grass roots; all evidence of surface improvements and other objectionable material remaining after clearing and grubbing.
- D. Demolition: The removal of existing structures, portions of existing structures, concrete curbs, asphalt roadways, sidewalks, and driveways.
- E. Certified Arborist: An arborist certified by the International Society of Arboriculture and approved by the City.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Equipment shall be suitable for the work to be done and shall be in good operating condition.

B. Equipment operators and workmen are to be skilled in such operations and shall be competently supervised.

3.02 PREPARATION

- A. Utilities:
 - 1. Disconnect any remaining utility services that will no longer be active.
 - 2. Remove all disconnected utilities within the site.
 - 3. Repair utility mains as necessary in conformance with City Details or Caltrans Standard Specifications and Details.
 - 4. Protect or reconnect and repair any damaged irrigation utilities.
- B. Protection
 - 1. Provide berms and other means acceptable to Engineer to keep drainage from demolition areas.
- C. Construction Staking
 - 1. The Contractor's field surveyor will provide construction staking as necessary to establish the lines and grades required for the completion of work specified in these specifications and on the plans.
 - 2. Contractor shall be responsible for preserving all benchmarks, reference points, and construction stakes in the area.

3.03 CLEARING, GRUBBING AND STRIPPING

- A. Clearing:
 - 1. Clear areas where construction is to be performed and other areas as indicated on the Drawings or specified in this Section of pavement, fences, lumber, walls, stumps, brush, roots, weeds, trees, shrubs, rubbish, and other objectionable material of any kind which, if left in place, would interfere with proper performance or completion of the work, would impair its subsequent use, or form obstructions therein.
 - 2. Do not incorporate organic material from clearing and grubbing operations in fills and backfills.
 - 3. Contractor's Construction Facilities: Fill or remove pits, fill, and other earthwork required for erection of facilities, upon completion of the work, and level to meet existing contours of adjacent ground.
- B. Grubbing:
 - 1. From Excavated Areas:
 - a. Grub stumps, roots, and other obstructions 1 inch or over in diameter to depth of not less than 36 inches below finish grade.
 - 2. Backfill and compact cavities left below subgrade elevation by removal of stumps or roots to density of adjacent undisturbed soil.
- C. Stripping:
 - 1. Remove soil material containing sod, grass, or other vegetation to depth of 6 inches from areas to receive fill or pavement and from area within 5 feet outside foundation walls.
 - 2. Deposit stripped material in accordance with following requirements:

- a. At locations designated as temporary spoils area.
- b. Reuse accepted material in top 6 inches of areas to be used for future planting.

3.04 DEMOLITION

- A. Remove existing pavement, landscaping, sidewalks, curb and gutter and existing facilities called for on the plans and as directed by the Engineer.
- B. Contractor shall not demolish existing facilities beyond the limits designated on the drawings unless specifically directed to do so by the Engineer.

3.05 PRESERVATION OF PROPERTY

- A. The project area shall be cleared and grubbed only to the extent necessary to accommodate the work in conformance with the notes and details shown on the plans. Trees or growth shall not be trimmed back unnecessarily. Attention is directed to Section 3.06 of this specification section, regarding the protection of trees.
- B. Contractor shall take extreme care not to damage shrubs, trees, fences, irrigation systems and other improvements adjacent to the project site.
- C. All existing improvements not specifically designated on the plans to be removed or relocated shall remain in their original condition and location undisturbed. However, upon written permission by the City, existing improvements may, for the convenience of the Contractor, and at his expense, be removed and temporarily relocated during construction and shall be replaced in their original location in as good or better condition as when the Contractor entered upon the work site.

3.06 TREE PROTECTION

- A. No cutting of any part of trees to remain, including roots, shall be done without direct supervision of the certified arborist.
- B. Contractor shall protect all trees within the project limits at all times from damage by workers and equipment. Repair all minor damage to existing trees by using a licensed tree surgeon or other personnel approved by the certified arborist. Remove such trees permanently disfigured or killed, including roots from the site and replace each such tree or trees with equal sized trees if possible, or reimburse the City the cost listed below if such replacement is not possible. The certified arborist shall be the sole judge of the condition of any tree. Provide regular watering of existing landscaping within the construction area through the construction period.

3.07 DEMOLITION OF SURFACE IMPROVEMENTS

A. Removal of sidewalks, curbs and gutters, driveways, concrete slabs and pavement, if necessary, shall be in accordance with the provisions of the Standard Specifications. Curbs, gutters, sidewalks, driveways, slabs and pavement shall be removed by full depth saw cut to the nearest joint from the lines shown on the plans or as directed by the Engineer.

B. Asphalt pavement disturbed during construction shall be replaced; the existing pavement shall be removed and disposed of off-site. Asphalt removal and replacement shall conform to Section 32 01 16 of these Specifications.

3.08 DEMOLITION OF UNDERGROUND PIPE

- A. Demolition of underground pipe shall be only as shown on the Drawings or necessary as determined in the field by the Engineer.
- B. Portions of interfering pipelines removed from the trench shall be replaced with bedding material, controlled density fill or select backfill as appropriate, in conformance with the Plans and these Specifications.

3.09 ROOT REMOVAL

- A. The roots encountered during the course of Work, either trees removed previously on site or bushes removed as part of the Work, shall be removed to a depth of at least 24 inches below the natural grade.
- B. All exposed surface roots beyond the stump area shall be removed to a depth of at least 12 inches below the natural grade.
- C. Holes and depressions remaining after stump and root removal shall be filled per the Drawings.

3.10 REMOVAL OF DEBRIS

- A. All demolished and cleared material shall become the property of the Contractor and shall be legally disposed of by the Contractor.
- B. Removed concrete and asphalt concrete shall be legally disposed of off the right-of-way at a location provided by the Contractor. Demolished concrete shall not be buried in structure backfill areas.

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Reinforcing steel for concrete.
 - 2. Supports and accessories for steel reinforcement
- B. Related Sections:
- 1. Section 03 30 55 Cast-in-Place Concrete.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 117 Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International.
 - 2. 301 Specifications for Structural Concrete for Buildings; American Concrete Institute International.
 - 3. 318 Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International.
 - 4. SP-66 ACI Detailing Manual; American Concrete Institute International.
- B. American Society for Testing and Materials (ASTM):
 - 1. A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - 2. A185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 3. A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 4. 706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - 5. E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
- C. American Welding Society (AWS) D1.4 Structural Welding Code Reinforcing Steel; American Welding Society.
- D. CRSI (DA4) Manual of Standard Practice; Concrete Reinforcing Steel Institute.

1.03 SYSTEM DESCRIPTION

- A. The Drawings contain general notes concerning amount of reinforcement and placing, details of reinforcement at wall corners and intersections, and details of extra reinforcement around openings in concrete.
- 1.04 SUBMITTALS

- A. Shop Drawings (Placing drawings)
 - 1. Comply with requirements of ACI SP-66. Shop Drawings shall also show details for congested areas and connections. Shop drawings used in field must be reviewed copies.
- B. Product Data:
 - 1. Manufacturer's catalog sheets including instructions for use and description of application and ICC/IAPMO evaluation report shall be provided on each of the following items intended for use on project:
 - a. Mechanical anchorage devices for splices.
- C. Mill Certificates:
 - 1. The Contractor shall provide Mill Certificates for each size of bar for each heat to be used on project and certify that reinforcing steel supplied for this project meet or exceed specified requirements.
 - 2. Mill Certificates shall include name of mill, date of rolling, date of shipping to fabricator and shall be signed by fabricator certifying that each material complies with or exceeds the specified requirements. A Mill Certificate shall be furnished with each lot of material delivered to the project and the lot shall be clearly identified in the Certificate.
 - 3. When Mill Certificates cannot be provided, the Contractor shall hire a professional testing laboratory to verify compliance and provide laboratory test reports. The Contractor shall pay for the cost of testing.
- D. Laboratory Test Reports:
 - 1. Laboratory test reports shall be signed by a principal of the testing agency who is a registered Civil Engineer in the State of California.
 - 2. When required by other portions of these specifications, laboratory test reports shall be submitted for each size of bar tested for each heat to show compliance with appropriate ASTM Standards and these specifications.
- E. Welder's Certificates and WPS: Submit description of reinforcement weld locations, welding procedures, and welder certification when welding is permitted.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with the current governing edition of CBC, ACI 301, ACI SP-66, ACI 318, and AWS D1.4 except as modified by the contract documents.
- B. Sampling and Testing General:
 - 1. If the Owner's agent, through oversight or otherwise, has accepted material or work which is defective or contrary to specifications, this material or work, regardless of state of completion, may be rejected.
 - a. Testing agencies shall meet the requirements of ASTM E329. Testing agencies shall be accepted by the Engineer before performing any work.
- C. Testing responsibilities of Contractor:
 - 1. Submit data on qualifications of proposed testing agency for acceptance. Use of testing services will not relieve the Contractor of the responsibility to furnish materials and construction in compliance with the Contract Documents.

- 2. Cooperate with and notify owner's agent at least 24 hours in advance of inspections required and shall provide samples, test pieces, and facilities for inspection at no cost to the owner.
- 3. Identify each lot of fabricated reinforcing steel to be shipped to the site by assigning an individual lot number that identifies steel by heat number and shall be tagged in such a manner that each such lot can be accurately identified at the job site.
- 4. Remove all unidentified reinforcing steel, anchorage assemblies and bar couplers received at the site.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
 - 1. Deliver bars bundled and tagged with identifying tags.
- B. Acceptance at Site:
 - 1. Reinforcing Bars: Deliver reinforcing bars lacking grade identification marks accompanied by manufacturer's guarantee of grade.

1.07 SEQUENCING AND SCHEDULING

A. Coordinate work with all trades so as not to interfere with the work of other trades. Bring interferences between trades to Engineer's attention and resolve before any concrete is placed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcement:
 - 1. General: Provide reinforcing steel that is new material, of quality specified, free from excessive rust or scale or any defects affecting its usefulness.
- B. Reinforcing Bars:
 - 1. Bars for reinforcement shall conform to the requirements of ASTM A706
 - 2. Reinforcing Bars to Be Embedded in Concrete: Grade 60 deformed bars conforming to ASTM A 615 except as specified in the next subparagraph.
 - 3. Reinforcement resisting earthquake-induced flexural and axial forces in concrete frame members and in concrete wall boundary members shall comply with low alloy ASTM A 706. ASTM A 615 Grade 60 reinforcement may be used in these members if the following requirements are met:
 - 4. The actual yield strength based on mill tests does not exceed the specified yield strength by more than 18,000 pounds per square inch (retests shall not exceed this value by more than an additional 3,000 pounds per square inch).
 - 5. The ratio of the actual ultimate tensile stress to the actual tensile yield strength is not less than 1.25.
- C. Thread Bars:
 - 1. Provide thread bars having continuous rolled-in pattern of thread-like deformations along entire length.

- 2. Provide hex nuts and couplers for the thread bars that develop 125 percent of yield strength of bar.
- 3. Thread Bars:
 - a. Conform to ASTM A 615 Grade 60.
 - b. Manufacturers: One of the following or equal:
 - 1) DYWIDAG Systems International, DYWIDAG Threadbar.
- 4. Do not substitute cut threads on regular reinforcing bars for thread bars.
- D. Bar Supports:
 - 1. Reinforcement Support Chairs:
 - a. Hot-dip galvanized steel. Provide hot-dip galvanized steel with plastic tips at surfaces which will be exposed to view. Use unless otherwise indicated on the Drawings.
 - b. Stainless Steel where indicated on the Drawings.
- E. Tie Wires: Annealed Steel:
 - 1. All wire for concrete reinforcement shall conform to ASTM A82.
- F. Welded Wire Fabric Reinforcement:
 - 1. Welded Wire Fabric: ASTM A 185.
 - 2. Fabric may be used in place of reinforcing bars if accepted by the Engineer.
 - 3. Provide fabric in flat sheet form.
 - 4. Provide fabric having cross-sectional area per linear foot of not less than cross-sectional area per linear foot of reinforcing bars indicated on the Drawings.

2.02 WELDING ELECTRODES

A. Welding Electrodes shall be per Table 5-1 of AWS D1.4.

2.03 MECHANICAL COUPLING DEVICES

A. Mechanical coupling devices shall develop 125 percent of the minimum yield strength of the bars spliced.

2.04 REINFORCEMENT ACCESSORIES

A. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement. Reinforcement supports shall conform to the requirements of ACI 301.

2.05 OTHER MATERIALS

A. All other materials, not specifically described by these specifications but required for complete and proper placement of reinforcement shall be new, first quality of their respective kinds, and subject to the approval of the Engineer.

2.06 FABRICATION

A. Shop Assembly:
- 1. Cut and bend bars in accordance with provisions of ACI 315 and ACI 318.
- 2. Bend bars cold.
- 3. Provide bars free from defects and kinks and from bends not indicated on the Drawings.
- B. Welding of reinforcement is permitted only with the specific approval of Engineer. Perform welding in accordance with AWS D1.4. Do not weld crossing bars (tack welds) for assembly of reinforcement, supports, or embedded items. After completing welds on galvanized or epoxy-coated reinforcement, repair coating damage as mentioned in Part 2.01.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

- A. Prior to all work of the section, carefully inspect the installed work of other trades and verify that all work is sufficiently complete to permit the start of work under this section and that the completed work of this section will be in complete accordance with the original design and the reviewed shop drawings. In the event of discrepancy, immediately notify the Engineer in writing.
- B. In the event conduits, pipes, inserts, sleeves, or any other items interfere with placing the reinforcement as indicated on the drawings or approved shop drawings, or as otherwise required, immediately notify the Engineer and obtain approval on procedure before placement of reinforcement is started.

3.02 BENDING

A. Bends for reinforcing steel shall be made in accordance with ACI 301 and ACI 318. Bend bar sizes No. 3 through 5 cold only one time, provided reinforcing bar temperature is above 32°F. Do not field bend reinforcing steel in a manner that will injure material, cause the bars to be bent on too tight a radius, or that is not indicated as allowed on drawings or permitted by Engineer. Do not straighten bent or kinked bars for use on project without permission of Engineer. Replace bars with kinks or bends not shown on the drawings.

3.03 PLACING

- A. All reinforcement shall be placed in strict conformance with the requirements of the Contract Drawings, both as to location, position and spacing of members. It shall be supported and secured against displacement by the use of adequate and proper wire supporting and spacing devices, tie wires, etc. so that it will remain in its proper position in the finished structure. Reinforcement may not be wet set in concrete pours.
- B. Tolerances: Do not exceed the placing tolerances specified in ACI 318 and ACI 117, whichever is more stringent, before concrete is placed. Placing tolerances shall not reduce cover requirements except as specified in ACI 117.
- C. Minimum concrete cover for reinforcement and couplers shall be as indicated in the Contract Drawings. Concrete cover is measured from the theoretical excavation line, not the line of any over excavation. Where less than 3 inches cover is noted and concrete will be placed against soil, increase the section thickness to attain 3 inches cover.

- D. Preserve clear space between parallel bars of not less than 1-1/2 times the nominal diameter of round bars and in no case let the clear distance be less than 1-1/2 inches nor less than 1-1/3 times the maximum size of aggregate for concrete.
- E. For slabs on ground, extend welded wire reinforcement to within 2 in. of the concrete edge. Reinforcement shall be lapped and tied around the perimeter of each sheet in order to maintain the proper positioning of the reinforcement. Lap splices shall have a minimum of two ties per spliced length. Do not place welded wire reinforcement on grade and subsequently raise into position in concrete.
- F. Furnish and use templates for placement of column dowels unless otherwise permitted by engineer.
- G. Lap splices shall be contact lap splices in accordance with ACI 318 unless noted otherwise on the Contract Drawings. Bars shall be wired together at laps. Wherever possible, stagger splices in adjacent bars. Splice bars in members such as spandrels, beams, etc, as follows: Top bars at centerline of span, bottom bars at the support. Make all splices in welded wire reinforcement at least 1-1/2 meshes wide or 12 inches, whichever is greater. When splicing in areas to receive shotcrete, lap splices shall be non-contact with at least 2 inches clearance between bars.
- H. Butt splices shall be accomplished by mechanical anchorage devices. Stagger these devices 2 feet, unless noted otherwise on the Contract Documents.
- I. Bars shall not be cut by gas torch.

3.04 CLEANING REINFORCEMENT

A. Take all means necessary to ensure that steel reinforcement, at the time concrete is placed around it, is completely free from rust, soil, loose mill scale, oil, paint and all coatings which will destroy or reduce the bond between steel and concrete.

END OF SECTION

SECTION 03 30 55

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Cast-in-place Concrete
- B. Related Sections:
 - 1. Section 33 39 00 Reinforced Concrete Storm Drain Structures.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 318 Building code Requirements for Structural Concrete.
 - 2. Manual of Concrete Practice.
 - 3. Recommended Practices.
- B. American Society for Testing and Materials (ASTM):
 - 1. C 31 Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. C 33 Specification for Concrete Aggregates.
 - 3. C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. C 40 Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 5. C 42 Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 6. C 88 Test Method of Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - 7. C 94 Specification for Ready-Mixed Concrete.
 - 8. C 114 Test Methods for Chemical Analysis of Hydraulic Cement.
 - 9. C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 10. C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 11. C 143 Test Method for Slump of Hydraulic Cement Concrete.
 - 12. C 150 Specification for Portland Cement.
 - 13. C 157 Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
 - 14. C 171 Sheet Materials for Curing Concrete.
 - 15. C 172 Practice for Sampling Freshly Mixed Concrete.
 - 16. C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 17. C 203 Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.

- 18. C 227 Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method).
- 19. C 260 Specification for Air-Entraining Admixtures for Concrete.
- 20. C 289 Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method).
- 21. C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- 22. C 311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete.
- 23. C 469 Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.
- 24. C 494 Specification for Chemical Admixtures for Concrete.
- 25. C 595 Specification for Blended Hydraulic Cements.
- 26. C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland-Cement Concrete.
- 27. D 75 Practices for Sampling Aggregates.
- 28. D 1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

1.03 DEFINITIONS

- A. Alkali: Is defined to mean sum of sodium oxide and potassium oxide calculated as sodium oxide.
- B. Hairline Crack: Crack with a crack width of less than 4 thousandths of an inch.
- C. f'c: Specified compressive strength.
- D. f'cr: Average compressive strength.

1.04 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. General:
 - a. Except as otherwise specified, provide concrete composed of Portland Cement, fine aggregate, coarse aggregate, and water so proportioned and mixed as to produce plastic, workable mixture in accordance with requirements as specified in this Section and suitable to specific conditions of placement.
 - b. Proportion materials in manner such as to secure lowest water-cement ratio which is consistent with good workability, plastic, cohesive mixture, and one which is within specified slump range.
 - c. Proportion fine and coarse aggregate in manner such as not to produce harshness in placing nor honeycombing in structures.
 - 2. Watertightness of Concrete Work: It is the intent of this Section to secure for every part of the Work concrete and grout of homogeneous structure, which when hardened will have required strength, watertightness, and durability.
 - a. It is recognized that some surface hairline cracks and crazing will develop in the concrete surfaces.

- b. Construction, contraction, and expansion joints have been positioned in structures as indicated on the Drawings, and curing methods specified, for purpose of reducing number and size of these expected cracks, due to normal expansion and contraction expected from specified concrete mixes.
- c. Class A and Class B Concrete: Watertight: Repair cracks which develop in walls or slabs and repair cracks which show any signs of leakage until all leakage is stopped.
- 3. Workmanship and Methods: Provide concrete work, including detailing of reinforcing, conforming with best standard practices, and as set forth in ACI 318, Manuals, and Recommended Practices.

1.05 SUBMITTALS

- A. Product Data: submit data completely describing products.
- B. Information on Heating Equipment to Be Used for Cold Weather Concreting: Submit information on type of equipment to be used for heating materials and/or new concrete in process of curing during excessively cold weather.
- C. For conditions that promote rapid drying of freshly placed concrete such as low Humidity, high temperature, and wind: submit corrective measures proposed for use Prior to placing concrete.
- D. Copies of Tests of Concrete Aggregates: submit certified copies in triplicate of commercial laboratory tests of all samples of concrete aggregates.
 - 1. Fine Aggregate:
 - a. Clay lumps.
 - b. Reactivity.
 - c. Shale and chert.
 - d. Soundness.
 - e. Color.
 - f. Decantation.
 - 2. Coarse Aggregate:
 - a. Clay lumps and friable particles.
 - b. Reactivity.
 - c. Shale and chert.
 - d. Soundness.
 - e. Abrasion loss.
 - f. Coal and lignite.
 - g. Materials finer than 200 sieve.
- E. Sieve Analysis: Submit sieve analyses of fine and coarse aggregates being used in triplicate at least every 3 weeks and at any time there is significant change in grading of materials.
- F. Concrete Mixes: Submit full details, including mix design calculations for concrete mixes proposed for use for each class of concrete.
 - 1. Include information on correction of batching for varying moisture contents of fine aggregate.
 - 2. Submit source quality test records with mix design submittal.
 - a. Include calculations for f'cr based on source quality test records.

- G. Change in Aggregate Source, or Aggregate Quality from Same Source: submit new set of design mixes covering each class of concrete.
- H. Test Batch Test Data:
 - 1. Submit data for each test cylinder.
 - 2. Submit data that identifies mix and slump for each test cylinder.
- I. Sequence of Concrete Placing: submit proposed sequence of placing concrete showing proposed beginning and ending of individual placements.
- J. Curing Compound Other than Specified Compound: Submit complete data on proposed compound.
- K. Repair of Defective Concrete: Submit mix design for grout.
- L. Acceptance of Method of Concrete repair: Make no repair until the Engineer has accepted method of preparing surfaces and proposed method of repair.
- M. If either Fine or Coarse Aggregate is Batched from More than One bin: submit analyses for each bin, and composite analysis made up form these, using proportions of materials to be used in mix.
- N. Cement Mill Tests: Include alkali content, representative of each shipment of cement for verification of compliance with specified requirements.
- O. Pozzolan Certificate of Compliance: Identify source of pozzolan and certify compliance with requirements of ASTM C 618.
- P. Information on mixing equipment.
- Q. Drying shrinkage test data.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
 - 1. Deliver, store, and handle concrete materials in manner as to prevent damage and inclusion of foreign substances.
 - 2. Deliver and store packaged materials in original containers until ready for use.
 - 3. Deliver aggregate to mixing site and handle in such manner that variations in moisture content will not interfere with steady production of concrete of specified degree of uniformity and slump.
- B. Acceptance at Site: Reject material containers or materials sowing evidence of water or other damage.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:

- 1. Hot Weather Concreting:
 - a. When Ambient Air Temperature is above 90°F: Prior to placing concrete, cool forms and reinforcing steel by water cooling to below 90°F.
 - b. Temperature of Concrete mix at Time of Placement: Keep temperature below 90°F by methods which do not impair quality of concrete.
- 2. Cold Weather Concreting:
 - a. Concrete placed below ambient air temperature of 45°F and falling or below 40°F: Heat such materials.
 - b. If materials have been exposed to freezing temperatures to a degree that any material is below 35°F: heat such materials.
 - c. Do not heat in excess of 160°F.
 - d. Protection of Concrete in Forms:
 - 1) Protect by means of covering with tarpaulins, or other acceptable covering.
 - 2) Provide means for circulation warm moist air around forms in manner to maintain temperature of 50°F for at least 5 days.
- 3. For conditions that promote rapid drying of freshly placed concrete such as low humidity, high temperature, and wind: Take corrective measures to minimize rapid water loss from concrete.
 - a. Furnish and use sufficient number of maximum and minimum self-recording thermometers to adequately measure temperature around concrete.

1.08 SEQUENCING AND SCHEDULING

A. Schedule placing of concrete in such manner as to complete any single placing operation to construction, contraction, or expansion joint.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Aggregate:
 - 1. General:
 - a. Provide concrete aggregates that are sound, uniformly graded, and free of deleterious material in excess of allowable amounts specified.
 - b. Grade aggregate in accordance with ASTM D 75 and C 136.
 - c. Provide unit weight of fine and coarse aggregate which produces in place concrete with weight of not less than 140 pounds per cubic foot.
- B. Fine Aggregate:
 - 1. Provide fine aggregate for concrete or mortar consisting of clean, natural sand or of sand prepared from crushed stone or crushed gravel.
 - 2. Do not provide aggregate having deleterious substances in excess of following percentages by weight of contaminating substances. In no case shall total exceed percent listed.

Item	Test Method	Percent
Removed by decantation (dirt, silt, etc.)	ASTM C 117	3
Shale or Chert	ASTM C 295	1
Clay Lumps	ASTM C 142	1

- 3. Except as otherwise specified, grade fine aggregate from coarse to fine in accordance with requirements of ASTM C 33.
- C. Coarse Aggregate:
 - 1. General: Provide coarse aggregate consisting of gravel or crushed stone made up of clean, hard, durable particles free from calcareous coatings, organic matter, or other foreign substances.
 - 2. Weight: Not exceeding 15%, for thin or elongated pieces having length greater than 5 times average thickness.
 - 3. Deleterious Substances: Not in excess of following percentages by weight, and in no case having total of all deleterious substances exceeding 2%.

Item	Test Method	Percent
Shale or chert	ASTM C 295	1
Coal and lignite	ASTM C 123	1/4
Clay lumps and friable	ASTM C 142	1/4
particles		
Materials finer than	ASTM C 117	1/2*
Number 200 sieve		
* Except when material finer than Number 200 sieve consists of crusher		
dust, maximum amount shall be 1%.		

- 4. Grading:
 - a. Graded as specified in ASTM C 33, Size Number 8.
 - b. Provide concrete utilizing this aggregate equal to Class C concrete in all other respects and is designated as Class CE.
- D. Portland Cement:
 - 1. General: Conform to specifications and tests for ASTM C 150, Types II or III, Low Alkali, except as specified otherwise.
 - 2. Low Alkali Portland: Have total alkali containing not more than 0.60%.
 - 3. Exposed Concrete in Any Individual Structure: Use only one brand of Portland cement.
 - 4. Cement for Finishes: Provide cement from same source and of same type as concrete to be finished.

E. Admixtures:

- 1. General:
 - a. Do not use admixtures of any type, except as specified, unless written authorization has been obtained from the Engineer.
 - b. Compatible with concrete and other admixtures.
 Do not use admixtures containing chlorides calculated as chloride ion in excess of 0.5% by weight.
 - c. Use in accordance with manufacturer's recommendations and add each admixture to concrete mix separately.
- 2. Air Entraining Admixture:
 - a. Provide all concrete with 5%, plus or minus 1%, entrained air of evenly dispersed air bubbles at time of placement.
 - b. Conform to ASTM C 260.
- 3. Pozzolan Admixture:
 - a. Fly Ash Pozzolan:

- 1) Conforming to requirements of ASTM C 618, Class F, may be used as admixture in concrete made with Type II Portland cement.
- 2) Pozzolan may replace Portland cement at ratio of 1.0 pound fly ash for each pound of Portland cement replaced.
- 3) Maximum of 15% by weight of minimum quantities of Portland cement listed in Table A under paragraph 2.03E may be replaced with fly ash pozzolan.
- 4) Do not use pozzolan as an admixture in concrete made with Portlandpozzolan cement.
- 5) Loss on Ignition for Pozzolan: Not exceed 4%.
- b. Ground granulated blast-furnace slag, grades 100 or 120, complying with ASTM C989 may substitute for Portland cement up to a maximum of 25% of the total cementitious material by weight.
- c. Substitutions that combine fly ash and ground granulated blast-furnace slag are limited to a combined total of 30% of the total cementitious material by weight with fly ash no more than 15% of the total.
- 4. Water Reducing Admixture:
 - a. May be used at the Contractor's option.
 - b. Conform to ASTM C 494, Type A or Type D.
 - c. Not contain air entraining agents.
 - d. Liquid form before adding to the concrete mix.
 - e. No decrease in cement is permitted as result of use of water reducing admixture.
- 5. Superplasticizers: Are not to be used without acceptance by Engineer.
- F. Water:
 - 1. Water for Concrete, Washing Aggregate, and Curing Concrete: Clean and free from oil and deleterious amounts of alkali, acid, organic matter, or other substances.
 - 2. Chlorides and Sulfate Ions:
 - a. Water for Conventional Reinforced Concrete: Use water not containing more than 1,000 milligrams per liter of chlorides calculated as chloride ion, nor more than 1,000 milligrams per liter of sulfates calculated as sulfate ion.
- G. Keyway Material: Steel, plastic, or lumber.
- H. Sprayed Membrane Curing Compound: Clear type with fugitive dye conforming to ASTM C 309, Type 1D.
- I. Surface Sealant System: Manufacturers: One of the following or equal:
 - a. Radcon Laboratories, Inc., Las Vegas, Nevada, Formula Number 7.
 - b. IPA Systems, Philadelphia, Pennsylvania, Duripal.

2.02 EQUIPMENT

- A. Mixing concrete:
 - 1. Mixers may be of stationary plant, paver, or truck mixer type.
 - 2. Provide adequate equipment and facilities for accurate measurement and control of materials and for readily changing proportions of material.
 - 3. Mixing Equipment:

- a. Capable of combining aggregates, cement, and water within specified time into thoroughly mixed and uniform mass and of discharging mixture without segregation.
- b. Maintain concrete mixing plant and equipment in good working order and operated at loads, speeds, and timing recommended by manufacturer or as specified.
- c. Proportion cement and aggregate by weight.
- B. Machine Mixing:
 - 1. Batch plant shall be capable of controlling delivery of all material to mixer within 1% by weight of individual material.
 - 2. If bulk cement is used, weigh it on separate visible scale which will accurately register scale load at any stage of weighing operation from zero to full capacity.
 - 3. Prevent cement from coming into contact with aggregate or with water until materials are in mixer ready for complete mixing with all mixing water.
 - 4. Procedure of mixing cement with sand or with sand and coarse aggregate for delivery to project site, for final mixing and addition of mixing water will not be permitted.
 - 5. Retempering of concrete will not be permitted.
 - 6. Discharge entire batch before recharging.
 - 7. Volume of Mixed Material Per Batch: Not exceed manufacturer's rated capacity of mixer.
 - 8. Mixers:
 - a. Perform mixing in batch mixers of acceptable type.
 - b. Equip each mixer with device for accurately measuring and indicating quantity of water entering concrete, and operating mechanism such that leakage will not occur when valves are closed.
 - c. Equip each mixer with device for automatically measuring, indicating, and controlling time required for mixing.
 - 1) Interlock device to prevent discharge of concrete from mixer before expiration of mixing period.
- C. Transit-mixed Concrete:
 - 1. Mix and deliver in accordance with ASTM C 94.
 - 2. Total Elapsed Time Between Addition of Water at Batch Plant and Discharging Completed Mix: Not to exceed 90 minutes or elapsed time at project site shall not exceed 30 minutes.
 - 3. Under conditions contributing to quick setting, total elapsed time permitted may be reduced by the Engineer.
 - 4. Equip each truck mixer with device interlocked so as to prevent discharge of concrete from drum before required number of turns and furnish such device that is capable of counting number of revolutions of drum.
 - 5. Continuously revolve drum after it is once started until it has completely discharged its batch.
 - a. Do not admit water until drum has started revolving.
 - b. Right is reserved to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. The CONTRACTOR will not be entitled to additional compensation because of such increase or decrease.

- D. Other Types of Mixers: In case of other types of mixers, mixing shall be as follows:
 - 1. Mix concrete until there is uniform distribution of materials, and discharge mixer completely before recharging.
 - 2. Neither speed nor volume loading of mixer shall exceed manufacturer's recommendations.
 - 3. Continue mixing for minimum of 1-1/2 minutes after all materials are in drum, and for batches larger than one cubic yard increase minimum mixing time 15 seconds for each additional cubic yard or fraction thereof.

2.03 MIXES

- A. Measurements of Materials:
 - 1. Measure materials by weighing, except as otherwise specified or where other methods are specifically authorized in writing by the Engineer.
 - 2. Furnish apparatus for weighing aggregates and cement that is suitably designed and constructed for this purpose.
 - 3. Accuracy of Weighing Devices: Furnish devices that have capability of providing successive quantities of individual material that can be measured to within 1% of desired amount of that material.
 - 4. Measuring or Weighing Devices: Subject to review by the Engineer, and bear valid seal of the Sealer of Weights and Measures having jurisdiction.
 - 5. Weighing Cement:
 - a. Weigh cement separately.
 - Cement in Unbroken Standard Packages (Sacks): Need not be weighed.
 - b. Bulk Cement and Fractional Packages: Weigh such cement.
 - 6. Mixing Water: Measured by volume or by weight.
- B. Concrete Proportions and Consistency:
 - 1. Concrete Consistency and Composition:
 - a. Provide concrete that can be worked readily into corners and angles of forms and around reinforcement without excessive vibration and without permitting materials to segregate or free water to collect on surface.
 - b. Prevent unnecessary or haphazard changes in consistency of concrete.
 - 2. Ratio of Coarse Aggregate to Fine Aggregate: Not less than 1.0 nor more than 2.0 for all concrete Classes, with exception of Class CE.
 - 3. Aggregate:
 - a. Obtain aggregate from source which is capable of providing uniform quality, moisture content, and grading during any single day's operation.
 - 4. Concrete Mix Water to Cement Ratio, Minimum Cement Content, and Slump Range: Conform to values specified in Table A in this Section.
 - 5. Concrete Batch Weights: Control and adjust so as to secure maximum yield, and at all times maintain proportions of concrete mix within specified limits.
 - 6. Mixture Modification: If required, by the ENGINEER, modify mixture within limits set forth in this Section.
- C. Concrete Mixes:

- 1. Proportioning of Concrete Mix: Proportion mixes on required average on compressive strength f'cr as defined in Subparagraph 2.04A2.
- 2. Mixes:
 - a. Adjusting of Water: After acceptance, do not change mixes without acceptance by Engineer, except that at all times adjust batching of water to compensate for free moisture content of fine aggregate.
 - b. Total Water Content of Each Concrete Class: Not exceed those specified in Table A in this Section.
 - c. Checking Moisture Content of Fine Aggregate: Furnish satisfactory means at batching plant for checking moisture content of fine aggregate.
- 3. Change in Mixes: Undertake new trial batch and test program as specified in this Section.
- D. Hand Mixed Concrete:
 - 1. Hand mix concrete only when acceptable to the Engineer.
 - 2. Prepare hand mixed concrete on watertight, level platform in batches not to exceed 1/3 cubic yard each.
 - 3. Aggregate:
 - a. First spread required amount of coarse aggregate on platform in an even and uniform layer, and then over such aggregate spread proper proportion of fine aggregate.
 - b. Combined Depth of Both Such Layers: Not be greater than 1 foot.
 - 4. Cement:
 - a. First evenly spread required quantity of cement over fine aggregate.
 - b. Then turn entire batch with shovels at least twice before adding water.
 - 5. Water:
 - a. Then uniformly sprinkle or spray proper amount of water over batched materials.
 - b. Then turn with shovels not less than three times before being removing from platform.
- E. Classes of Concrete:
 - 1. Provide concrete consisting of 5 classes, referred herein as Classes A, B, C, and D specified in this Section and use where specified or indicated on the Drawings.
 - 2. Weight of Concrete Classes: Provide classes of concrete having minimum weight of 140 pounds per cubic foot.
 - 3. Class B Concrete: Class B concrete may be substituted for Class A concrete, when highearly strength concrete is needed in areas specifically accepted by the Engineer and that do not require sulfate resistant concrete.
 - 4. Class C Concrete: Class C concrete may be used for fill for unauthorized excavation, for thrust blocks and ground anchors for piping, for bedding of pipe, and where indicated on the Drawings.
 - 5. Class D Concrete: Use Class D for precast concrete items.
 - 6. All other concrete, unless specified or otherwise indicated on the Drawings: Use Class A concrete.

"TABLE A" CONCRETE WITH AIR ENTRAINMENT				
Class	Specified Compressive Strength f'c at 28 Days (Pounds per Square Inch)	Maximum Net Water to Cement Ratio	Minimum Cement per Cubic Yard of Concrete by Weight (Pounds)	Slump Range (Inches)
A	4,000	0.45	564	2 to 4*
B (Type III cement)	4,000	0.45	564	2 to 4*
С	3,500	0.62	423	3 to 6
D	4,500	0.45	658	2 to 4
* NOTE: Slump for slabs, decks, walks, and beams shall be not more than 3-1/2 inches.				

7. Pumped Concrete: Provide pumped concrete that complies with all requirements of this Section.

- 8. Do not place concrete with slump outside limits indicated in Table A.
- 9. Classes:
 - a. Classes A, C, and D Concrete: Make with Type II low alkali cement.
 - b. Class B Concrete: Make with Type III low alkali cement.
 - c. Admixtures: Provide admixtures as specified in this Section.
- F. Air Entraining Admixture:
 - 1. Add agent to batch in portion of mixing water.
 - 2. Batch solution by means of mechanical batcher capable of accurate measurement.

2.04 SOURCE QUALITY CONTROL

- A. Tests:
 - 1. Concrete Mixes:
 - a. After concrete mixes have been accepted by Engineer, have trial batches of the accepted Class A, Class B, and Class D concrete mix designs prepared by testing laboratory acceptable to the Engineer.
 - b. Prepare trial batches by using specified cement and aggregates proposed to be used for the Work.
 - c. Trial Batches: Provide batches of sufficient quantity to determine slump, workability, consistency, and finishing characteristics, and to provide sufficient test cylinders.
 - d. Test Cylinders: Provide cylinders having six inch diameter by 12 inch length and that are prepared in accordance with ASTM C 31 for tests specified in this Section.
 - e. Determine slump in accordance with ASTM C 143.
 - f. Test Cylinders from Trial Batch:
 - 1) Test 8 cylinders for compressive strength in accordance with ASTM C 39.
 - a) Test 4 cylinders at 7 days and 4 at 28 days.
 - b) Establish ratio between 7 day and 28 day strength for mix. Seven day strength may be taken as satisfactory indication of 28 day strength provided effects on concrete of temperature and humidity between 7 day and 28 day are taken into account.
 - 2) Average Compressive Strength of 4 Test Cylinders Tested At 28 Days: Equal to or greater than required average compressive strength fcr on which concrete mix design is based.

- B. Drying Shrinkage:
 - 1. Prepare 5 drying shrinkage specimens in accordance with ASTM C 157, except as modified herein.
 - 2. Remove drying shrinkage specimens from molds at age of 23 hours plus or minus 1 hour after trial batching, then immediately place them in water at 73°F plus or minus 3°F for at least 30 minutes and then measure specimens within 30 minutes thereafter to determine original length. Then submerge specimens in saturated lime water at 73°F plus or minus 3°F for moist curing.
 - 3. Make measurement to determine expansion expressed as percentage of original length at age 7 days. Use length at age 7 days as base length for drying shrinkage calculations.
 - 4. Immediately store specimens in humidity-controlled room maintained at 73°F plus or minus 3°F and 50% plus or minus 4 relative humidity for remainder of test.
 - 5. Make and report measurements to determine shrinkage expressed as percentage of base length separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.
 - 6. Drying Shrinkage Deformation:
 - a. Measure drying shrinkage deformation of each specimen as difference between base length and length after drying at each test age.
 - b. Measure average drying shrinkage deformation of specimens to nearest 0.0001 inch at each test age.
 - c. If drying shrinkage of any specimen departs from average of test age by more than 0.0004 inch, disregard results obtained from that specimen and test another specimen.
 - d. Shrinkage of trial batch concrete at 28 days drying age shall not exceed 0.045% maximum.
 - 7. If trial batch tests do not meet specified requirements for slump, strength, workability, consistency, drying shrinkage, and finishing, change concrete mix design proportions and, if necessary, source of aggregate. Make additional trial batches and tests until an acceptable trial batch is produced that meets requirements of this Section.
 - 8. Perform test batches and tests required to establish trial batches and acceptability of materials without change in Contract Price.
 - 9. Do not place concrete until the concrete mix design and trial batch have been accepted by Engineer.
- C. Required Average Compressive Strength:
 - 1. Determine required average compressive strength (f'cr) for selection of concrete proportions for mix design, for each class of concrete, using calculated standard deviation and its corresponding specified compressive strength f'c, in accordance with ACI 318, Part 3, Chapter 5.
 - 2. When test records of at least 30 consecutive tests that span period of not less than 45 calendar days are available, establish standard deviation as described in ACI 318, Part 3, Chapter 5 and as modified as follows herein.
 - 3. Provide test records from which to calculate standard deviation that represent materials, quality control procedures, and conditions similar to materials, quality control procedures, and conditions expected to apply in preparation of concrete for the Work.
 - 4. Provide changes in materials and proportions within test records that are more restricted than those for the Work.

- 5. Specified Compressive Strength (fc) of Concrete Used in Test Records: Within 1,000 pounds per square inch of that specified for the Work.
- 6. When lacking adequate test records for calculation of standard deviation meeting requirements, determine required average compressive strength fcr from following Table B.

TABLE B		
Specified Compressive Strength f'c	Required Average Compressive Strength f'cr (pounds per square	
(pounds per square inch)		
2 000 to 5 000	$f_{c} + 1,000$	
Over 5 000	f' ± 1,200	
Over 5,000	Ic + 1,400	

D. Pozzolan:

- 1. Sampling and Testing:
 - a. Sample and test pozzolan in accordance with ASTM C 311.
 - b. In Computing Water to Cement Ratio And Cement Content Per Cubic Yard Of Concrete: Consider cement weight to be weight of Portland cement plus 100% of weight of fly ash.

E. Aggregate:

- 1. Testing of concrete aggregate is at Contractor's expense.
- 2. Sieves:
 - a. Use sieves with square openings for testing grading of aggregates.
 - b. Sieve Analyses: If sieve analyses indicate significant change in materials, the Engineer may require that new mix design be submitted and accepted before further placing of concrete.
- 3. Sample aggregate in accordance with ASTM D 75 and C 136.
- 4. Fine Aggregate:
 - a. Provide fine aggregate not containing strong alkali nor organic matter which gives color darker than standard color when tested in accordance with ASTM C 40.
 - b. Provide aggregate having soundness complying with requirements of ASTM C 33 when tested in accordance with ASTM C 88.
 - c. Provide aggregate complying with reactivity requirements of ASTM C 33 when tested in accordance with ASTM C 289.
- F. Coarse Aggregate:
 - 1. Soundness when tested in accordance with ASTM C 88: Have loss not greater than 10% when tested with sodium sulfate.
 - 2. Abrasion Loss: Not exceed 45% after 500 revolutions when tested in accordance with ASTM C 131.
 - 3. Reactivity: Not exceed limits specified in Appendix of ASTM C 33 when tested in accordance with ASTM C 289.
 - 4. Portland Cement:
 - 5. Determination Alkali Content: Determine by method set forth in ASTM C 114.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All surface concrete (sidewalk, curb, valley gutters, manhole collars, etc.) must use Lamp Black Colorant.
- B. Surface Sealant System: Apply as recommended by manufacturer published instructions. Where concrete continues to sweat or leak, apply additional coats of surface sealant until the sweating or leaks stop.
- C. Joints and Bonding:
 - 1. As far as practicable construct concrete work as monolith.
 - 2. Locations of contraction, construction, expansion, and other joints are indicated on the Drawings or as specified in this Section.
 - 3. Construction Joints:
 - a. Where construction joints are not indicated on the Drawings, provide slabs and walls with construction joints at intervals not greater than 30 feet.
 - b. In order to preserve strength and watertightness of structures, make no other joints, except as authorized the Engineer.
 - c. At construction joints, thoroughly clean concrete of laitance, grease, oil, mud, dirt, curing compounds, mortar droppings, or other objectionable matter by means of heavy sandblasting, and wash surfaces just prior to succeeding concrete placement.
 - d. At Horizontal Joints: Immediately prior to resuming concrete placing operations, thoroughly spread bed of grout not less than 1/2 inch in thickness, nor more than 1 inch in thickness over horizontal joint surfaces.
- D. Keyways in Joints:
 - 1. Provide keyways in joints as indicated on the Drawings.
 - 2. Treat lumber keyway material with form release coating, applied in accordance with manufacturer's instructions.
- E. Take special care to ensure that concrete is well consolidated around and against waterstops and that waterstops are secured in proper position.
- F. Cleaning of Construction Joints:
 - 1. Wash construction joints free of sawdust, chips, and other debris after forms are built and immediately before concrete or grout placement.
 - 2. Should formwork confine sawdust, chips, or other loose matter in such manner that it is impossible to remove them by flushing with water, use vacuum cleaner for their removal, after which flush cleaned surfaces with water.
 - 3. Provide cleanout hole at base of each wall and column for inspection and cleaning.
- G. Expansion, Contraction, and Construction Joints
 - 1. Constructed where and as indicated on the Drawings.
 - 2. Waterstops, Expansion Joint Material, Synthetic Rubber Sealing Compound, and Other Similar Materials: As specified in Section 03 63 00 Epoxy Grouting.

- H. Repair of Concrete: Where it is necessary to repair concrete by bonding mortar or new concrete to concrete which has reached its initial set, first coat surface of set concrete with epoxy bonding agent as specified in Section 03 63 00 Epoxy Grouting.
- I. Conveying Concrete:
 - 1. Convey concrete from mixer to place of final deposit by methods which prevent separation or loss of materials.
 - 2. Use equipment for chuting, pumping, and conveying concrete of such size and design as to ensure practically continuous flow of concrete at delivery end without separation of materials.
 - 3. Design and use chutes and devices for conveying and depositing concrete that direct concrete vertically downward when discharged from chute or conveying device.
 - 4. Keep equipment for conveying concrete thoroughly clean by washing and scraping upon completion of any day's placement.
- J. Placing Concrete:
 - 1. Place no concrete without prior authorization of the Engineer.
 - 2. Do Not Place Concrete Until:
 - a. Reinforcement is securely and properly fastened in its correct position and loose form ties at construction joints have been retightened.
 - b. Dowels, bucks, sleeves, hangers, pipes, conduits, bolts, and any other fixtures required to be embedded in concrete have been placed and adequately anchored.
 - c. Forms have been cleaned and oiled as specified.
 - 3. Placement of concrete in which initial set has occurred, or of retempered concrete, will not be permitted.
 - 4. Place no concrete during rainstorms or high velocity winds.
 - 5. Protect concrete placed immediately before rain to prevent water from coming in contact with such concrete or winds causing excessive drying.
 - 6. Keep sufficient protective covering on hand at all times for protection of concrete.
 - 7. After acceptance, adhere to proposed sequence of placing concrete, except when specific changes are requested and accepted by the Engineer.
 - 8. Notify the Engineer in writing of readiness, not just intention, to place concrete in any portion of the work.
 - a. Provide this notification in such time in advance of operations as the Engineer deems necessary to make final inspection of preparations at location of proposed concrete placing.
 - b. Place forms, steel, screeds, anchors, ties, and inserts in place before notification of readiness is given to the Engineer.
 - c. Depositing Concrete:
 - 1) Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing.
 - 2) Do not deposit concrete in large quantities in one place and work along forms with vibrator or by other methods.
 - 3) Do not drop concrete freely into place from height greater than 5 feet.
 - 4) Use tremies for placing concrete where drop is over 5 feet.
 - 5) Commence placement of concrete on slopes, at bottom of slope.
 - 9. Place concrete in approximately horizontal layers not to exceed 24 inches in depth and bring up evenly in all parts of forms.

- 10. Continue concrete placement without avoidable interruption, in continuous operation, until end of placement is reached.
- 11. If more than 20 minutes lapse prior to placement of new concrete over concrete previously placed, reduce depth of layers being placed at one time, and/or increase placing equipment, until it is possible to return with placing operation to previously placed concrete within 20 minutes.

12.

- 13. If concrete is to be placed over previously placed concrete and more than 20 minutes have elapsed, then spread layer of grout not less than 1/2 inch in thickness nor more than 1 inch in thickness over surface before placing additional concrete.
- 14. Placement of Concrete for Slabs, Beams, or Walkways:
 - a. If cast monolithically with walls or columns, do not commence until concrete in walls or columns has been allowed to set and shrink.
 - b. Allow set time of not less than one hour for shrinkage.
- K. Consolidating Concrete:
 - 1. Place concrete with aid of acceptable mechanical vibrators.
 - 2. Thoroughly consolidate concrete around reinforcement, pipes, or other shapes built into the work.
 - 3. Provide sufficiently intense vibration to cause concrete to flow and settle readily into place and to visibly affect concrete over radius of at least 18 inches.
 - 4. Vibrators:
 - a. Keep sufficient vibrators on hand at all times to vibrate concrete as placed.
 - b. In addition to vibrators in actual use while concrete is being placed, have on hand minimum 1 spare vibrator in serviceable condition.
 - c. Place no concrete until it has been ascertained that all vibrating equipment, including spares, are in serviceable condition.
 - 5. Take special care to place concrete solidly against forms so as to leave no voids.
 - 6. Take every precaution to make concrete solid, compact, and smooth, and if for any reason surfaces or interiors have voids or are in any way defective, repair such concrete in manner acceptable to the Engineer.
- L. Slabs on Grade:
 - 1. Do not place concrete on ground or compacted fill until subgrade is in moist condition acceptable to the Engineer.
 - 2. If necessary, sprinkle subgrade with water not less than 6 nor more than 20 hours in advance of placing concrete.
 - 3. If it becomes dry prior to actual placing of concrete, sprinkle again, without forming pools of water.
 - 4. Place no concrete if subgrade is muddy or soft.
- M. Loading Concrete:
 - 1. Green Concrete:
 - a. No heavy loading of green concrete will be permitted.
 - b. Green concrete is defined as concrete with less than 100% of the specified strength.

- 2. No backfill shall be placed against concrete walls until the concrete has reached the specified strength and the connecting slabs and beams have been cast and have reached the specified strength.
- 3. Use construction methods, sequencing, and allow time for concrete to reach adequate strength to prevent overstress of the concrete structure during construction.
- N. Curing Concrete:
 - 1. General:
 - a. Cure concrete by methods specified in this Section.
 - b. Cure concrete minimum of 7 days.
 - c. Cure concrete to be painted with water or plastic membrane.
 - d. Do not use curing compound on concrete surfaces that are to receive paint or upon which any material is to be bonded.
 - e. Water cure or plastic membrane cure concrete slabs which are specified to be sealed by concrete sealer.
 - f. Cure other concrete by water curing or sprayed curing membrane at the Contractor's option.
 - g. Floor slabs may be cured using plastic membrane curing.
 - 2. Water Curing:
 - a. Keep surfaces of concrete being water cured constantly and visibly moist day and night for period of not less than 7 days.
 - b. Each day forms remain in place may count as 1 day of water curing.
 - c. No further curing credit will be allowed for forms in place after contact has once been broken between concrete surface and forms.
 - d. Do not loosen form ties during period when concrete is being cured by leaving forms in place.
 - e. Flood top of walls with water at least 3 times per day, and keep concrete surfaces moist at all times during 7 day curing period.
 - 3. Sprayed Membrane Curing:
 - a. Apply curing compound to concrete surface after repairing and patching, and within 1 hour after forms are removed.
 - b. If more than 1 hour elapses after removal of forms, do not use membrane curing compound, but apply water curing for full curing period.
 - c. If surface requires repairing or painting, water cure such concrete surfaces.
 - 4. Curing Compound:
 - a. Do not remove curing compound from concrete in less than 7 days.
 - b. Curing compound may be removed only upon written request by the Contractor and acceptance by the Engineer, stating what measures are to be performed to adequately cure structures.
 - c. Take care to apply curing compound in area of construction joints to see that curing compound is placed within construction joint silhouette.
 - d. Remove curing compound placed within construction joint silhouette by heavy sandblasting prior to placing any new concrete.
 - e. Contractor's Option: Instead of using curing compound for curing of construction joints such joints may be water cured.
 - f. Apply curing compound by mechanical, power operated sprayer and mechanical agitator that will uniformly mix all pigment and compound.
 - g. Apply compound in at least 2 coats.
 - h. Apply each coat in direction 90°F to preceding coat.

- i. Apply compound in sufficient quantity so that concrete has uniform appearance and that natural color is effectively and completely concealed at time of spraying.
- j. Continue to coat and recoat surfaces until specified coverage is achieved and until coating film remains on concrete surfaces.
- k. Thickness and Coverage of Compound: Provide compound having film thickness that can be scraped from surfaces at any and all points after drying for at least 24 hours.
- 1. The Contractor is cautioned that method of applying curing compound specified herein may require more compound than normally suggested by manufacturer of compound and also more than is customary in the trade.
- m. Apply amounts specified herein, regardless of manufacturer's recommendations or customary practice, if curing compound is used in place of water curing.
- n. If the Contractor desires to use curing compound other than specified compound, coat sample areas of concrete wall with proposed compound and also similar adjacent area with specified compound in specified manner for comparison.
- o. If proposed sample is not equal or better, in opinion of the Engineer, in all features, proposed substitution will not be allowed.
- p. Prior to final acceptance of the work, remove, by sandblasting or other acceptable method, any curing compound on surfaces exposed to view, so that only natural color of finished concrete is visible uniformly over entire surface.
- 5. Plastic Membrane Curing:
 - a. Polyethylene film may be used to cure slabs. Seal joints and edges with small sand berm.
 - b. Install plastic membrane as soon as concrete is finished and can be walked on without damage.
 - c. Keep concrete moist under plastic membrane.

3.02 CONCRETE FINISHING

- A. Provide concrete finishes in accordance with the Drawings.
- B. Edges of Joints:
 - 1. Provide joints having edges as indicated on the Drawings.
 - 2. Protect wall and slab surfaces at edges against concrete spatter and thoroughly clean upon completion of each placement.
 - 3. Apply Sealant:
 - a. Apply sealant at coverage rate not to exceed 500 square feet per gallon.
 - b. Apply as soon as slab or floor will bear weight.
 - c. Sealer:
 - 1) Before applying sealer, sweep entire surface clean with very soft bristled brush which will not mark finish.
 - 2) Apply sealer with large, clean, mop type applicator.
 - 3) Paint rollers are not acceptable.
 - 4) Workmen shall wear flat soled shoes which will not mark or scar surface.
 - 5) Do not allow traffic on floors and slabs until sealer has dried and hardened.

3.03 FIELD QUALITY CONTROL

A. Testing of Concrete:

- 1. During progress of construction, the Contractor will have tests made to determine whether the concrete, as being produced, complies with requirements specified.
- 2. Tests will be performed in accordance with ASTM C 31, ASTM C 39, and ASTM C 172.
- 3. Required Number Cylinders for testing by Contractor:
 - a. Not less than 3 cylinder specimens, 6 inch diameter by 12 inch long, will be tested for each 150 cubic yards of each class of concrete with minimum of 3 three specimens for each class of concrete placed and not less than 3 specimens for each half day's placement.
 - b. One cylinder will be broken at 7 days and 2 at 28 days.
- 4. The Contractor's laboratory technician will test slump at the beginning of each placement, as often as necessary to keep slump within the specified range, and when requested to do so by the Engineer.
- 5. The Contractor shall:
 - a. Coordinate test cylinder sampling with their laboratory technician.
 - b. Coordinate slump tests of concrete with their laboratory technician, who will use a slump cone in accordance with requirements of ASTM C 143.
 - c. Not use concrete that does not meet specification requirements in regards to slump, but remove such concrete from project site.
 - d. Provide concrete for test specimens when requested by the Engineer for the purposes of Quality Assurance testing.
- B. Air Entraining Admixture:
 - 1. Test percent of entrained air in concrete at beginning of each placement, as often as necessary to keep entrained air within specified range, and when requested to do so by the Engineer.
 - 2. Provide test equipment.
 - 3. Do not use concrete that does not meet Specification requirements as to air entrainment and shall remove such concrete from project site.
 - 4. Test air entrainment in concrete in accordance with ASTM C 173.
 - 5. The Engineer may at any time test percent of entrained air in concrete received on project site.
- C. Enforcement of Strength Requirement:
 - 1. Concrete is expected to reach higher compressive strength than that which is indicated in Table A as specified compressive strength f'c.
 - 2. Strength Level of Concrete: Will be considered acceptable if following conditions are satisfied.
 - a. Averages of all sets of 3 consecutive strength test results is greater or equal to specified compressive strength f'c.
 - b. No individual strength test (average of 2 cylinders) falls below specified compressive strength fc by more than 500 pounds per square inch.
 - c. Whenever one, or both, of 2 conditions stated above is not satisfied, provide additional curing of affected portion followed by cores taken in accordance with ASTM C 42 and ACI 318 and comply with following requirements:
 - 1) If additional curing does not bring average of 3 cores taken in affected area to at least specified compressive strength fc, designate such concrete in affected area as defective.

2) The Engineer may require the Contractor to strengthen defective concrete by means of additional concrete, additional reinforcing steel, or replacement of defective concrete, all of the Contractor's expense.

3.04 ADJUSTING

- A. Repair of Defective Concrete:
 - 1. Remove and replace or repair defective work.
 - 2. Correct defective work as specified in this Article.
 - 3. Do not patch, repair, or cover defective work without inspection by the Engineer.
 - 4. Provide repairs having strength equal to or greater than specified concrete for areas involved.
 - a. Chip out and key imperfections in the work and make them ready for repair.
 - 5. Dry Pack Method:
 - a. Dry Pack Method: Use for holes having depth nearly equal to or greater than least surface dimension of hole, for cone-bolt, and narrow slots cut for repair.
 - b. Smooth Holes: Clean and roughen by heavy sandblasting before repair.
 - 6. Mortar Method of Replacement: Use for following:
 - a. Holes too wide to dry pack and too shallow for concrete replacement.
 - b. Comparatively shallow depressions, large or small, which extend no deeper than reinforcement nearest surface.
 - 7. Concrete Replacement:
 - a. Use: When holes extend entirely through concrete section or when holes are more than 1 square foot in area and extend halfway or more through the section.
 - b. Method of Repair for Surfaces of Set Concrete to Be Repaired: First coat with epoxy bonding agent.
 - 8. Acceptable Method of Concrete Repair
 - a. Make no repair until the Engineer has accepted method of preparing surfaces and proposed method of repair.

3.05 INSTALLATION

- A. Precast concrete pipe, culvert and structures shall be installed as shown on the plans, according to manufacturer's recommendations.
- B. Joint sealers shall be used as specified herein for a water-tight installation.
- C. Precast concrete reinforced concrete box culvert structures shall be in place and plumb prior to pouring associated appurtenant structures. Dowel extensions shall be cast into the structures as detailed on the Drawings.

3.06 DEFECTIVE CONCRETE REPAIRS

- A. Concrete shall be considered defective for the following reasons:
 - 1. Failure of finished concrete profiles to conform to the drawings within tolerance.
 - 2. Failure to meet the specified cylinder strength requirements.
 - 3. Concrete showing cracks, rock pockets, voids, spalls, or defects that adversely affect the structural adequacy of the concrete.

- B. Defective concrete that results from improper casting or curing shall be repaired or replaced at the plant prior to shipment; damaged concrete that results from transportation, handling, or storage after the piece leaves the plant shall be repaired or replaced at no expense to the City.
- C. Repairing and Patching: Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, rock pockets, tie holes, except as specified, etc., shall be patched at once. Defective areas shall be chipped away to a depth of about one inch with the edges perpendicular to the surface.

END OF SECTION

SECTION 03 63 00

EPOXY GROUTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Epoxy
 - 2. Grout

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2 inch or 50 millimeter cube specimens).
 - 2. C 531 Test Method for Liner Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
 - 3. C 579 Test Method for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfacings.
 - 4. C 827 Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - 5. C 939 Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
 - 6. C 1090 Test Method for Measuring Change in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
 - 7. C 1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - 8. C 1181 Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts
 - 9. D 638 Test Method for Tensile Properties of Plastics.
 - 10. D 695 Test Method for Compressive Properties of Rigid Plastics.
 - 11. D 790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.03 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Provide epoxy materials that are new and use them within shelf-life limitations set forth by manufacturer.
 - 2. Perform and conduct work of this Section in neat orderly manner.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data completely describing epoxy materials.

- B. Perform and conduct work of this Section in neat orderly manner.
- C. Non-shrink Grout and Non-shrink Epoxy Grout: Submit manufacturer's literature and certified test data prior to installation.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be delivered to the jobsite in their original, unopened packages or containers, clearly labeled with the manufacturer's product identification and printed instructions.
- B. All materials shall be stored in a cool dry place and in accordance with the manufacturer's recommendations.
- C. All materials shall be handled in accordance with the manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Epoxy: Water-insensitive two-part type low viscosity epoxy adhesive material containing 100 percent solids and meeting or exceeding following characteristics when tested in accordance with standards specified: Manufacturers: One of the following or equal:
 - 1. Master Builders, Inc., Concressive Standard LVI.

Physical Characteristic	Test Method	Required Results
Tensile Strength	ASTM D 638	8,000 pounds per square inch at 14 days and 77°F cure.
Flexure Strength	ASTM D 790	11,000 pounds per square inch at 14 days and 77°F cure.
Compressive Strength	ASTM D 695	16,000 pounds per square inch at 24 hours and 77°F cure.
Bond Strength		Concrete shall fail before failure of epoxy.
Gel Time In 5-Mil Film		Four hours maximum at 77°F.
Elongation	ASTM D 638	1 percent minimum at 14 days and 77°F.

2. Sika Chemical Corp., Sikadur 35 Hi-Mod LV.

- B. Epoxy Gel: Manufacturers: One of the following or equal:
 - 1. Sika Chemical Corp.'s, Sikadur 31, Hi-Mod Gel.

C. Epoxy Bonding Agent: Manufacturers: One of the following or equal:

- 1. Master Builders, Inc., Concressive 1001 Liquid LPL.
- 2. Sika Chemical Corp.'s, Sikadur 32, Hi-Mod.
- D. Grout:
 - 1. Consist of mixture of Portland cement and sand.
- E. Non-shrink Grout:

- 1. Non-shrink grout shall be a preportioned and prepackaged cement-based mixture. It shall contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings. It shall require only the addition of potable water.
- 2. Potable water for pre-soaking, mixing, and curing shall be clean and free of oils, acids, alkalies, organics, and any other deleterious matter.
- 3. Bleeding: Non-shrink grout shall be free from the emergence of mixing water from within or the presence of water on its surface.
- 4. Non-shrink grout shall be in accordance with ASTM C 1107.
- Consistency: Non-shrink grout shall remain at a minimum flowable consistency for at least 45 minutes after mixing at 45°F to 90°F when tested in accordance with ASTM C 230. If at a fluid consistency, it shall be verified in accordance with ASTM C 939.
- 6. Dimensional Stability (height change): Non-shrink grout shall be in accordance with ASTM C 1107, volume-adjusting Grade B or C at 45°F to 90°F. It shall show 90 percent or greater bearing area under bases or baseplates.
- 7. Compressive Strength: Non-shrink grout shall show minimum compressive strengths at 45°F to 90°F in accordance with ASTM C 1107 for various periods from the time of placement, including 5,000 pounds per square inch at 28 days when tested in accordance with ASTM C 109 as modified by C 1107.
- 8. Manufacturers: One of the following or equal:
 - a. Five Star Products, Inc., Fairfield, CT, Five Star Grout.
 - b. Master Builders, Inc., Cleveland, OH, Masterflow 928.
 - c. L&M Construction Chemicals, Inc., Omaha, NE, CRYSTEX.

2.02 MIXES

- A. Grout Mix:
 - 1. For Concrete Repair: Mix in same proportions used for concrete being repaired, with only sufficient water to give required consistency for spreading.
 - 2. For Spreading over the Surfaces of Construction or Cold Joints: Mix with no more water used than allowed by water-cement ratio specified for concrete.
 - 3. For Other Applications: Mix in proportions by weight of one part cement to four parts of concrete sand.
- B. Non-shrink Grout Mix:
 - 1. Mix in accordance with manufacturer's installation instructions such that resulting mix has fluid or flowable consistency and is suitable for placing by pouring.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.
- B. Epoxy:
 - 1. Apply in accordance with manufacturer's installation instructions.
- C. Epoxy Gel:
 - 1. Apply in accordance with manufacturer's installation instructions.

- 2. Use for vertical or overhead work, or where high viscosity epoxy is required.
- 3. Epoxy gel used for vertical or overhead work may be used for horizontal work.
- D. Epoxy Bonding Agent:
 - 1. Apply in accordance with manufacturer's installation instructions.
 - 2. Bonding agent will not be required for filling form tie holes or for normal finishing and patching of similar sized small defects.
- E. Grouts:
 - 1. Shall be mixed in accordance with the manufacturer's recommendations.
- F. Non-shrink Grouts:
 - 1. Non-shrink cementitious grout shall be added to a premeasured amount of water that does not exceed the manufacturer's maximum recommended water content.
 - 2. Mix cementitious grouts per manufacturer's instructions for uniform consistency.
 - 3. Grouts may be drypacked, flowed, or pumped into place.
 - 4. Do not retemper grout by adding more water after stiffening.

END OF SECTION

SECTION 04 30 00

STAINLESS STEEL STOP LOGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and supplies required to install and prepare for operation the stainless steel stop logs, guide frames and stop log lifters as shown on the Contract Drawings and as specified herein.

1.02 SUBMITTALS

- A. Provide the following information to confirm compliance with the specification.
 - 1. Complete description of all materials including the material thickness of all structural components of the stop logs, guide frames and stop log lifter.
 - 2. Installation drawings showing all details of construction, components required for installation, dimensions and anchor bolt locations. Include installation order relative to TCD to ensure stop logs will fit through hatches, if necessary.
 - 3. Maximum bending stress and deflection of the stop logs under the maximum design head.
 - 4. The location of the company headquarters of the manufacturer and the location of its manufacturing facility. Provide the name of the company that fabricates the equipment if the supplier utilizes an outside source.

1.03 QUALITY ASSURANCE

- A. Qualifications
 - 1. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20 years experience designing and manufacturing stop logs. The manufacturer shall have manufactured stop logs for a minimum of 100 projects.
 - 2. The specification is based on the Stainless-Steel Stop Log as manufactured by Waterman Valve, LLC of Exeter, California.

PART 2 - EQUIPMENT

- 2.01 GENERAL
 - A. Stop log assemblies shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.

- B. When in use, leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter.
- C. The stop logs shall incorporate a continuous resilient seal along the bottom edge of each stop log. Vertical seals shall be mechanically fastened to the guide frame rails.
- D. Stop logs shall be of the height as shown in the Contract Drawings and shall function properly when stacked in any order.
- E. Stop logs shall be designed to be self-draining, non-buoyant, and shall drop into place under their own weight, without any downward pressure necessary.
- F. All structural components of the stop logs shall be fabricated of stainless steel and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
- G. All structural components of the guide frames shall be fabricated of stainless steel and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
- H. All welds shall be performed by welders with AWS D1.6 certification.
- I. Finish: Mill finish on stainless steel. Weldments shall be passivated to remove weld burn and scale.

J. Materials:

<u>Components</u> Frame Guides & Invert	<u>Materials</u> Stainless Steel, Type 316L, ASTM A240, ASTM A 276
Stop Logs	Stainless Steel, Type 316L, ASTM A240, ASTM A 276
Lip Seal	(Neoprene ASTM D2000) (EPDM)
Anchor Studs, Fasteners and Nuts	Stainless Steel, Type 316, ASTM A276, ASTM F 593, ASTM F 594

2.02 FRAME GUIDES

A. The frame guides or grooves and invert member shall be constructed of stainless steel with a minimum thickness of 1/4-inch.

- 1. Frame design shall allow for embedded mounting or mounting directly to a wall with stainless steel anchor bolts and grout. Mounting style shall be as shown on the Contract Drawings.
- 2. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of the frame guides and shall be positioned to ensure that the load is transferred to the anchor bolts.
- 3. An invert member shall be provided across the bottom of the guides. The invert member shall be of the flushbottom type.

2.03 STOP LOGS

- A. The stop logs shall be constructed of formed stainless steel shapes with a minimum thickness of 1/4-inch.
 - 1. The stop logs shall be of the heights indicated on the Contract Drawings.
 - 2. Maximum bending stress shall not exceed 18,000 PSI at maximum operating head.
 - 3. Two attachment slots shall be provided in the top of each stop log for removal and installation using the stop log lifter.
 - 4. Each stop log shall be outfitted with a stainless-steel identification tag.

2.04 SEALS

- A. Each stop log shall be outfitted with a continuous resilient lip seal along the bottom edge of each log.
 - 1. The continuous lip seal shall be constructed of rubber or EPDM and shall be mechanically retained to the stop log.
 - 2. The lip seal shall be activated by a combination of the weight of the stop log and the differential water pressure, which pushes the seal against the inside of the groove assembly.
 - 3. Stop logs that utilize rubber "J" seals or "P" seals are not acceptable.
 - 4. Stop logs shall have a bi-directional seal.

2.05 LIFTER

- A. One stop log lifter shall be furnished for each different guide frame width.
 - 1. The lifter shall be constructed of stainless steel and shall be outfitted with UHMW guide bars and stainless-steel fasteners.

- 2. The lifter shall be provided with lifting hooks that automatically engage lifting pins through the slots in the top of the stop logs. A lanyard release will be incorporated into the design.
- 3. The lifter shall be capable of installing and removing all stop logs of the same width whether they are in place or placed on the adjacent floor.

2.06 STORAGE RACKS

- A. Storage racks shall be provided to house stop logs while they are not in use.
 - 1. Storage racks shall be constructed of aluminum and shall be provided to the City.

2.07 ANCHOR BOLTS

- A. Anchor bolts shall be provided by the stop log manufacturer for mounting the guide frames.
 - 1. Quantity and location shall be determined by the stop log manufacturer.
 - 2. If epoxy type anchor bolts are provided, the stop log manufacturer shall provide the studs and nuts.
 - 3. For surface mount installations, anchor bolts shall have a minimum diameter of 1/2-inch.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation of the stop logs, guide frames and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
- B. The CONTRACTOR shall review thoroughly the installation drawings and installation instructions prior to installing the guide frames.
- C. The guide frames shall be installed in a true vertical plane, square and plumb.
- D. The CONTRACTOR shall fill the void in between the guide frames and the wall with nonshrink grout as shown on the installation drawing and in accordance with the manufacturer's recommendations.

3.02 FIELD TESTING

A. After installation, all stop logs shall be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. The stop logs shall be inserted into the guide frames to confirm that they operate in accordance with the specification. Each stop log assembly shall be water tested by the CONTRACTOR, at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowable leakage.

END OF SECTION

SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. The general extent of all excavation, fill and grading is shown on the Plans.
- B. Section Includes:
 - 1. Removal of excess and unsuitable material from the site.
 - 2. Excavation of material to allow for the placement of underground structures, including any necessary shoring and bracing.
 - 3. Backfilling of underground conduit, pipe, and structures.
 - 4. Preparation of subgrade for concrete slab work and pavement.
 - 5. Furnish and compact artificial fill.
 - 6. Finish grading.
- C. Related Sections:
 - 1. Section 31 50 00 Excavation Support and Protection.
 - 2. Section 31 23 16 Trenching.

1.02 REFERENCES

- A. Associated General Contractors (AGC):
 - 1. Manual of Accident Prevention in Construction (Section 9).
- B. American Society for Testing and Materials (ASTM):
 - 1. C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 2. C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. D 422 Standard Test Method for Particle Size Analysis of Soils.
 - 4. D 1556 Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
 - 5. D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m).
 - 6. D 2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - 7. D 2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 8. D 3017 Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - 9. D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- C. Division of Industrial Safety (DIS).

- D. Occupational Safety and Health Act (OSHA).
- E. State of California Department of Transportation (Caltrans).

1.03 DEFINITIONS

- A. Excavation: Consists of satisfactory loosening, removing, loading, transporting, depositing, and compacting in final location, wet and dry materials, necessary to be removed for purposes of construction, or as required for ditches, grading, roads, and such other purposes as are indicated on the Plans.
- B. Backfill Adjacent to Structure: Is backfill around the exterior surfaces of a structure from the bottom of the excavation to finish grade.
- C. In-Place Density of Compacted Backfill: Is density determined in accordance with ASTM D 1556, or with ASTM D 2922 and ASTM D 3017.
- D. Maximum Density: Is maximum density obtained in laboratory when tested in accordance with ASTM D 1557 and ASTM D4253 for levee toe drain aggregate.
- E. Definitions Related to Compaction of Coarse Fill:
 - 1. One Pass: Defined as one movement of roller over area being compacted.
 - 2. Measurement Of Pass Width: Measure width of pass between centers of outside tires or outside edge of roller wheel.
- F. Optimum Moisture Content: Is the optimum content at the maximum density when tested in accordance with ASTM D 1557.

1.04 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. General:
 - a. Onsite material shall only be used for structural backfill when approved by the site geotechnical engineer.
 - b. No extra compensation will be made for hauling fill materials or for water required to compact fills.
 - 2. Subgrade Preparation:
 - a. The bottom of the excavation should be lined with a minimum of 18 inches of Caltrans Class 1 Aggregate Subbase material or ³/₄-inch clean crushed rock. A layer of geotextile shall be placed underneath crushed rock.
 - 3. Structural Backfill:
 - a. Material for Backfill: As specified in these specifications.
 - 4. Compacted Fills:
 - a. Provide specified compaction for backfill, fill, and other earthwork.
 - b. The City will perform confirmation tests to verify and confirm that work has complied, and is complying at all times, with requirements specified in this Section concerning field quality control testing.
 - 5. Borrow Area:

- a. Where borrow material is required, provide such material from source selected by the Contractor, subject to acceptance by the Engineer.
- b. Use of imported borrow shall not cause additional cost to the Contract.
- 6. Environmental Requirements:
 - a. Keep excavations reasonably free from water.
 - b. Provide standby power to ensure continuous dewatering in case of power failure.
- 7. Geotechnical Investigation:
 - a. The Contractor shall incorporate the findings, conclusions and recommendations of the Project Geotechnical Report, entitled "Geotechnical Report on East Palo Alto Trash Capture Device Newbridge Street and Willow Road East Palo Alto, California", dated January, 2025, for the site earthwork. The Report is attached to these Specifications.
 - b. The Report, in part, concludes that:
 - 1) Groundwater was encountered at approximately 18 feet below ground surface (bgs) with historical data indicating higher groundwater levels up to approximately 10 feet bgs. Design and construction of the TCD will require a means of preventing uplift.
 - 2) The site is underlain by low permeability fine-grained silts and clays. Between 11 and 16 feet bgs, a poorly graded sand layer was encountered which is susceptible to caving. The bottom of the excavation is anticipated to be composed of moist to wet homogenous sandy clays.
- B. A temporary dewatering system should be installed to provide a firm, relatively dry base from which to install the Trash Capture Device. Contractor shall dewater to minimum 2 feet below bottom of excavation.
- C. Temporary shoring shall be designed by a shoring engineer. The dewatering system, passive or active, should be appropriate for the temporary shoring methods chosen.

1.05 SUBMITTALS

- A. Product Data: Submit material source, gradation, and testing data for all materials, including imported and on-site materials.
- B. Test Reports: Submit certified test reports of all tests specified to be performed by the Contractor. Test reports shall be signed and sealed by a registered geotechnical engineer in the state of California.
- C. Excavation Plan: Submit proposed excavation plan which shall include a detailed description of materials and equipment to be used, limits of excavation, material stockpile locations, and a shoring plan.
- D. Dewatering Plan: Proposed dewatering plan including arrangement, location, and depths of system components, type, and sizes of filters, water sample, and required permits.

1.06 QUALITY ASSURANCE

A. Compaction Sequence Requirements: Until specified degree of compaction on previously specified amounts of earthwork is achieved, do not perform additional earthwork of the same kind.

- B. After satisfactory conclusion of initial compaction demonstration and at any time during construction, provide confirmation tests as directed by the Engineer.
- C. Dewatering: Dispose of water from dewatering in accordance with Section 31 23 19 Dewatering and Stormwater Management.

1.07 SEQUENCING AND SCHEDULING

- A. Schedule earthwork operations to meet requirements as provided in this Section for excavation and uses of excavated material.
- B. Excavation and Filling: Perform excavation and filling, during construction, in manner and sequence that provides drainage at all times.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Water for Compacting Fills: Use water from source acceptable to Engineer.
- B. Fill Materials:
 - 1. Class 1 Aggregate Subbase:
 - a. Aggregate must be clean and consist of any combination of the following:
 - 1) Broken stone
 - 2) Crushed gravel
 - 3) Natural rough-surfaced gravel
 - 4) Sand
 - 5) Processed reclaimed asphalt concrete, PCC, LCB, or CTB
 - b. Aggregate gradation shall be per the table below:

	1
Sieve Sizes	Percent by Weight
(Square Openings)	Passing Sieve
3 inch	100
2 1/2 inch	87-100
Number 4	30-75
Number 200	0-23

- C. Controlled Low Strength Material: Refer to Section 31 23 23 Controlled Low Strength Material.
- D. Crushed Rock: Crushed rock for mat foundation underlayment, pipe bedding, and where necessary to stabilize excavation bottoms shall be a clean, durable uniformly graded rock between 3/8 inch and 1 inch size.
 - 1. Device shall be supported underneath by 18 inches of Caltrans Class 1 Aggregate Subbase material or ³/₄-inch clean crushed rock.
 - 2. A layer of geotextile shall be installed underneath the crushed rock if soft/loose materials are encountered per the recommendations of the project geotechnical engineer. Geotextiles are described in Section 31 05 19 Filter Fabric and Geotextiles.
 - 3. Rock gradation shall be per the table below:
| Sieve | Percentage |
|----------------------------------|------------|
| Size | Passing |
| | Sieve |
| 1 inch | 90 - 100 |
| ³ / ₄ inch | 30 - 100 |
| ¹ / ₂ inch | 5 - 25 |
| 3/8 inch | 0-6 |

- E. Native Material:
 - 1. Native Material may be used if approved by the project geotechnical engineer for reuse.
- F. Imported Materials:
 - 1. Imported materials shall be in conformance with Section 19 of the State Standard Specifications, these Special Provisions for their intended use, and approved by the Engineer prior to use. The Contractor shall submit for review information on all backfill materials to be used on the project giving a description of the source of the material, environmental history and past uses of the property at the source location, quantity of material and the purpose for which it is intended. All potential imported fill must be reviewed and approved by the geotechnical engineer before importation to the site. A minimum of five (5) days will be required to evaluate and test suitability of planned imported materials.
 - 2. Imported and non-expansive material shall be inorganic and shall have a Plasticity Index of 15 percent or less and a Liquid Limit of 30 percent or less.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Character and Quantity of Material:
 - a. Verify character and quantity of rock, gravel, sand, clay, water, and other inorganic or organic materials to be encountered in work to be performed.
 - b. Determine gradation and shrinkage of excavation and fill material, and suitability of material for use intended in work to be performed.
 - c. Determine quantity of material, and cost thereof, required for construction of excavations and fills, whether from on-site excavations, borrow areas, or imported materials. Include in cost of work to be performed.
 - d. Include wasting of excess material, if required, in cost of work to be performed.
 - e. All excavated soils will be disposed of offsite in a legal manner.
 - f. The Contractor shall, prior to submitting his bid, visit the site and become familiar with actual site and soil conditions. No allowance will be made by the City for any unfavorable conditions or events which should have been foreseen from a thorough examination of the contract documents, the site, and working conditions.
- B. Verification of Prepared Subgrade prior to Constructing Improvements:

- 1. The Contractor shall request the Engineer to visually inspect and provide written confirmation of the suitability of prepared subgrade soils prior to the continuation of work.
 - a. Work completed without such confirmation is at the Contractor's risk and subject to removal at the direction of the Engineer.
 - b. The Engineer will perform this inspection no later than two working days after the Contractor makes his request.
- I. Contractor shall protect excavation prior to and during the inspection.
 - 2. The Contractor remains solely responsible for excavation safety. This responsibility is not waived when the Engineer agrees to enter the work site for inspection.

3.02 PROTECTION

- A. If existing live utilities are encountered, they are to be protected from damage and the proper authorities and affected utility companies notified.
- B. Record unmarked utility locations on record drawings and notify the Engineer.
- C. Open excavations, trenches, and the like are to be protected with fences, barricades, covers and railings as required.
- D. Every precaution shall be taken to prevent spillage when hauling on or adjacent to any public street or highway. Any spillage shall be promptly removed.

3.03 SAFETY

A. In conformance with Section 31 50 00 – Excavation Support and Protection, the Contractor is solely responsible for excavation safety, including support to all adjacent improvements at all times.

3.04 PREPARATION

- A. Surface Preparation:
 - 1. Preparing Ground Surfaces for Fill or Concrete:
 - a. After clearing, grubbing and stripping is completed, scarify entire areas which underlie fill sections or structures to a depth of 6 inches and until surface is free of ruts, hummocks, and other features which would prevent uniform compaction by equipment to be used.
 - b. Moisture condition and recompact areas to density specified in "Compacted Fills" before placing of fill material or concrete.
 - c. Where cemented rock, cobbles, or boulders compose a large portion of foundation material underlying structures, slabs, or paved areas, it may not be advisable to scarify the top 6 inches prior to compaction. If the Engineer deems it advisable not to scarify existing natural ground, then moisten the native soil and compact it as specified in "Compaction of Coarse Fill."
 - d. Where subgrade stabilization is required, scarification and compaction of native soils is not practical. In these instances, stabilize the subgrade by placing geotextile and crushed rock as shown on the plans and/or specified herein.
 - e. Finished compacted subgrade shall be firm and non-yielding under the weight of compaction equipment. If the relative compaction of the subgrade is less than specified, or the surface of the subgrade exhibits significant yielding, over-

excavate the area and rebuild or rework the area until the subgrade compaction conforms to this specification.

- B. Preparing for Backfill:
 - 1. After completion of device installation and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed, and excavation shall be cleaned of all trash and debris.
 - a. After inspection of foundation, walls, and pipes, backfill shall be placed symmetrically to prevent eccentric loading upon or against structures.
 - b. All backfill shall be compacted per Compaction of this specification.

3.05 APPLICATION

- A. General:
 - 1. Dispose of excavated materials in lawful manner.
 - 2. Dispose of surplus material on private property only when written permission agreement is furnished by owner of property. Submit copies of such agreements.
 - 3. Obtain material required for fills from borrow areas subject to the fill material requirements specified herein.
 - 4. Rocks, broken concrete, or other solid materials larger than 4 inches in greatest dimension shall not be placed in fill areas but removed from project site at no additional cost to the Contract.
 - 5. Stabilization of Subgrade: Provide materials used or perform work to stabilize subgrade so it can withstand loads which may be placed upon it by Contractor's equipment.
 - 6. No material larger than 1" shall be placed in the first two feet below subgrade.
- B. Excavation:
 - 1. Excavations for Structures:
 - a. All excavations shall comply with Section 31 50 00 Excavation Support and Protection.
 - b. Dimensions and Elevations of Excavations: Provide excavations conforming to dimensions and elevations indicated on the Drawings for each structure, including trenching for adjacent piping and all work incidental thereto.
 - c. Soil of Unsuitable Bearing Value: Where soil is encountered having unsuitable bearing value, Engineer may direct in writing that excavation be carried to elevations above or below those indicated on the Drawings.
 - d. Unless directed by the Engineer, excavations shall not be carried below elevations indicated on the Drawings.
 - e. Bottom of Excavations for Structures: Consist of native material with top 12 inches compacted to 95 percent of maximum density and graded to conform to outside limits of structures as indicated on the Drawings, except where otherwise indicated on the Drawings or specified.
 - f. The Contractor shall keep all exposed expansive soil subgrade, including trench excavation sidewalls, moist until protected by overlying improvements.
 - 2. Necessary Over Excavation:
 - a. General:
 - 1) Where it becomes necessary to excavate beyond normal lines of excavation in order to remove boulders or other interfering objects, backfill voids

remaining after removal as specified in Backfilling of Voids, or as acceptable to the Engineer.

- 3. Perform necessary excavation beyond normal lines as specified above and backfill such voids.
- 4. Backfilling of Voids:
 - a. Fill voids with suitable material acceptable to the Engineer, placed in manner and to same uniform density as surrounding material.
- 5. With acceptance of the Engineer, concrete may be used.
- C. Compaction:
 - 1. Lifts:
 - a. All fills shall be placed in loose lifts not exceeding 8 inches thick in uncompacted thickness in accordance with ASTM D1557.
 - 2. Compacted Fills:
 - a. Lines and Grades:
 - 1) Construct fills, and backfills, designated herein as fills, at locations and to lines and grades indicated on the Plans.
 - 3. Where required, Contractor shall provide necessary imported fill material from outside sources.
 - a. Compacted Fill Shape and Sections: Provide completed fill that corresponds to shape of typical sections indicated on the Plans or that meets requirements for particular case.
 - b. Preparation of Areas Designated to Receive Fill Material: Scarify to minimum depth of 6 inches, unless otherwise indicated on the Drawings, and recompact to density of fill material as specified in following Article.
 - c. Fills and Backfills and Upper 6 Inches in Cuts: Compact to percentage of maximum density as follows and as determined by ASTM D1557:
 - 1) Backfill adjacent to structures: 90 percent
 - 2) Upper 12" of backfill adjacent to structures: 95%
 - 3) Under present and future structures: 95 percent.
 - 4) Under paved areas not subject to traffic loading, curbs, and sidewalks: 95 percent.
 - 5) Other areas: 95 percent.
 - 6) Demolition areas: 95 percent.
 - 4. Placing Compacted Fills:
 - a. Placement: Place loose material in successive layers that do not exceed 8 inches in thickness after compaction.
 - b. Moisture Content: Bring each layer to specified moisture content for maximum density before compaction by rolling.
 - c. Each successive lift shall be firm and non-yielding under the weight of construction equipment.
 - d. Defective Compacted Fills: Remove and recompact.
- D. Equipment:
 - 1. Clayey soils shall be compacted with sheepsfoot equipment.
 - 2. Sandy/gravely shall be consolidated in place with vibratory equipment.

3.06 FIELD QUALITY CONTROL

- A. Tests:
 - 1. Confirmation Tests:
 - a. Contractor shall accomplish specified compaction for backfill, fill, and other earthwork.
 - b. Contractor may, at his option, arrange for conformation testing through his own forces or a testing laboratory.
 - c. Confirmation testing is only for the Contractor's benefit and shall not substitute for Compliance Tests as specified herein.
 - d. Control operations in response to confirmation tests and City Compliance Testing to verify that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.
 - e. Cost of Confirmation Tests: Paid for by the Contractor.
 - f. Confirmation Test submittals are not required.
 - 2. Compliance Tests:
 - a. Compliance tests will be made by the Engineer to verify that compaction is meeting requirements specified herein.
 - b. City's Testing Laboratory will perform confirmation testing as acceptable to the Engineer.
 - c. Contractor shall coordinate with Engineer regarding the frequency of Compliance Testing and testing results.
 - d. Copies of Compliance Test Reports will be submitted promptly to the Engineer for disbursement to Contractor.
 - e. Coordination with Engineer Testing: Remove overburden above level at which the Engineer wishes to test and backfill and recompact excavation after testing is completed.
 - f. If compaction fails to meet specified requirements, perform remedial work by one of the following methods:
 - 1) Remove and replace backfill at proper density.
 - 2) Bring density up to specified level by other means acceptable to the Engineer.
 - 3. Retesting:
 - a. Costs of Retesting: Costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements shall be borne by the Contractor.
 - b. City's Compliance Tests During Performance of Remedial Work will be performed as follows:
 - 1) Tests will be performed in a manner acceptable to the Engineer.
 - 2) Frequency: Double amount specified for initial confirmation tests.
- B. Tolerances:
 - 1. 1. Finish Grading of Excavations, Backfill and Fills:
 - a. Perform fine grading under concrete structures such that finished surfaces are never above established grade or approved cross section and are never more than 0.10 feet below.
 - b. Provide finish surface areas outside of structures that are not more than 0.10 feet above or below established grade or accepted cross section.
- C. For Areas Which Are Not under Structures, Concrete, Asphalt, Roads, Pavements, Walks, Dikes and Similar Type Items:
 - 1. Provide finish graded surfaces of either undisturbed natural soil, or cohesive material not less than 6 inches deep.

- 2. Intent of preceding is to avoid sandy or gravelly areas.
- D. Finished Grading Surfaces:
 - 1. Reasonably smooth, compacted, and free from irregular surface changes.
 - 2. Provide degree of finish that is ordinarily obtainable from blade grader operations, except as otherwise specified.
 - 3. Uniformly grade areas which are not under concrete.
 - 4. Finish gutters and ditches so that they drain readily.

3.07 WET WEATHER AND WET SOIL CONDITIONS

- A. To the maximum extent possible within schedule constraints, major excavation should take place during periods of suitable weather conditions.
- B. The continuous presence of groundwater at the project site is possible.
- C. When the moisture content of fill materials is significantly above optimum:
 - 1. Scarify and air dry until fill materials have a suitable moisture content for compaction; or
 - 2. Over-excavate the fill and replace with suitable import materials with an appropriate moisture content; and/or
 - 3. Install a geotextile or geogrid to reinforce soft fill.
 - 4. Chemically treat with lime, kiln-dust, or cement to reduce the moisture content and increase the strength of the fill.

3.08 CONTROL OF WATER

A. Water may be encountered within the Work at any time, and the presence of such water may be continuous. Contractor shall control site water so that work may be done in the dry in a safe working environment according to relevant provisions of the Safety Orders. Control of water shall follow specification section 31 23 19.

3.09 ADJUSTING

- A. Finish Grades of Excavations, Backfilling and Fill:
 - 1. Repair and reestablish grades to required elevations and slopes due to any settlement or washing way that may occur from action of the elements or any other cause prior to final acceptance.
- B. Finish Grades of Excavations, Backfilling and Fill:
 - 1. Protect newly graded areas from action of the elements.

END OF SECTION

SECTION 31 05 19

FILTER FABRIC AND GEOTEXTILES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Engineering Fabrics (Geotextiles).

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
- B. D 1388 Test Method for Stiffness of Fabrics
- C. D 3776 Test Methods for Mass per Unit Area (Weight) of Woven Fabric.
- D. D 4491 Test Methods for Water Permeability of Geotextiles by Permittivity.
- E. D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles.
- F. D 6567 Test Method for Measuring the Light Penetration of a Turf Reinforcement Mat (TRM)
- G. D 6818 Test Method for Linear Thermal Expansion of Electrode Carbons
- H. D 7322 Test Method for Determination of Rolled Erosion Control Product (RECP) Ability to Encourage Seed Germination and Plant Growth Under Bench-Scale Conditions
- I. Erosion Control Technology Council (ECTC):
- J. ECTC Guidelines

1.03 DEFINITIONS

- A. Filter Fabric for Drains and Underdrains: Nonwoven filter fabric manufactured from polyester, nylon, or polypropylene material, or any combination thereof.
- B. Geotextile: Woven Polypropylene geotextile fabric.
- C. Geogrid: Woven polyester biaxial geogrids for base course reinforcement and subgrade stabilization applications.

1.04 PROJECT CONDITIONS

A. Take field measurements to determine the exact lengths and dimensions of the surfaces to receive the fabric.

1.05 SUBMITTALS

- A. Product Data.
- B. Samples.
- C. Quality Control Submittals:
- D. Certificates of Compliance.
- E. Manufacturer's Instructions.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Storage and Protection:
- B. Furnish engineering fabrics in protective covers capable of protecting the fabric from ultraviolet rays, abrasion, and water.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Geotextile for separation and stabilization over very weak subgrades One of the Following or Equal:
 - 1. Mirafi, 500X Geofabric
 - 2. Tensar BX1200 Geogrid

2.02 MATERIAL REQUIREMENTS

A. Physical Properties: Filter Fabric to meet the following minimum requirements.

Property	Test Value	Test Method
Minimum Weight	5.6 ounces per square yard	ASTM D3776
Minimum Grab Tensile Strength	200 pounds	ASTM D4632
Minimum Elongation at Break	15%MD/10%CD	ASTM D4632
Minimum Puncture Strength	90 pounds	ASTM D4833
Minimum Burst Strength	400 pounds per square inch	ASTM D3786
Minimum Apparent Open Size	#50	ASTM D4751
Minimum Permittivity	0.05 per second	ASTM D4491
Minimum UV Resistance	70%	ASTM D4355

B. Physical Properties: Geogrid to meet the following minimum requirements.

Property	Value (Machine Direction)	Value (Cross- Machine Direction)	Test Method
Aperture Size (nominal)	1 in	1.3 in	
Tensile Strength (ultimate)	1,310 lbs/ft	1,970 lbs/ft	ASTM D6637
Tensile Strength (2%)	410 lbs/ft	620 lbs/ft	ASTM
Tensile Strength (5%)	810 lbs/ft	1,340 lbs/ft	ASTM D6637
Junction Efficiency	93%		GRI-GG2-87
Flexural Stiffness	750,000 mg-cm		ASTM D5732
Aperture Stability	6.6 kg-cm/deg		USACE
UV Resistance (500 hr)	98%		ASTM D4355

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Preparation: During grading operations, take care not to disturb or scarify the subgrade. This may require use of lightweight dozers for low strength soils such as saturated, cohesionless, or low cohesion soils. Recompact to minimum 95 percent at maximum density if subgrade is scarified.
- B. Prior to placement of fabric; prepare surface to smooth conditions free of debris, depressions, or obstructions which may damage the fabric.

3.02 INSTALLATION

- A. Follow manufacturer's installation instructions and as complimented herein.
 - 1. Place the fabric smoothly without folds or wrinkles.
 - 2. Use special care when placing the fabric in contact with the soil so that no void spaces occur between the geotextile and the prepared surface.
 - 3. Overlap the fabric sheets as indicated on the Drawings or according to manufacturer's installation, whichever is greater.
 - 4. Place drainage aggregate on the geotextile as specified.

3.03 FIELD QUALITY CONTROL

A. Inspection: Before covering, the conditions of the fabric will be observed by the Engineer to determine that no holes or rips exist in the fabric. Repair all such occurrences by placing a new layer of fabric extending beyond the defect in all directions a distance equal to the minimum overlap required for adjacent rolls.

END OF SECTION

SECTION 31 23 16

TRENCHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Trench excavation, fine grading, pipe bedding, backfilling, and compaction for the following:

1. Stormwater piping.

B. Related Sections:

- 1. Section 31 50 00 Excavation Support and Protection.
- 2. Section 31 00 00 Earthwork.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

- 1. C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- 2. C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- 3. D 1556 Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
- 4. D 1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft.lbf/ft^3 (2,700 kN.m/m^3)).
- 5. D 2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- 6. D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- 7. The Contractor shall refer to the findings, conclusions and recommendations of the Project Geotechnical Report, entitled "Geotechnical Report on East Palo Alto Trash Capture Device, Newbridge Street and Willow Road, East Palo Alto, California", dated January 2025 for site trenching. The Report is attached to these Specifications.

1.03 SUBMITTALS

- A. Products Data: For all proposed bedding and backfill materials.
 - 1. Material source.
 - 2. Gradation.
 - 3. Testing data and testing laboratory qualifications including lab certification.

B. Trench excavation plan, drawings, and calculations as specified in Section 31 50 00 - Excavation Support and Protection.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. Provide bedding and backfill material per Section 31 00 00 – Earthwork.

PART 3 - EXECUTION

3.01 PREPARATION

A. General:

- 1. Trench Condition:
 - a. Install pipe and materials as specified herein and detailed on the Drawings.
- 2. Embankment Condition:
 - a. Exists where width of pipe trench exceeds limits specified herein.
 - b. Before laying pipes or electrical conduits in fill, place fill and compact it to not less than 2 feet above top of pipe or conduit.
 - c. After placing and compacting fill, excavate through fill and fine grade as required in this Section.
- 3. Protection: Stabilize excavation as specified in Section 31 50 00 Excavation Support and Protection.

3.02 INSTALLATION

A. Trench Excavation:

- 1. General Requirements:
 - a. If because of soil conditions, safety requirements or other reasons, trench width at top of pipe is increased beyond width specified in this Section and shown on the plans, upgrade laying conditions or install stronger pipe designed in conformance with Specifications for increased trench width, without additional cost.
- 2. Pipe and Electrical Conduits:
 - a. Lay pipe in open trench; install pipe bedding as shown on the Plans.
 - b. If bottom of excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of pipe and refill to grade with bedding material placed at uniform density, with minimum possible compaction, at no additional cost.
 - c. If bottom of excavation is found to consist of soft or unstable material which is incapable of properly supporting pipe, remove such material to a depth and for the length required, as determined by the Engineer, and then refill trench to grade with crushed rock and compacted to 90 percent maximum density.
- 3. Trench Widths: as shown on drawings
- 4. For Manholes, Valves, or Other Accessories:

- a. Provide excavations sufficient to leave at least 12 inches clear between their outer surfaces and embankment or shoring which may be used to hold banks and protect them.
- b. Do not backfill with earth under manholes, vaults, tanks, or valves.
- c. Fill any unauthorized excess excavation below elevation indicated on the Drawings for foundation of any structure with crushed rock at no additional cost. Backfill material may be substituted for crushed rock in areas where foundation material is not required and when approved by the Engineer.
- 5. Backfilling of Manhole Excavation: Conform to backfilling requirements as specified for trenches in this Section.
- 6. At Road Crossings or Existing Driveways:
 - a. Make provision for trench crossings at these points, either by means of backfills, tunnels, or temporary bridges.

B. Pipe Bedding:

- 1. Bedding material shall be crushed rock as described in Section 31 00 00 Earthwork unless otherwise specified or shown on the drawings.
- 2. General:
 - a. Over excavate bottom of trench to allow installation of at least 12 inches, or 1/12 outside diameter of pipe, whichever is greater.
 - b. Place bedding material at uniform density, with minimum possible compaction.
- 3. Bell or Coupling Holes:
 - a. Dig holes after trench fine grading has been placed.
 - b. Provide holes of sufficient width to provide ample room for grouting, banding, or welding.
 - c. Excavate holes only as necessary in making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.
- 4. Depressions for Joints, Other than Bell-and-spigot:
 - a. Make in accordance with recommendations of joint manufacturer for particular joint used.
- 5. Bedding material shall be as scheduled herein unless otherwise specified.
- 6. After Pipe Laid:
 - a. Place bedding material under, around, and above pipe to 12 inches above top of pipe in maximum 6-inch lifts and compact to 90 percent of maximum density.
- 7. Pipe Displacement:
 - a. Take necessary precautions in placement and compaction of bedding material to prevent displacement of piping.
 - b. In event there is movement or floating, re-excavate, re-lay, and backfill the pipe.
- 8. Consolidation:
 - a. Bedding shall be mechanically compacted at optimum moisture content or above according to ASTM D1557 with vibratory or other compaction equipment. Water settling methods such as flooding and poling or jetting are prohibited.

C. Trench Backfill:

- 1. Backfill material shall be as specified in Section 31 00 00 Earthwork.
- 2. Place and compact backfill in accordance with following requirements:
 - a. From 6 inches above top of pipe to natural surface level with backfill material compacted to 90 percent of maximum density.

- b. Trench Backfill within 12" of pavement with backfill material compacted to 95 percent of maximum density. Match finish grade as indicated on the Drawings.
- c. Backfill shall be mechanically compacted at optimum moisture content or above according to ASTM D1557 with vibratory equipment weighing no more than 12 tons static weight. All backfill shall be placed in maximum 8-inch lifts. Water settling methods such as flooding and poling or jetting are prohibited.
- D. Native or Import Material:
 - 1. Native or import material meeting the requirements within Section 31 00 00 Earthwork shall be used as backfill.

E. Excess Material:

1. Remove excess excavated material from the project site and dispose of legally off-site.

3.03 FIELD QUALITY CONTROL

A. Shall meet the compaction and testing requirements in Section 31 00 00 – Earthwork.

END OF SECTION

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SECTION 31 23 19

DEWATERING AND STORMWATER MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. The Work specified in this Section includes the requirements for the design, procurement, location, permitting, installation, maintenance, operation, and removal of dewatering systems, and all Work necessary to control, handle, satisfactorily treat, and dispose of groundwater and surface water and stormwater, and all other water that may be encountered, as required for performance of the Work.
- B. Contractor shall furnish all labor, materials, equipment, facilities, transportation and services for all dewatering necessary to work in the dry.
- C. This Section consists of all Work necessary to remove water from the project site and nuisance water from whatever source (the storm drain system, groundwater surface runoff, or rainwater) that interferes with the progress of the Work. Also included are all equipment and construction necessary for dewatering including pumps, pipe, valves, and suction and discharge appurtenances. This includes all work necessary for Water Quality Control per NPDES permit requirements.

1.02 RELATED SECTIONS

- A. Section 31 50 22 Excavation Support and Protection.
- B. Section 31 23 16 Trenching.
- C. Geotechnical Report on East Palo Alto Trash Capture Device Newbridge Street and Willow Road, Haley & Aldrich, January 2025.

1.03 REFERENCES

- A. Except as otherwise indicated, the current editions of the following Specifications and Standards apply to the Work of this Section:
 - 1. Environmental Protection Agency (EPA)
 - a. 40 CFR 136 Guidelines Establishing test Procedures for the Analysis of Pollutants
 - b. 40 CFR 261 Identification and Listing of Hazardous Waste
 - c. 40 CFR 403 General Pretreatment Regulations for Existing and New Sources of Pollution
 - 2. Occupational Safety and Health Act (OSHA).
 - 3. Regional Water Quality Control Board NPDES Water Quality Order R2-2022-0018 with all subsequent amendments.
 - 4. State Water Resources Control Board NPDES Water Quality Order 2022-0057-DWQ, Construction General Permit with all subsequent amendments.
 - 5. San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)

1.04 SUBMITTALS

- A. Water Control Plan: Working drawings, design data, and descriptions of proposed dewatering and water pollution control facilities for each location where these facilities are proposed, including:
 - 1. The proposed types of dewatering or groundwater control system, including a description of the methods, equipment, standby equipment, and power supply, pollution and sediment control facilities, and discharge locations to be utilized.
 - 2. Proposed system for stormwater and rainwater control and conveyance, including a description of the methods, equipment, standby equipment, and power supply as needed, and discharge locations to be utilized.
 - 3. Arrangement, location, depth, and elevations of the components of the proposed systems with a complete description of the equipment to be used with associated installation, operation, and maintenance procedures.
 - 4. Description of the proposed treatment system(s), including number and locations of setting tanks and filtration system.
 - 5. Location and size of sumps, berms, dikes, sediment pits, discharge lines, and any other proposed dewatering installations, including their relation to existing drainage facilities.
 - 6. Estimates of pumping rate for the dewatering system and duration of the dewatering pumping period.
 - 7. A schedule for the installation of the system, procedures for the installation start-up protocols and removal of each system.
 - 8. Proposed best management practices (BMPs) to protect stormwater quality from dewatering operations, stormwater runoff, or other sources. A construction BMP plan shall be included in the Water Control Plan which is compliant with SMCWPPP and California Stormwater Quality Association (CASQA) Construction BMP Handbook.
- B. Calculations demonstrating the adequacy of the proposed dewatering and/or groundwater control systems and equipment.
- C. Resubmit if the system is modified during installation or operation.
- D. Daily reports and records as specified herein.
- E. Working drawings for excavation and groundwater treatment and disposal, including proposed discharge locations.
- F. A copy of the approved discharge permit from RWQCB or Regional Water Quality Control Plan (if permit is required).
- G. The City's review of Water Control Plan or any other Plan shall not relieve the Contractor from his obligation to meet these Specifications, applicable OSHA and Cal OSHA requirements for excavation safety, or any other worker safety provisions.

1.05 QUALITY CONTROL

A. Contractor shall be able to provide the following replacement equipment within two (2) days of an equipment failure or malfunction: standby equipment, machinery, piping,

power, and pumps in good working condition and of adequate capacity to continue dewatering operations at all sites where dewatering is in progress.

- B. Sufficient pumping equipment for immediate use shall be on the project site at all times, including standby pumps for use in case other pumps become inoperable. Water shall be disposed of to cause no injury to public or private property, or to be a menace to the public health.
- C. Install the complete dewatering system and activate it at least 7 calendar days prior (and no more than 2 weeks) to the need for that system on the construction schedule. In the presence of the Engineer, or designee, test the system as required to demonstrate its adequacy. Test by running the system as long as necessary to obtain stabilized flow rate and to provide representative samples of dewatering effluent. Continue system testing until the effluent is in compliance with the discharge requirements.

1.06 WATER POLLUTION CONTROL

- A. Before starting any work and during construction, existing storm water inlets and drain systems within and adjacent to the project limits shall be protected from being damaged, polluted, or plugged with debris resulting from the Contractor's operation on new installation or existing facility modifications.
- B. It is the Contractor's responsibility to keep the storm water flowing freely at all times. The Contractor shall install false bottom (plate forms) or other methods as approved by the Engineer to prevent debris from entering the deep inlets while working on the top, and provide positive debris collection and/or dewater system for shallow inlets to prevent the debris from entering the drainage pipe system. All methods to be used for this project shall be submitted to the City in the Water Control Plan for approval five (5) working days prior to the construction at existing storm drainage systems.
- C. After breaking old pavement, remove all chunks and pieces to avoid contact with rainfall or runoff. During saw-cutting operations, slurry must not be discharged to storm drain system. Reduce the amount of water used in the saw cutting operation, supply enough water to prevent damage to the blade, no water will run to the Storm Water Inlet (SWI). Instead a paste shall be created that will not travel in the gutter. Shovel and vacuum saw cut materials and remove from the site. During inclement weather use absorbent pads, pillows, sacks, or other equivalent filtering device to block or form berm around the SWI. Remove the concrete sediment material before it hardens completely. The Contractor must not wash construction equipment at the jobsite or discharge wash water into the storm drain system.
- D. Contractor shall not allow the tracking of dust or dirt on City roadways. BMPs for dust and sediment control shall be used.
- E. Contractor shall follow SMCWPPP and CASQA BMP Handbook guidelines for construction stormwater pollution prevention BMPs.

1.07 PROJECT CONDITIONS

A. Repair, subject to the Engineer's acceptance, any damage, disruption, or interference resulting directly or indirectly from dewatering operations.

- B. The Contractor shall incorporate the findings, conclusions and recommendations of the Project Geotechnical Report, entitled "Geotechnical Report on East Palo Alto Trash Capture Device Newbridge Street and Willow Road East Palo Alto, California", dated January, 2025, for the site dewatering design. The Report is attached to these Specifications (Appendix B).
- C. The Report, in part, concludes that:
 - 1. Groundwater was encountered at approximately 18 feet below ground surface (bgs) with historical data indicating higher groundwater levels up to approximately 10 feet bgs. Construction of the TCD will require a means of preventing uplift. The site is underlain by low permeability fine-grained silts and clays. Between 11 and 16 feet bgs, a poorly graded sand layer was encountered which is susceptible to caving. The bottom of the excavation is anticipated to be composed of moist to wet homogenous sandy clays. A temporary dewatering system should be installed to provide a firm relatively dry base

A temporary dewatering system should be installed to provide a firm, relatively dry base from which to install the Trash Capture Device. Contactor shall dewater to minimum 2 feet below bottom of excavation.

- D. Temporary shoring should be designed by a shoring engineer. Due to the presence of sand layers and high groundwater, sheet piles are recommended for shoring of the excavation. The dewatering system, passive or active, should be appropriate for the temporary shoring methods chosen. Contractor shall not use speed shores, trench boxes or slide rail systems.
- E. Make dewatering facilities accessible to the City at any time for monitoring purposes.

1.08 DESIGN CRITERIA

- A. Design dewatering systems to satisfy the following objectives:
 - 1. Effectively control water to provide a dewatered and stable work area required to safely complete the Work.
 - 2. Provide continuous control of water and the safety of dewatered areas at all times during the course of construction, including weekends and holidays and during periods of work stoppages.
 - 3. Provide adequate backup systems to provide for (1) and (2) above.
 - 4. If the Contractor chooses to use electric driven pumping equipment, a backup power source shall be provided. Should the Contractor choose to use engine drivel pumps, he shall maintain, on site, sufficient fuel reserves to operate the pumps for a period of at least 8 hours.
 - 5. Meet the requirements of all applicable legislative statues, judiciary decisions, codes, ordinances, and regulations, including those pertaining to the local noise ordinances.
- B. Design Flow Rates
 - 1. During the dry season (April 1st October 31st) contractor shall anticipate dry weather flows of approximately 1 cfs. Contractors shall coordinate with the City for operations of the downstream Ravenswood pump station as necessary to lower tailwater elevations. Dewatering to the sanitary sewer system is prohibited, exceptions may be allowed only under special circumstances and with a discharge permit obtained through East Palo Alto Sanitary District (EPASD). Contractor shall be responsible for obtaining all permits.

- 2. Construction shall not occur during the wet season (November 1st March 31st).
- 3. Contractor shall maintain existing storm drain system capacity at all times.
- C. Include the monitoring and recording system in the design, and criteria for achievement or objectives.
- D. Include proof that design is viable and not expected to create problems.
- E. Treatment of the groundwater and excavation water will be required to limit the turbidity below the threshold of the receiving City storm drainpipe. All sediment or other matter removed during treatment shall be properly disposed of. Contractor is responsible to limit dewatering turbidity below that of permit requirements (if permit is needed). Contractor shall adjust dewatering system as directed by Engineer to comply with permit requirements. A settling tank and filtration system will be required at a minimum.
- F. Water originating from the storm drain system does not need to be treated and can be bypassed back into the storm drain culvert downstream of the project site unless comingled with groundwater.
- G. Temporary dewatering structures shall consist of clean washed gravel, sandbags, or other non-erodible material and shall be completely removed from the work area at project completion.
- H. Due to clay deposits and high-water table, dewatering shall not be done by point wells. Dewatering may be accomplished with a sump pit at the bottom of the excavation.
- I. Contractor shall design the dewatering system to limit lowering of the water table and prevent settlement of surrounding improvements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide dewatering equipment with totalizing flow meters to accurately determine flow rates and the quantity of water pumped. Install flow meters no closer than 5 feet from any bend in the discharge pipe or further if recommended by the flow meter manufacturer. Monitor and record the volume of water pumped per calendar day.
- B. Provide a Section of clear piping, a minimum of 12 inches long, for observation of turbidity in the discharge piping. Maintain as necessary to allow for observation of flow.

PART 3 - EXECUTION

3.01 EQUIPMENT

A. Equipment shall be suitable for the work to be done and shall be in good operating condition. Equipment operators and workmen are to be skilled in such operations and shall be competently supervised.

3.02 SITE CONDITIONS

- A. Prior to biding on the Work, the Contractor shall familiarize himself with project site conditions. No allowance will be made by the Owner for any unfavorable conditions or events which should have been foreseen from a thorough examination of the Contract Documents and the site and working conditions.
- B. Contractor shall control site water so that work may be done in the dry in a safe working environment according to relevant provisions of the Safety Orders.
- C. The Contractor shall prevent water from any source from flooding the project site.
- D. The Contractor shall remove all water which accumulates in grading areas during the progress of work so that all work can be done in the dry. Excavated areas shall be kept free from water while new infrastructure is constructed.

3.03 INSTALLATION

- A. Install piping, fittings, equipment, and materials in accordance with the approved Water Control Plan.
- B. Install construction stormwater pollution prevention BMPs in accordance with the approved Water Control Plan.

3.04 DISCHARGE OF GROUNDWATER AND EXCAVATION WATER

- A. Groundwater may be encountered, and the site may have to be continuously dewatered for the removal of groundwater during the Work.
- B. Secure all applicable permits for discharge of water, as required to accomplish Work.
- C. Contractor may discharge disposal water to the sewer system only with special exception from the EPASD. Contractor is responsible for obtaining all permits.
- D. Perform dewatering to the extent required to lower groundwater levels in the excavations to facilitate the work and to provide a stable, dewatered subgrade for the execution of the project Work.
- E. Contractor shall make adequate provisions for the removal of sediment from groundwater and excavation water prior to discharge. Water discharged shall not have a turbidity level (as measured using Nephelometric Turbidity Units, NTU) greater than 10 percent of the receiving water, or 250 NTU, whichever is less.
 - 1. Flow originating from the existing storm drain system can be bypassed downstream of the project site to the storm drain pipe without requiring additional treatment.
 - 2. A minimum of one (1) baker settling tank shall be provided at the site. Additional tanks shall be provided as needed to meet the turbidity requirements.

- 3. Dewatering devices shall be adequately filtered to prevent the removal of fines from the soil.
- F. A water sample of the groundwater and excavation discharge water must be collected and analyzed for Constituent sampling and frequency of analysis will depend on what type of discharge permit or authority is granted, i.e. temporary discharge permit to the sanitary sewer, discharge to the storm system as a conditionally exempt discharge per the MRP, or discharge to the storm system under the Groundwater General or Fuel Contaminated NPDES permit issued by the RWQCB.
 - 1. Water can be discharged into storm drain if results show very low levels of contaminants as determined by the NPDES Municipal Regional Permit (MRP).
 - 2. Water can be discharged into storm drain if results exceed contaminant level determined by the MRP and permit approval is received from the RWQCB. This option is for groundwater and excavation discharge water that is contaminated and needs treatment before discharge.
 - 3. Water may be able to be discharged into the sanitary sewer only under special circumstance if results exceed contaminant level determined by the MRP, the project has no other alternative, and a temporary discharge permit is obtained from the EPASD.
 - 4. Contractor is responsible for performing all discharge water sampling and obtaining all discharge permits at no additional cost to the City.
 - 5. Contractor shall sample the effluent water and provide the results to the City any time contractor's dewatering operations have changed or at the request of the City.
- G. Provide a method of disposal that satisfies the requirements of the authority having jurisdiction. The City may also conduct quality assurance testing and determine sediment levels independently.
- H. Discharge conveyance through onsite storm water pipes, structures, pump station and any other facilities must not cause flooding by overloading or blocking the flow in the drainage facilities. Leave the facilities unrestricted and as clean as originally found. Repair or restore any damage to existing facilities as directed by the Engineer or the authority having jurisdiction.
- I. Manage dewatering effluent in a manner that prevents releasing hazardous substances to surface or subsurface soil or groundwater.
- J. Discharge of pumping water to the ground surface around the work site is not permitted.
- K. Promptly repair any damage caused by dewatering operations.
- L. Pipe inflow shall be anticipated even during the dry season and periods of no rain. This inflow can be allowed to enter the project site excavation area to be pumped out with the existing water from being below the water table.

3.05 OPERATION

A. Maintain dewatering systems as necessary to complete the Work or until authorized by the Engineer to be removed.

- B. Maintain and operate the dewatering system on a continuous basis. Provide a qualified person on site at all times to oversee the operation of the system or as otherwise approved by the Engineer.
- C. Immediately repair any leaks or spills in the dewatering system and clean up the spill.
- D. The Contractor will need to provide dewatering pumps, hoses, and appurtenances to completely dewater the project site.
- E. Water removed from the project site excavation using pumps provided by the Contractor shall at a minimum be treated for sediment using a weir tank and filtration system.
- F. Based on the Contractor's pumping rate and weir tank and filtration system performance, additional treatment methods or equipment may be required. They include but are not limited to additional weir tanks, additional sand media particulate filters, and upstream cartridge filters. Additional treatment methods shall be discussed in the Water Control Plan.
- G. The Contractor shall be responsible for any damage to foundations, the stormwater pipe, or other parts of existing structures or of any of the new work, caused by the failure of any part of the Contractor's protective works.
- H. Contractor shall be responsible for maintaining all stormwater BMPs for the duration of construction. BMPs shall be inspected weekly, prior to and after rain events.

3.06 EQIPMENT REMOVAL

- A. After dewatering is no longer necessary, all dewatering pumps and appurtenances shall be removed by the Contractor.
- B. After construction all construction stormwater BMPs shall be removed from the project site (i.e. inlet protection, fiber rolls, etc.)

3.07 HAZARDOUS MATERIALS

A. Hazardous materials encountered during dewatering shall be disposed of in accordance with applicable county, state, and federal laws.

END OF SECTION

SECTION 31 23 23

CONTROLLED LOW STRENGTH MATERIAL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for furnishing and installing controlled low strength material (CLSM) as backfill in confined areas around structures, pipelines, or trenches, where specified or where access for compaction equipment is limited.
- B. Controlled low strength material (CLSM) is a mixture of Portland cement, fly ash, aggregates and admixtures proportioned to provide a non-segregating, self-consolidating, free-flowing fill material that can be excavated by hand.

1.02 RELATED SECTIONS

- A. Section 31 00 00 Earthwork.
- B. Section 31 23 16 Trenching.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C 33 Concrete Aggregates
 - 2. C 94 Ready-Mixed Concrete
 - 3. C 150 Portland Cement
 - 4. C 260 Ari-Entraining Admixtures for Concrete
 - 5. C618 Concrete Made by Volumetric Batching and Continuous Mixing
 - 6. D 1558 Standard Test Method for Moisture Content Penetration Resistance Relationships Of Fine-Grained Soils
 - 7. D 4318 Liquid Limit, Plastic Limit, And Plasticity Index of Soils
 - 8. D 4832 Preparation and Testing of Soil-Cement Slurry Test Cylinders
 - 9. D 6103 Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)

B. American Concrete Institute:

- 1. ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete
- 2. ACI 318 Building Code Requirements for Structural Concrete

1.04 SUBMITTALS

A. The contractor must submit CLSM certification. Submit certified laboratory test results that the mix proportions and materials comply with these specifications. Mix design proportions must be established based on experience with the plant's materials, established methods, and trial mixtures with the materials to be employed in accordance with ACI 318

chapter 5. Submit certification on cementitious products and aggregates performed within the past 6 months, including:

- 1. Cementitious Materials.
- 2. Coarse And Fine Aggregates.
- 3. Admixtures.
- 4. Water.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials must conform to the following:
 - 1. Portland cement: ASTM C150, type I, ii or v, according to the existing soil conditions.
 - 2. Aggregate: comply with ASTM C33. Aggregate must consist of fine aggregate, with or without coarse aggregate, with a maximum size of 1-inch, free of clay, organics, and other deleterious materials. Less than 10% by weight must pass the no. 200 sieve, and material passing the no. 40 sieve must be non-plastic as determined in accordance with ASTM D4318.
 - 3. Water: clean and free from substances deleterious to the hardening of the soil cement.
 - 4. Fly ash: ASTM C618, class f unless otherwise approved.
 - 5. Admixtures: air entraining admixtures must meet ASTM C260. Air content limited to 15% unless demonstrated to avoid segregation. Provide a liquid admixture such as Darafill manufactured by W.R. Grace when air contents from 15-35% are required.

2.02 MIXES

- A. Performance requirements: proportion the CLSM to be non-segregating, free-flowing, self-consolidating, low-shrink slurry. Mix design requirements: determine the materials and proportions used to meet the requirements of the specifications. The mix design must be prepared for a range of aggregate gradations that are expected to be used.
- B. Strength: the unconfined compressive strength at 28 days must be between 50 psi and 150 psi. For mixtures containing fly ash, the maximum strength at 28 days must not exceed 125 psi.
- C. Flowability: the mixture must meet the requirements of ASTM D6103. Material spread diameter must be no less than eight (8) inches and no greater than ten (10) inches. There must not be any segregation.
- D. Density: the density must be between 115-145 lb/ft3.
- E. Special mixes: use a "fast setting mixture" for backfilling trenches under pavement within the public right-of-way when the pavement must be quickly reopened to traffic so as to minimize inconvenience to vehicular traffic as shown on the plans, allowing for placement of pavement within two hours after mixture placement. The fast-setting mixtures must produce an unconfined compressive strength of 20 psi in two hours as measured with a

penetrometer using the 1.124 inch-diameter head as according to ASTM D1558 (a reading of 60 psi on the penetrometer is estimated to be equivalent to a 20 psi unconfined compressive strength).

2.03 SOURCE QUALITY CONTROL

A. Mix, transport, and place CLSM in accordance with the methods and procedures in ACI 304 and ASTM C94.

PART 3 - EXECUTION

3.01 SCHEDULING AND EXAMINATION

- A. Commence CLSM batching, mixing, and placing only if the weather conditions are favorable and when the air temperature is greater than 34oF. At the time of placement, the CLSM must have a temperature of at least 40oF. Stop mixing and placing when the air temperature is 38oF or less and falling.
- B. Ensure that the subgrade on which CLSM is to be placed is free of disturbed or softened materials, debris, and water.

3.02 PLACEMENT

- A. Contain CLSM in trench sections using bulkheads or fill materials to confine the flow of material.
- B. Provide restraint as necessary to the pipes and associated structures to ensure that they do not "float" during installation and prior to curing of controlled density fill backfill. Sequence CLSM backfill in such a way to prevent "floating" of the pipes and associated structures.
- C. Place CLSM in lifts not exceeding 6 feet in height, with a time interval of not less than 1 hour between lifts.
- D. Place Portland cement concrete or asphaltic concrete pavements only when the CLSM test cylinders achieve an unconfined compressive strength of 20 psi or greater.

3.03 FIELD QUALITY CONTROL

- A. The port will collect all samples and perform all quality control tests for acceptance testing.
 - 1. Test frequency: each mix type placed, each day placed.
 - 2. Compressive strength: a set of four standard 6-inch x 12-inch cylinders will be cast for each mix and for 100 cubic yards or fraction thereof.
 - 3. Making, storing and initial cure of cylinders: ASTM C94 or C685. The contractor must provide site storage for the initial cure, 16 hours minimum and 24 hours maximum.
 - 4. Final cure and tests of cylinders: ASTM D4832. The port's independent testing laboratory will transport cylinders from site, cure, test, and provide report. The laboratory will test one specimen at 7 days, and two at 28 days. One specimen will be

held as a "spare" and may be used in the event of questionable results from one of the scheduled tests.

5. Flow consistency test: test will be performed on each 50 cubic yards or fraction thereof as per ASTM D6103. Results outside the limits indicate possible cause for rejection of the CLSM mix, at the engineer's discretion.

3.04 PROTECTION

- A. Take appropriate precautions to prevent both pipe displacement and flotation.
- B. When backfilling against retaining walls or other below grade structures, protection the wall or structure from the lateral pressures exerted by the material.
- C. Protect facilities from bleed water. Make provisions for runoff of bleed water.
- D. Provide steel plates to span trenches and prevent traffic contact if necessary. Do not allow traffic or construction equipment on CLSM for at least 24 hours after placement, or until the material is hard enough to prevent rutting or damage.

END OF SECTION

SECTION 31 50 00

EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Requirements for designing, furnishing and installing, maintaining, and removing excavation support and protection.
 - 2. Monitoring vibration and settlement.
- B. Related Sections:
 - 1. Section 31 00 00 Earthwork.
 - 2. Section 31 23 16 Trenching.

1.02 REFERENCES

- A. American Institute of Steel Construction, Inc. (AISC):
 - 1. Manual of Steel Construction Allowable Stress Design.
- B. American Society of Civil Engineers:
 - 1. Guidelines of Engineering Practice for Braced and Tied-Back Excavations.
- C. California Code of Regulations (CCR):
 - 1. Title 8 Construction Safety Orders.
- D. California Labor Code Sections 6705 to 6707 (CLC).
- E. Department of the Navy Naval Facilities Engineering Command (NAVFAC):
 - 1. NAVFAC Design Manual 7.2 Foundations and Earth Structures.
 - 2. NAVFAC Design Manual 7.3 Soil Dynamics Deep Stabilization and Special Geotechnical Construction.
- F. International Code Council (ICC)/California Building Standards Commission (CBSC):
 - 1. International Building Code (IBC).
 - 2. California Building Code (CBC).
- G. State of California Department of Transportation (CALTRANS):
 - 1. CALTRANS California Trenching and Shoring Manual.
- H. United States Steel Corporation (USS):
 - 1. USS Steel Sheet Piling Design Manual.
- I. Cal/OSHA the Division of Occupational Safety and Health
 - 1. Trenching and Excavation Safety OSHA 2226-10R 2015

2. Cal/OSHA Title 8 Regulations: Division 1, Chapter 4, Article 6: Excavations.

1.03 DEFINITIONS

- A. General Engineering Design Practice: General engineering design practice in area of the Project, performed in accordance with recent engineering literature on subject of shoring and stability of excavations.
- B. Shoring: A temporary structural system designed to support vertical faces, or nearly vertical faces, of soil or rock for purposes of excavation. Shoring includes internally braced sheet piling, slurry walls, soldier piles and lagging, and other similar shoring systems. Sloping of the soil is not shoring.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor assumes full and complete responsibility for excavation support and protection, including shoring design and installation.
- B. The review of Contractor's shoring system design, submittals and/or installations by the Engineer does not relieve Contractor of his responsibility for excavation safety. This requirement shall apply continuously and is not limited to normal working hours.
- C. Contractor's reliance upon documents furnished by City does not provide relief from these requirements.
- D. Contractor shall conduct a pre-condition survey including photographs and installation of monitoring points for the existing site improvements.

1.05 SYSTEM DESCRIPTION

- A. Where General Engineering Design Practice is specified, provide drawings, and signed calculations and have design performed by civil or structural engineer registered in California.
 - 1. Provide design calculations that clearly disclose assumptions made, criteria followed, and stress values used for the materials being used.
 - 2. Furnish references acceptable to Engineer substantiating appropriateness of design assumptions, criteria, and stress values.
- B. Design Requirements:
 - 1. General:
 - a. Design means for safe and stable excavations in accordance with general engineering design practice.
 - 1) The preceding requirement shall not apply to trench excavation support conforming to standards set forth in CCR Title 8 Construction Safety Orders.
 - b. Design steel members in accordance with the Uniform Building Code and the AISC Manual of Steel Design.
 - c. Design shoring involving materials other than steel in accordance with Uniform Building Code.
 - d. Shoring Design shall account for the weight of all equipment, including the trash capture device installation crane. Contractor shall perform a settlement and

stability analysis for the loaded crane as part of the shoring design. Shoring design shall include a minimum uniform ground pressure of 250 pounds per square foot (psf).

- e. Shoring Design shall account for the high groundwater table.
- f. The Contractor shall incorporate the findings, conclusions and recommendations of the Project Geotechnical Report, entitled "Geotechnical Report on East Palo Alto Trash Capture Device Newbridge Street and Willow Road East Palo Alto, California", dated January, 2025, for the site excavation support and protection design. The Report is attached to these Specifications.
- g. When electing to design with material stresses for temporary construction higher than allowable stresses prescribed in the Manual of Steel Construction and the Uniform Building Code, increase in such stresses shall not exceed 10 percent of value of prescribed stresses.
- h. Minimum safety factor used for design shall not be less than 1.5.
- i. The calculated minimum depth of penetration of shoring below the bottom of the excavation shall not less than 5 feet below the base of the planned excavation for cantilever shoring systems.
- j. The location of the point of fixity for shoring shall not be less than half the calculated minimum embedment depth below the bottom of the excavation.
- k. Generally acceptable references for the design of shoring and excavations are as follows:
 - 1) Caltrans California Trenching and Shoring Manual.
 - 2) NAVFAC Design Manual 7.2 Foundations and Earth Design.
 - 3) NAVFAC Design Manual 7.3 Soil Dynamics Deep Stabilization and Special Geotechnical Construction.
 - 4) USS Steel Sheet Piling Design Manual.
 - 5) Guidelines of Engineering Practice for Braced and Tied-Back Excavations published by American Society of Civil Engineers.
- 1. Shoring shall be designed, stamped and signed by a Civil or Structural Engineer licensed to practice in California. Include costs for this shoring design in the bid.
- m. Heavy construction loads (cranes, etc.) and material stockpiles shall be set back at least 15 feet behind the shoring.
- n. The temporary shoring design parameters in Table 1 shall be used at a minimum in the shoring design.

Table 1: Lateral Earth Pressures for Unbraced Shoring

Pressure Type	Above Groundwater Level (Equivalent Fluid Pressure) (pcf)	Below Groundwater Level (Bouyant Equivalent Fluid Pressure + Hydrostatic) (pcf)
Active (0-16 ft)	40	80
At-Rest (0-16 ft)	60	90
Passive (0-16 ft)	425	275
Active (16-30 ft)	50	90
At-Rest (16-30 ft)	75	100
Passive (16-30 ft)	315	225

2. Soldier Piles and Lagging:

- a. Provide lagging over the full face of the excavation. Joints between pieces of lagging shall be tight to prevent loss of soil.
- b. Provide full face lagging all around penetrations through the lagging.
- c. If the soldier piles are installed in predrilled holes, the predrilled holes shall be filled with control density backfill after the soldier piles are installed.
- d. The effective width of driven soldier piles for passive soil resistance shall not exceed 2 times the width of the pile. The effective width of concrete encased soldier piles for passive soil resistance shall not exceed 2 times the width of the concrete encasement.
- e. Fill voids behind lagging with gravel or other material acceptable to the Engineer.
- f. Apply loads from tie back soil, rock, or deadman anchors concentrically to soldier piles or wales spanning between soldier piles. Wales shall be back-to-back double channels or other members acceptable to the Engineer. Eccentrically loaded with section soldier piles or wales are not acceptable.
- 3. Soil Anchors, Rock Anchors, and Deadmen Anchors:
 - a. Design tie back anchors for a safety factor of not less than 2 times the calculated load from the shoring.
 - b. Proof load all production anchors to not less than 125 percent of the calculated load from the shoring. Lock off anchors at the calculated anchor load.
 - c. The length of soil anchors used to calculate resistance to load from the shoring, shall not include any length within the potential active pressure soil failure zone behind the face of shoring.
 - d. Apply load from anchors concentrically to wales and other shoring members.
 - e. Design tie rods for anchors for 130 percent of the calculated load from the shoring.
 - f. Design tie rods for anchors for 150 percent of the calculated load from the shoring when tie rod couplers are used and for other conditions where stress concentrations can develop.
- C. Performance Requirements:
 - 1. General:
 - a. Support faces of excavations and protect structures and improvements in vicinity of excavations from damage and loss of function due to settlement or movement of soils, alterations in ground water level caused by such excavations, vibration associated with installation and removal of excavation support structures, and related operations.
 - b. Herein Specified Provisions:
 - Complement, but do not substitute or diminish, obligations of Contractor for the furnishing of a safe place of work pursuant to provisions of the Occupational Safety and Health Act of 1970 and its subsequent amendments and regulations and for protection of the Work, structures, and other improvements.
 - 2) Represent minimum requirement for:
 - c. Number and types of means needed to maintain soil stability.
 - d. Strength of such required means.
 - 1) Methods and frequency of maintenance and observation of means used for maintaining soil stability.
 - 2. Provide safe and stable excavations by means of sheeting, shoring, bracing, sloping, and other means and procedures, such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain the stability of soils and rock.

- 3. Provide support for trench excavations for protection of workers from hazard of caving ground.
- 4. Provide Shoring:
 - a. Where, as result of excavation work and analysis performed pursuant to general engineering design practice, as defined in this Section:
 - 1) Excavated face or surrounding soil mass may be subject to slides, caving, or other types of failures.
 - 2) Stability and integrity of structures and other improvements may be compromised by settlement or movement of soils, or changes in soil load on structures and other improvements.
 - b. For trenches 5 feet and deeper.
 - c. For trenches less than 5 feet in depth, when there is a potential for cave in.
 - d. Where indicated on the Drawings.
- 5. For safe and stable excavations, use appropriate design and procedures for construction and maintenance to minimize settlement of supported ground and to prevent damage to structures and other improvements, including:
 - a. Using stiff support systems.
 - b. Following appropriate construction sequence.
 - c. Preventing soil loss through or under support system.
 - d. Provide support system that is tight enough to prevent loss of soil and extend deep enough to prevent heave or flow of soils from supported soil mass into the excavation.
 - e. Providing surface runoff routing and discharge away from excavations.
 - f. Where dewatering is necessary, recharge groundwater as necessary to prevent settlement in area surrounding excavation.
 - g. Where sheet piling is used, use interlocking type sheets including interlocking corners. The sheet piles shall be continuous and driven in interlock. If the bottom of the excavation is located below the water table, use "thumb and finger" type interlock.
 - h. Not applying shoring loads to existing structures and other improvements.
 - i. Not changing existing soil loading on existing structures and other improvements.
 - j. Provide welded steel packing between soil retaining members such as sheet piles and wales and similar members when the gap exceeds 1/2 inch before the wales are loaded.
- 6. If temporary shoring is braced, a rectangular or trapezoidal loading diagram shall be used; such as those recommended by Terzaghi and Peck (1967), Tschebotarioff (1973), Caltrans (2021) and the Federal Highway Administration (FHWA; 1999). The method and loading should be determined by the contractor and provided to the Engineer for review.
- 7. Use template for driving sheet piles to minimize need for pulling and redriving sheet piles.

1.06 SUBMITTALS

- A. Shop Drawings and Calculations:
 - 1. All of the following shop drawings and calculations shall be prepared, stamped, and signed by a registered Civil or Structural Engineer of the State of California.
 - 2. In accordance with requirements in California Labor Code for trench excavations 5 feet or more in depth and for trenches less than 5 feet in depth when there is potential for

cave-in. Submit in advance of excavation work, detailed drawings showing means for safe and stable excavations.

- a. Where such drawings vary from excavation support standards set forth in California Code of Regulations Title 8 - Construction Safety Orders, submit design calculations pursuant to general engineering design practice.
- b. Provide means for safe and stable excavations that are not less effective than required in CCR Title 8 Construction Safety Orders.
- 3. For excavations other than trenches, submit, in advance of excavation work, design calculations as performed pursuant to general engineering design practice, as specified in this Section, and detail drawing showing means for safe and stable excavations. In design calculations and detail drawing, cover, as a minimum:
 - a. Excavations adjacent to structures and other improvements, and
 - b. Excavations 5 feet or more in depth, or less than 5 feet in depth when there is potential for cave-in, at other locations.
 - c. Settlement and stability analysis for the loaded crane, including crane distance from excavation and crane pads.
- 4. Submit Following:
 - a. Provide calculations for the different load, support, and other conditions that occur during the sequence of installation of shoring, construction of facilities protected by the shoring, and sequence of removal of shoring.
 - b. Provide sketches showing the condition at various stages of installation and removal of shoring.
 - c. Show structures, pipelines, and other improvements located near the shoring, and the shoring on a plan.
 - d. When utilities penetrate the shoring, submit an elevation of all sides of the shoring showing the locations of the penetrations. Submit details on ground support and sealing around utility penetrations.
- B. Control Points and Schedule of Measurements:
 - 1. Submit location and details of control points and method and schedule of measurements in accordance with requirements of this Section.
 - 2. Submit pre-condition survey including photographs.
 - 3. Promptly upon constructing control points and making measurements at such control points, as specified in this Section, submit copy of field notes with such measurements. The field notes shall show the current measurement and the change in measurement from the first measurement taken.
- C. Detailed Sequence of Installation and Removal of Shoring:
 - 1. Consider effects of ground settlement in the sequence of installation and removal of shoring.
 - 2. Provide sketches showing the conditions at various stages in the sequence of installation and removal of shoring.
 - 3. Clay and silt may stick to sheet piles when sheet piles are removed.
- D. Submit submittals for stability of excavations as a complete package and include all items required in this section. Incomplete submittals will not be reviewed and will be returned for resubmittal as a complete package. Complete submittal shall include all necessary information regarding the dewatering system as specified in Section 31 23 19 Dewatering and Stormwater Management.

1.07 SEQUENCING AND SCHEDULING

- A. Do not begin work on excavations, trenches, and means for providing stability of excavation and trenches until submittals have been accepted by Engineer and until materials necessary for installation are on site.
- B. Submit submittals a minimum of 30 days prior to the scheduled date to begin excavation work.
- C. Do not begin construction of any shoring or excavation operations until:
 - 1. Control points as specified in this Section and as indicated on the Drawings on existing structures and other improvements have been established and surveyed to document initial elevations and locations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 INSTALLATION AND REMOVAL

- A. Install means for providing safe and stable excavations as indicated in the submittals section above.
- B. Except for concrete encased soldier piles, slurry walls, and similar shoring systems, remove shoring by completion of the Work. Select shoring system and method of removal, which will minimize soil that sticks to shoring from creating large voids and causing settlement. To prevent settlement caused by pulling shoring, fill voids with sand, pea gravel, or pressure injected grout. The methods used shall prevent settlement. Pressure preservative treated wood lagging may be left in place when acceptable to the Engineer.

3.02 MAINTENANCE

- A. Where loss of soil occurs, plug gap in shoring and replace lost soil with fill material acceptable to Engineer.
- B. Where measurements and observations indicate possibility of failure or excessive movement of excavation support, determined in accordance with general engineering design practice, take appropriate action immediately.

END OF SECTION

SECTION 32 01 16

PAVEMENT RESTORATION AND REHABILITATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Resurfacing roads and paved surfaces in which surface is removed or damaged by installation of new work. Depth of aggregate base course shall match depth of existing aggregate base course or shall be a minimum of 18 inches, whichever is greater, unless otherwise indicated on the Drawings.
 - 2. Traffic stripes and pavement markings.
- B. Related Sections:
 - 1. Section 32 11 00 Aggregate Base Course.

1.02 SYSTEM DESCRIPTION

- A. Performance Requirements:
 - 1. Limiting Dimensions:
 - a. Determine the exact lengths and dimensions of such roads, pavements, parking areas, and walks that will require removal and replacement for new work.
 - b. Join existing surfaces to terminals of new surfacing in smooth juncture.

1.03 SUBMITTALS

- A. Mix Designs:
 - 1. Prior to placement of asphalt concrete, submit full details, including design and calculations for the asphalt concrete mix proposed.
 - 2. Submit gradation of aggregate base.
 - 3. Submit proposed mix design of portland cement concrete.
- B. Traffic stipes and pavement markings
 - 1. Submit as specified in Caltrans Section 84-2.

PART 2 - PRODUCTS

- 2.01 MATERIALS
 - A. Aggregate Base Course: As specified in Section 32 11 00 Aggregate Base.
 - B. Portland Cement Concrete Replacement Material: Class A concrete as specified in Section 03 30 55 Cast-in-Place Concrete.

C. Traffic stripes and pavement markings: As specified in Caltrans Section 84-2.

2.02 EQUIPMENT

- A. Roads, Pavements, Parking Areas, and Walks:
 - 1. Equipment Requirements: Good condition, capable of performing work intended in satisfactory manner.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Aggregate Surface Removal Replacement:
 - 1. When trench cut is in aggregate surfaced areas, replace aggregate base course material with material matching existing material compacted to 95 percent of its maximum density. Depth of aggregate base course shall match depth of existing aggregate base course or shall be a minimum of 6 inches, whichever is greater, unless otherwise indicated on the Drawings.
- B. Pavement Removal and Temporary Asphalt Replacement:
 - 1. Install temporary asphalt pavement or first course of permanent pavement replacement immediately following backfilling and compaction of trenches that have been cut through existing pavement.
 - 2. Except as otherwise provided, maintain this temporary pavement in a safe and reasonably smooth condition until required permanent pavement is installed.
 - 3. Remove and dispose of temporary paving from project site.
 - 4. Where longitudinal trench is partly in pavement, replace pavement to original pavement edge, on a straight line, parallel to centerline of roadway.
 - 5. Where no part of longitudinal trench is in pavement, surfacing replacement shall only be required where existing surfacing materials have been removed.
- C. Asphalt Pavement Replacement:
 - 1. Replace asphalt pavement to same thickness as adjacent pavement and match as nearly as possible adjacent pavement in texture. Pavement thickness shall be a minimum of 6-inches, whichever is greater, unless otherwise indicated on the Drawings.
 - 2. Cut existing asphalt pavements to be removed for trenches or other underground construction by wheel cutter, clay spade, or other device capable of making neat, reasonably straight, and smooth cut without damaging adjacent pavement. Cutting device operation shall be subject to acceptance of Engineer.
 - 3. Cut and trim existing pavement after placement of required aggregate base course and just prior to placement of asphalt concrete for pavement replacement, and paint trimmed edges with material for painting asphalt concrete pavement immediately prior to constructing new abutting asphalt pavements. No extra payment will be made for these items, and all costs incurred in performing this work shall be incidental to pipe laying or pavement replacement.
 - 4. Conform replacement of asphalt pavement to contour of original pavement.
- D. Portland Cement Concrete Pavement Replacement:

- 1. Where trenches lie within Portland cement concrete section of streets, alleys, sidewalks, and similar concrete construction, saw cut such concrete (to a depth of not less than 1-1/2 inches) to neat, vertical, true lines in such manner adjoining surfaces are not damaged.
- 2. Place Portland cement concrete replacement material to dimension as indicated on the Drawings.
- 3. Provide expansion joints that match existing.
- 4. Before placing replacement concrete, thoroughly clean edges of existing pavement and wash with neat cement and water.
- 5. Surface Finish: Wood float finish.
- E. Curb, Gutter, and Sidewalk Replacement:
 - 1. Where any concrete curb, gutter, or sidewalk has been removed or displaced, replace to nearest construction joints with new Class A curb, gutter, or sidewalk to same dimensions and finish as original construction that was removed.
 - a. Provide expansion joints of same spacing and thickness as original construction.
- F. Pavement Matching:
 - 1. Trim existing asphalt pavements which are to be matched by pavement widening or pavement extension to neat true line with straight vertical edges free from irregularities with saw specifically designed for this purpose. Minimum allowable depth of cut shall be 1-1/2 inches.
 - 2. Cut and trim existing pavement after placement of required aggregate base course and just prior to placement of asphalt concrete for pavement widening or extension, and paint trimmed edges with material for painting asphalt concrete pavement immediately prior to constructing new abutting asphalt concrete pavements. No extra payment will be made for these items and all costs incurred in performing this work shall be incidental to widening or pavement extension.
- G. Traffic Stripes and Pavement Markings
 - 1. As specified in Caltrans Section 84-2.

3.02 FIELD QUALITY CONTROL

- A. Tests:
 - 1. Concrete as specified in Section 03 30 55 Cast-in-Place Concrete.
- B. Inspection:
 - 1. Asphalt Concrete:
 - a. Lay 10-foot straightedge parallel to centerline of trench when the trenches run parallel to street and across pavement replacement when trench crosses street at angle.
 - b. Remove and correct any deviation in cut pavement replacement greater than 1/4 inch in 10 feet.
 - 2. Portland Cement Concrete Replacement Pavement:
 - a. Lay 10 foot straightedge either across pavement replacement or longitudinal with centerline of gutter or ditch.

b. Remove and correct any deviation in cut pavement replacement greater than 1/4 inch in 10 feet.

END OF SECTION
SECTION 32 11 00

AGGREGATE BASE COURSE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Aggregate base course.
- B. Related Sections:
 - 1. Section 31 00 00 Earthwork.
 - 2. Section 32 01 16 Pavement Restoration and Rehabilitation.

1.02 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. C 117 Test Method for Material Finer than 75-μm (Number 200) Sieve in Mineral Aggregate by Washing.
 - 2. C 136 Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. D 4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- B. State of California Department of Transportation.
 - 1. CALTRANS Standard Specifications.

1.03 SUBMITTALS

- A. Product Data:
 - 1. Source, gradation, and testing data for aggregate base course.
- B. Quality Control:
 - 1. Test Reports: Reports for tests required by Sections of CALTRANS Standard Specifications.
 - 2. Certificates of Compliance: Certificates as required by Sections of CALTRANS Standard Specifications.

1.04 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: Protect from segregation and excessive moisture during delivery, storage, and handling.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregate Base Course:

- 1. Class 1, 3/4-inch maximum aggregate size free from vegetable matter and other deleterious substances and of such nature that aggregate can be compacted readily under watering and rolling to form a firm, stable base.
- 2. Materials derived from processing demolished or removed asphalt concrete are not acceptable.
- 3. Coarse aggregate material retained in Number 4 sieve shall consist of material of which at least 25 percent by weight shall be crushed particles when tested in accordance with California Test 205.
- 4. Aggregate shall not be treated with lime, cement, or other chemical material before the Durability Index test is performed.
- 5. Aggregate grading and sand equivalent tests shall be performed to represent not more than 500 cubic yards or one day's production of material, whichever is smaller.
- 6. Grade within the limits and conform to quality requirements as follows when tested in accordance with California Test 202:

Sieve Sizes (Square Openings)	Percent by Weight Passing Sieve	
1 inch	100	
3/4 inch	90-100	
Number 4	35-55	
Number 30	10-30	
Number 200	2-9	

Quality Requirements				
Description	California Test Minimum Test Result			
Resistance (R Value)	301	78		
Sand Equivalent	217	22		
Durability Index	229	35		

- B. Crushed Drain Rock
 - 1. Crushed Drain Rock meeting the gradation criteria for coarse aggregate No. 57 per ASTM C33 with no more than 10 percent by weight passing the No. 4 sieve.
 - 2. Crushed Drain Rock layer shall be wheel-rolled to properly consolidate and interlock.
 - 3. Grade within the limits and conform to quality requirements as follows when tested in accordance with California Test 202:

Sieve Sizes	Percent by Weight	
(Square Openings)	Passing Sieve	
1 ½ inch	100	
1 inch	95-100	
½ inch	25-60	
Number 4	0-10	
Number 8	0-5	

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine conditions upon which the work specified in this Section depends for defects that may influence installation and performance.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Subgrade Preparation: Prepare as specified in Section 31 00 00 – Earthwork.

3.03 INSTALLATION

- A. Furnish, spread, and compact aggregate base course material to the lines, grades, and dimensions indicated on the Drawings.
 - 1. Spreading: Spread in accordance with sections of CALTRANS Standard Specifications.
 - 2. Compacting: Compact to 95% relative density in 8 inch lifts.

3.04 FIELD QUALITY CONTROL

A. Tests: Perform field tests as required by sections of CALTRANS Standard Specifications.

SECTION 33 00 00

UTILITIES AND SYSTEMS COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes requirements for coordination with and protection of existing utilities.

1.02 GENERAL

A. Locate and protect from damage existing utilities and other facilities that are to remain in place and existing utilities and other facilities that are to be relocated by others.

B. Protect from damage new utilities and other facilities installed within the area of the Work during or prior to the Contract.

1.03 SUBMITTALS

A. Utility Installation, Protection and Relocation Plan.

B. Schedule and plan for advanced potholing.

1.04 LOCATION AND PROTECTION OF EXISTING UTILITIES

A. Known utilities are indicated on the Contract Drawings. Locate and identify all underground structures, facilities, and piping prior to commencing any Work which may compromise said utilities. Maintain existing utilities and protect from damage as necessary to satisfy the requirements of jurisdictional utility companies and related codes and regulations. Refer to potholing specified elsewhere in this section for additional requirements in regard to locating utilities.

B. Do not disconnect or shut down any part of the existing utilities and services, except by permission of authorities having jurisdiction. Submit schedule of estimated shut-down time in order to obtain such permission, and notify all interested parties, private and public owners, neighbors, utilities, and municipal and county authorities, as required.

C. Utilities to be removed shall not be removed until shut-down time and service impact can be kept to a minimum. Do not remove an existing utility line or service until the replacement line, crossover, or capping is ready to be performed.

D. Provide shoring, underpinning, and structural support for existing utility lines and structures which become suspended or otherwise unsupported because of adjacent excavation operations.

E. Excavate, including potholing, in proximity of existing underground facilities using methods as required by the utility companies and as specified, whichever is more protective of underground facility.

F. Protect active underground utilities from damage. If underground utilities are damaged in any way, notify the Engineer and affected utilities immediately for corrective action. In case of emergency involving utilities which participate in the Underground Service Alert (USA), call USA at 1-800-227-2600 and notify the Engineer of the assigned ID number or emergency issue. Comply with instructions of affected utility

company and pay all expenses of repair made in connection with such damages at no additional cost to the City.

1.05 NOTIFICATIONS AND POTHOLING FOR EXISTING UTILITIES

A. Prior to performing any excavation, boring, or other work close to any underground pipeline, conduit, duct, wire or other structure, notify the Engineer, the Underground Service Alert Northern California (USA) at 1-800-227-2600, and utility companies that do not participate in USA which have underground facilities within the limits of the work. Notify USA at least 2 working days, but not more than 14 days prior to performing excavation or other work close to underground facility. Notify other utility companies in accordance with each utility's notification requirements. Have USA and other utility companies locate and mark their facilities within the area of excavation or other work. Maintain such markings in accordance with utility requirements, i.e. have markings renewed, as applicable.

B. Potholing for Utilities and Other Facilities: Prior to any excavation or other subsurface work, excavate, expose, and verify the location of existing utility mains and laterals and other existing underground facilities which may be affected by the Work.

- 1. At a minimum, pothole and accurately locate all marked or inferred facilities located with less than five (5) feet of clearance to the nearest point of proposed trenching, excavation, shoring or other subsurface temporary or permanent facility.
- 2. Survey and record the size, location, elevation, and alignment of potholed existing underground utilities and other facilities for inclusion in as-built drawings.

C. Pothole and locate the invert elevation of the reinforced concrete pipe (RCP) at the entrance and exit of the Trash Capture Device. Contractor shall notify the Engineer of a discrepancy in invert elevation from the Plan. An elevation difference of ± 4 inches shall not be considered a changed condition.

D. Do not proceed with excavation or other subsurface work until surrounding utilities and underground facilities have been located by potholing or other positive means. Determine the method and equipment required to perform potholing without damage to existing facilities. At minimum, utilize hand digging in the vicinity of high risk utilities and where recommended by USA guidelines.

E. Immediately notify the Engineer of utilities or underground facilities located with less than one (1) foot of clearance to the nearest point of proposed trenching, excavation, shoring, pile or other subsurface temporary or permanent facility.

F. Backfill potholes and exploratory excavations, and replace in kind any improvements removed during the potholing operation including pavement, curbs, sidewalks, or other improvements.

1.06 DELIVERY, STORAGE AND HANDLING

A. The following list of utility contacts is not intended as a comprehensive list and is provided as a convenience to the contractor.

Utility/Department	Main Contact	Emergency #	After Hours #
Comcast	(855) 345-0337		(855) 345-0337
PG&E	(877) 743-7782	(877) 743-7782	(877) 743-7782
East Palo Alto Water	(650) 322-2083	(650) 304-4432	(650) 304-4432
East Palo Alto Sanitary District (EPASD)	(650) 853-3100		

1.07 WORK BY UTILITIY OWNERS

A. Certain Utilities may need to be depowered by the affected utility companies prior to the Work of the Contract.

B. The utility relocations shall be coordinated by the UTILITY OWNERS. The depowering shall be coordinated by CONTRACTOR with UTILITY OWNER.

PART 2 - MATERIALS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 33 39 00

REINFORCED CONCRETE STORM DRAIN STRUCTURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. All labor, materials, equipment, facilities, transportation and services to complete all reinforced concrete box culvert storm drains and appurtenant manholes, catch basins and structures as shown on the plans and/or specified herein.
 - 2. Design of precast concrete storm drain structures.
- B. Related Sections:
 - 1. Section 31 05 19 Filter Fabric and Geotextiles.
 - 2. Section 31 50 00 Excavation Support and Protection.
 - 3. Section 31 23 16 Trenching.
 - 4. Section 32 11 00 Aggregate Base
 - 5. Section 03 30 55 Cast-In-Place Concrete.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 2. C76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - 3. C150 Portland Cement.
 - 4. C478 Precast Reinforced Concrete Manhole Structures.
 - 5. C858 Underground Precast Concrete Utility Structures.
 - 6. C890 Precast Concrete Vaults
 - 7. C913 Precast Concrete Water/Wastewater Structures.
- B. Occupational Safety and Health Act (OSHA).
- C. State of California Department of Transportation (Caltrans).

1.03 QUALITY CONTROL

- A. All precast reinforced concrete pipe and box culverts will be manufactured in a plant especially designed for that purpose. Standard products may be used wherever feasible.
- B. Enough concrete test cylinders will be taken by the precast concrete manufacturer to give a comprehensive knowledge of the concrete in each section of the work. All specimens will be taken from the concrete as it is placed in the forms, and in accordance with ASTM C39. The cost of sampling and testing will be borne by the manufacturer.

C. Concrete work, being represented by specimens not attaining the minimum allowable compressive strength, shall be examined and tested at the expense of the Contractor to determine whether the work is to be accepted or rejected by decision of the Engineer. Rejected work shall be completely removed and reconstructed at the Contractor's expense to the approval of the Engineer.

1.04 SUBMITTAL

A. Structural calculations, fabrication drawings, concrete mix designs, and reinforcement diagrams shall be submitted to the Engineer for review. Review by the Engineer does not relieve the precast concrete manufacturer of responsibility for the adequacy of design.

1.05 DESIGN

- A. The design of precast concrete junction structures and storm drain manholes is left to the manufacturers of these structures. Calculations and design shall be prepared by a Civil Engineer or Structural Engineer licensed in California. Design parameters include sectional configuration, joints, wall thickness, and reinforcement. All design shall conform to the UBC and ACI Code. The following loading conditions shall be used to design structures suitable for the dimensions and conditions shown on the drawings:
 - 1. Surface Live Load: HS-20
 - 2. Unit Weight of Backfill: 125 pounds per cubic foot (pcf)
 - 3. The more critical of the following:
 - a. At-rest equivalent fluid weight of 60 pcf above the design high groundwater table and 90 pcf below.
 - b. Active pressure of 40 pcf plus a seismic increment per 2022 CBC requirements (triangular distribution) above the design groundwater level, and 80 pcf below the groundwater level plus a seismic increment per 2022 CBC requirements (triangular distribution).
 - 4. Where traffic loads (including trucks) are expected within 10 feet of the walls, an additional design load of 250 pounds per square foot (psf) should be applied to the upper 10 feet for static loading conditions.
- B. Loading Conditions: Concrete structures shall be designed for:
 - 1. Full hydrostatic uplift (groundwater at surface) with no water on the inside of the structure; and
 - 2. A fully surcharged pipe or culvert with hydraulic grades one foot above the ground surface with no groundwater outside the pipe or culvert.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE STRUCTURES

A. Where shown on the plans, the Contractor may use reinforced concrete structures that are cast at an off-site location. In general, these structures include storm drain and sanitary sewer manholes and storm drain catch basins.

- B. Appurtenant precast concrete structures shall conform to the dimensions and notes shown on the detailed drawings.
- C. All precast concrete structures shall be manufactured in a plant especially designed for that purpose. Standard products may be used wherever feasible.

2.02 NON-SHRINK GROUT

A. Grout used to seal pipe penetrations and support base plates shall be nonmetallic, noncorrosive, non-staining grouting compound containing silica sands, Portland cement, shrinkage compensating agents and water reducing agents. Acceptable Products include Five Star Grout, Masterflow, and Upcon Nonshrink.

PART 3 - EXECUTION

3.01 CASTING

- A. No concrete shall be cast until all submittals have been favorably reviewed by the Engineer and returned to the Contractor.
- B. Precast concrete shall be fully cured at the plant prior to shipment.

3.02 PREARATION FOR INSTALLATION

A. Reinforced concrete structures shall be installed as shown and detailed on the plans. Bedding shall be placed prior to installation; any necessary support or stabilization shall be provided and remain in place until the pipe is securely anchored by trench backfill.

3.03 HANDLING

- A. Care shall be taken in handling, transporting and placing appurtenant structures to prevent damage to the structure. Temporary bracing may be required to prevent damage while transporting structures. All handling operations shall be done with an exterior sling or with a suitable forklift.
- B. No damaged structure will be accepted until and unless the damage has been repaired to the satisfaction of the Engineer. Damaged pipe, culvert and appurtenant structures will be replaced at the Engineer's discretion.

3.04 INSTALLATION

- A. Precast concrete structures shall be installed as shown on the plans, according to manufacturer's recommendations.
- B. Joint sealers shall be used as specified herein for a water-tight installation.

3.05 DEFECTIVE CONCRETE REPAIRS

- A. Concrete shall be considered defective for the following reasons:
 - 1. Failure of finished concrete profiles to conform to the drawings within tolerance.

- 2. Failure to meet the specified cylinder strength requirements.
- 3. Concrete showing cracks, rock pockets, voids, spalls, or defects that adversely affect the structural adequacy of the concrete.
- B. Defective concrete that results from improper casting or curing shall be repaired or replaced at the plant prior to shipment; damaged concrete that results from transportation, handling, or storage after the piece leaves the plant shall be repaired or replaced at no expense to the City.
- C. Repairing and Patching: Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, rock pockets, tie holes, except as specified, etc., shall be patched at once. Defective areas shall be chipped away to a depth of about one inch with the edges perpendicular to the surface.

3.06 BACKFILLING

A. Structures shall not be backfilled until the installation has been inspected and approved.

SECTION 33 41 02

REINFORCED CONCRETE PIPE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. All labor, materials, equipment, facilities, transportation and services to complete all reinforced concrete pipe storm drains as shown on the plans and/or specified herein.
 - 2. Design of precast reinforced concrete pipe.
- B. Related Sections:
 - 1. Section 31 05 19 Filter Fabric and Geotextiles.
 - 2. Section 31 50 00 Excavation Support and Protection.
 - 3. Section 31 23 16 Trenching.
 - 4. Section 32 11 00 Aggregate Base
 - 5. Section 03 30 55 Cast-In-Place Concrete.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 2. C76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - 3. C150 Portland Cement.
 - 4. C443 Joints for Circular Concrete Sewer and Culvert Pipe, with Rubber Gaskets.
 - 5. AASHTO M 170 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- B. Occupational Safety and Health Act (OSHA).
- C. State of California Department of Transportation (Caltrans).

1.03 QUALITY CONTROL

- A. All precast reinforced concrete pipe will be manufactured in a plant especially designed for that purpose. Standard products may be used wherever feasible.
- B. Enough concrete test cylinders will be taken by the precast concrete manufacturer to give a comprehensive knowledge of the concrete in each section of the work. All specimens will be taken from the concrete as it is placed in the forms, and in accordance with ASTM C39. The cost of sampling and testing will be borne by the manufacturer.
- C. Concrete work, being represented by specimens not attaining the minimum allowable compressive strength, shall be examined and tested at the expense of the Contractor to determine whether the work is to be accepted or rejected by decision of the Engineer.

Rejected work shall be completely removed and reconstructed at the Contractor's expense to the approval of the Engineer.

1.04 SUBMITTAL

A. Structural calculations, fabrication drawings, concrete mix designs, and reinforcement diagrams shall be submitted to the Engineer for review. Review by the Engineer does not relieve the precast concrete manufacturer of responsibility for the adequacy of design.

1.05 DESIGN

- A. The design of precast reinforced concrete pipe is left to the manufacturers of these structures. Calculations and design shall be prepared by a Civil Engineer or Structural Engineer licensed in California. Design parameters include sectional configuration, joints, wall thickness, and reinforcement. All design shall conform to the UBC and ACI Code. The following loading conditions shall be used to design structures suitable for the dimensions and conditions shown on the drawings:
 - 1. Surface Live Load: HS-20
 - 2. Unit Weight of Backfill: 140 pounds per cubic foot (pcf)
 - 3. Lateral Soil Load (undrained condition): 85 pounds per square foot (psf) equivalent fluid pressure per foot depth.
 - 4. Passive Soil Resistance: 350 psf equivalent fluid pressure per foot depth. Neglect the upper 24 inches of soil when determining passive resistance.
- B. Loading Conditions: Concrete pipes shall be designed for:
 - 1. Full hydrostatic uplift (groundwater at surface) with no water on the inside of the structure; and
 - 2. A fully surcharged pipe or culvert with hydraulic grades one foot above the ground surface with no groundwater outside the pipe or culvert.

PART 2 - PRODUCTS

2.01 REINFORCED CONCRETE PIPE

- A. Reinforced concrete pipe shall be Class II as specified in AASHTO M 170 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- B. Reinforced concrete pipe shall meet or exceed the requirements of ASTM C76 for reinforced concrete pipe. Pipe shall be suitable for installation under the conditions shown on the plans. Assumed backfill unit weight is 140 pcf.
- C. Cement used in the manufacture of reinforced concrete pipe shall be TYPE II (moderate sulfate resistance) in conformance with ASTM C150. Admixtures shall not be introduced to concrete mixes without specific approval by the Engineer.
- D. Pipe reinforcement and wall thickness shall not be less than that required under ASTM C76 for a D-load of 2000 pounds.

PART 3 - EXECUTION

3.01 CASTING

- A. No concrete shall be cast until all submittals have been favorably reviewed by the Engineer and returned to the Contractor.
- B. Precast concrete shall be fully cured at the plant prior to shipment.

3.02 STORAGE OF PIPE

A. Pipe may be stored on the project site at the Contractor's own risk. Precautions shall be taken to prevent damage to stored pipe.

3.03 PREARATION FOR INSTALLATION

A. Reinforced concrete pipe shall be installed as shown and detailed on the plans. Bedding shall be placed prior to installation; any necessary support or stabilization shall be provided and remain in place until the pipe is securely anchored by trench backfill.

3.04 HANDLING

- A. Care shall be taken in handling, transporting, and placing pipe to prevent damage to the pipe. Temporary bracing may be required to prevent damage while transporting pipes. No interior hooks or slings shall be used in lifting pipe. All handling operations shall be done with an exterior sling or with a suitable forklift.
- B. No damaged pipe will be accepted until and unless the damage has been repaired to the satisfaction of the Engineer. Damaged pipe will be replaced at the Engineer's discretion.

3.05 INSTALLATION

- A. Precast concrete pipe shall be installed as shown on the plans, according to manufacturer's recommendations.
- B. Joint sealers shall be used as specified herein for a water-tight installation.

3.06 DEFECTIVE CONCRETE REPAIRS

- A. Concrete shall be considered defective for the following reasons:
 - 1. Failure of finished concrete profiles to conform to the drawings within tolerance.
 - 2. Failure to meet the specified cylinder strength requirements.
 - 3. Concrete showing cracks, rock pockets, voids, spalls, or defects that adversely affect the structural adequacy of the concrete.
- B. Defective concrete that results from improper casting or curing shall be repaired or replaced at the plant prior to shipment; damaged concrete that results from transportation, handling, or storage after the piece leaves the plant shall be repaired or replaced at no expense to the City.

C. Repairing and Patching: Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, rock pockets, tie holes, except as specified, etc., shall be patched at once. Defective areas shall be chipped away to a depth of about one inch with the edges perpendicular to the surface.

3.07 BACKFILLING

A. Reinforced Concrete Pipes shall not be backfilled until the installation has been inspected and approved. Pipe backfilled prior to approval shall be uncovered and re-backfilled at the Contractor's expense.

SECTION 33 44 33

TRASH CAPTURE DEVICE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Fabrication and installation of stormwater trash and debris guards for stormwater treatment as indicated on the drawings and as specified herein.

1.02 RELATED REQUIREMENTS

- A. Section 31 00 00 Earthwork
- B. Section 31 50 00 Excavation Support and Protection
- C. Section 33 39 00 Reinforced Concrete Storm Drain Structures
- D. Section 33 41 02 Reinforced Concrete Pipe

1.03 REFERENCES

- A. Abbreviations And Acronyms
 - 1. AHJ: Authority Having Jurisdiction
 - 2. TCD: Trash Capture Device
- B. Reference Standards
 - 1. American Association of State Highway and Transportation Officials (AASHTO)
 - 2. Standard Specification for Highway Bridges 7th Edition
 - 3. American Association of Testing and Materials (ASTM) (Latest Revision Referenced)
 - 4. ASTM A-48 Standard Specification for Gray Iron Castings
 - 5. ASTM A-240 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - 6. ASTM A-320 Standard Specification for Alloy-Steel and Stainless-Steel Bolting for Low-Temperature Service
 - ASTM A-615 Standard Specification for Deformed and Plain, Carbon-Steel Bars for Concrete Reinforcement
 - 8. ASTM A-1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
 - 9. ASTM C-33 Standard Specification for Concrete Aggregates
 - 10. ASTM C-150 Standard Specification for Portland Cement
 - 11. ASTM C-857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
 - 12. ASTM C-858 Standard Specification for Underground Precast Concrete Utility Structures

- 13. ASTM C-891 Standard Practice for Installation of Underground Precast Concrete Utility Structures
- 14. ASTM C-990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- 15. ASTM D-3776 Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
- 16. ASTM D-3787 Standard Test Method for Bursting Strength of Textiles Constant-Rate-of-Traverse (CRT) Ball Burst Test
- 17. ASTM D-4886 Standard Test Method for Abrasion Resistance of Geotextiles (Sandpaper/Sliding Block Method)
- 18. ASTM D-3887 Standard Specification for Tolerances for Knitted Fabrics
- 19. ASTM D-4595 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
- 20. ASTM E-3332 Standard Test Method for Determining Trash and/or Debris Capture Performance of Stormwater Control Measures
- 21. American Concrete Institute (ACI)
- 22. ACI-318 Building Code Requirements for Structural Concrete

1.04 ADMINISTRATIVE REQUIREMENTS

A. The Contractor shall schedule a preinstallation meeting with the manufacturer no later than five (5) business days prior to delivery.

1.05 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- A. The following shall be submitted by the Contractor in accordance with Section 01 30 00 Contractor Submittals:
- B. Product Data
 - 1. TCD brochures or specification sheets
 - 2. Brochures or cut sheets of accessories and related components as indicated on the submittal drawings
- C. Submittal Drawings
 - 1. Submittal drawings are to detail the TCD's primary dimensions and elevations
 - 2. Pipe type, locations, provided pipe opening dimensions, and connection details
 - 3. Access opening locations, dimensions, and connection details
 - 4. Indicate all materials to be used and applicable material standards
 - 5. Design assumptions for structural analysis
- D. Certificates
 - 1. Certification by a Professional Engineer licensed in the State of installation shall be submitted that the TCD meets or exceeds the structural design standards listed in this specification if engineering stamp and calculations are required by the Owner.
 - 2. It is the responsibility of the Engineer of Record to verify that the design assumptions are acceptable for the proposed application.

- 3. Certification by a Professional Engineer licensed in the State of installation shall be submitted that the TCD meets or exceeds the hydraulic design standards listed in this specification if engineering stamp and calculations are required by the Owner.
- 4. It is the responsibility of the Engineer of Record to verify that the design assumptions are acceptable for the proposed application.
- E. Manufacturers' Instructions
 - 1. Installation Manual
 - 2. Inspection and Maintenance Manual
 - 3. Inspection Checklist

1.06 QUALITY ASSURANCE

- A. The manufacturer of the TCD shall be one that is acceptable to the Engineer of Record, regularly engaged in the engineering, design, and production of systems developed for the treatment of stormwater runoff for at least five (5) years and which have a history of successful production.
- B. Upon request, the TCD manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Report" stating that each TCD can achieve the specified performance criteria listed in these specifications.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. The TCD components shall be delivered to the jobsite by the manufacturer.
- B. The contractor shall provide all labor, equipment, and materials necessary to install the TCD as specified in the Drawings and the specifications herein.
- C. The contractor shall ensure the methods used to offload, store, and install the TCD components are done in a safe manner and do not damage the TCD.
- D. Any repair or replacement costs associated with events occurring after delivery is accepted shall be the responsibility of the contractor.
- E. Components shall be handled and stored in accordance with the manufacturer's recommendations.

1.08 WARRANTY

- A. The TCD manufacturer shall guarantee the components against all manufacturer originated defects in materials or workmanship for a period of five (5) years from the date of delivery.
- B. The manufacturer shall be notified of warranty claims in writing within the referenced warranty period. The manufacturer, upon its determination, shall repair, correct, or replace any manufacturing defects identified by the written notice.
- C. The use of TCD components shall be limited to the application for which it was specifically designed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The indicated manufacturer is the basis of design.
- B. The TCD shall be a Debris Separating Baffle Box (DSBB) as manufactured by Contech Engineered Solutions, LLC, (415) 897-8587. Website www.conteches.com. Local Representative: John Stiver

2.02 DESCRIPTION

- A. A stormwater TCD that is housed in a precast concrete vault or structure unless noted otherwise on drawings. The TCD shall use the passive energy of the influent flow to capture trash and debris within a screening device and shall drain dry during dry weather conditions.
- B. The TCD shall be designed to span the entire open cross-sectional area of the inlet pipe and shall be designed to convey all flows associated up to and including the design flow rate through a screening device. Bypass prior to the design flow rate, in a clean condition, is not permitted.
 - 1. The use of a net physically attached, mechanically connected, or tethered to a pipe is not permitted.
- C. TCD capacities shall not be less than the values listed in Section 2.3.B.
- D. The TCD must include the capability to partition flows, causing treatment flows to be diverted thru the screening device and flows exceeding the treatment capacity of the TCD (bypass flows) shall divert over the screening device to prevent washout of previously retained trash and debris.
- E. The use of rotational or "swirling" flow as the mechanism for trash and debris removal shall not be permitted.
 - 1. The use of tangential inlet pipes shall not be permitted.
- F. The clear opening of the access frames and covers that provide access for inspection and maintenance activities shall be 24 inches or greater in the shortest dimension.
 - 1. Removal of pollutants from the TCD shall be possible without confined space entry.

2.03 PERFORMANCE / DESIGN CRITERIA

- A. The TCD shall be designed such that the maximum head loss throughout the device in a clean condition does not exceed six (6") at the design flow rate.
- B. The TCD shall be sized to achieve a pollutant reduction as required by applicable AHJs.
- C. Product performance claims shall not be based upon event based average annual reduction methodologies.
- D. CAPACITIES
- 1. Design Flow Rate 103 CFS (as indicated on drawings)

2. Peak Flow Rate

162 CFS

2.04 MATERIALS

- A. Housing Unit
 - 1. The housing unit of the TCD shall be constructed of precast concrete unless noted otherwise on drawings. Precast components shall conform to applicable sections of ACI-318, ASTM C-857, ASTM C-858, and the following:
 - a. Concrete shall achieve a minimum twenty-eight (28) day compressive strength of six-thousand (6000) pounds per square-inch (psi);
 - b. Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO HS-20 traffic loads;
 - 1) Minimum/Maximum Cover: As indicated on drawings.
 - 2) Minimum Soil Pressure: As indicated on drawings.
 - 3) Groundwater: At ground level.
 - 4) Lateral soil pressures shall be determined using the more critical of the following:
 - a) At-rest equivalent fluid weight of 60 pcf above the design high groundwater table and 90 pcf below.
 - b) Active pressure of 40 pcf plus a seismic increment per 2022 CBC requirements (triangular distribution) above the design groundwater level, and 80 pcf below the groundwater level plus a seismic increment per 2022 CBC requirements (triangular distribution).
 - c. Vertical soil pressures shall be determined using:
 - 1) Live Load: AASHTO HS-20
 - 2) Dead Load: 120 pcf cover fill unit weight.
 - 3) Where traffic loads (including trucks) are expected within 10 feet of the TCD walls, and additional design load of 250 psf should be applied to the upper 10 feet of the wall for static loading conditions.
 - d. Lateral Seismic Surcharge per this Section.
 - e. Cement shall be Portland Cement conforming to ASTM C-150;
 - f. Aggregates shall conform to ASTM C-33, except that the requirements for gradation shall not apply;
 - g. Reinforcing steel shall consist of wire and welded steel wire conforming to ASTM A-1064 or of bars conforming to ASTM A-615;
 - h. Concrete clear cover for reinforcing steel shall conform to ACI-318.
 - 2. Sections shall have tongue and groove or ship-lap joints with a sealing compound conforming to ASTM C-990.
 - 3. Pipe openings shall be sized to accept pipes of the specified sizes and materials and shall be sealed by the contractor.
- B. Access Openings
- 2. Sizes: as indicated on drawings.
 - 1. Hatches shall be provided with a lockable latch and lift springs or comparable prop up mechanisms to hold the hatch doors in an opened position.
 - a. Minimum hatch clear opening: as indicated on drawings.
 - b. Minimum clear opening shall be the width of the frame plus six inches or greater.
 - 2. Manhole castings for system access shall be bolt down lids made of cast-iron conforming to ASTM A-48 Class 30 and designed to withstand AASHTO HS-20 loadings.

- a. Minimum cover clear opening: as indicated on drawings.
- b. Access covers shall provide a minimum of twenty-four (24) inch clear opening.
- 3. Size and location of access openings shall be determined by the manufacturer.
- 4. Manhole steps, when shown on the Drawings, shall be in conformance with OSHA requirements.
- C. Internal Components
 - 1. All internal components [mounting and support system, guide rails, lifting units, and bypass grating (applicable if indicated on drawings)] shall be designed and constructed to withstand all anticipated loadings associated with the fabrication, shipping, installation, and operation of the equipment.
 - a. Anticipated operational loadings shall be based upon the values as indicated on the drawings and the values listed in Section 2.3.B.
 - 2. Bypass grating (applicable if indicated on drawings) shall be constructed to withstand anticipated loadings with a minimum deflection of ¹/₄ inch or less under a uniform live load of 100 pounds and a deflection of ¹/₄ or less under a concentrated live load of 300 pounds applied at mid span.
- D. Screening Basket (applicable if indicated on drawings)
 - 1. The screening basket shall be designed and constructed to withstand all anticipated loadings associated with the fabrication, shipping, installation, and operation of the equipment.
 - a. Anticipated operational loadings shall be based upon the values as indicated on the drawings and the values listed in Section 2.3.B.
 - 2. The opening size and dimensions of the screening baskets shall be sized as indicated on the drawings and the values listed in Section 2.3.B.
- E. Mounting Hardware
 - 1. All mounting hardware shall be made of 304SS or 316SS conforming to ASTM A-240 or ASTM A-320 unless indicated otherwise on the drawings.
 - 2. Internal components shall be secured together using mounting hardware comprised of bolts, nuts, and washers of adequate size and numbers to withstand the anticipated loadings.
 - 3. Internal components shall be secured to the housing unit using "drill-in" type anchors.
 - 4. The manufacturer shall supply all necessary hardware required to install the supplied components.

2.05 ACCESSORIES

- A. Use of accessories shall be as indicated on submittal drawings.
- B. Refer to accessory manufacturers as indicated on submittal drawings for specific product details.

2.06 INSPECTION

A. The TCD shall be subject to inspection by the Engineer of Record or the Owner's Representative at either the place of manufacture or the jobsite. All components are subject to be rejected or identified for repair if the quality of materials and manufacturing

do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair. Final acceptance of the component is at the discretion of the Engineer of Record.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Review installation procedures and coordinate installation with preparation and adjacent work, including but not limited to grading, excavation, utilities, or erosion control.
- B. Do not permit loads greater than the design loads over completed TCD installation.

3.02 PREPARATION

- A. Verify in field, before installation, that pertinent dimensions and soil conditions are satisfactory, including but not limited to, groundwater conditions and soil bearing capacity.
- B. If field conditions are unsatisfactory, or an obstruction is present, notify the Engineer of Record of observed conditions. Do not commence system installation until conditions have been corrected and are deemed satisfactory.

3.03 INSTALLATION

- A. The contractor shall inspect and accept the TCD components prior to unloading the components. Commencement of installation constitutes acceptance of the TCD components.
 - 1. If any components are damaged prior to unloading, the contractor shall notify the manufacturer immediately. Failure to notify the manufacturer prior to unloading or any field modifications may void all associated warranties and manufacturer liability.
- B. The TCD shall be installed by the contractor in accordance with ASTM C-891, the site plans, the manufacturer's recommendations, the specifications herein, and per the approved submittal drawings.
- C. Backfill the TCD as soon as possible and in accordance with ASTM C-891, the site plans, the manufacturer's recommendations, the specifications herein, and per the approved submittal drawings.
- D. Any damage during delivery or installation shall be repaired or replaced at the discretion of the manufacturer.

3.04 FIELD QUALITY CONTROL

- A. MANUFACTURER SERVICES
 - 1. At the time and place of the TCD installation, the manufacturer shall provide a Product Liaison onsite to offer installation guidance and delivery coordination to the installing contractor at no additional expense.

2. Contractor shall notify the manufacturer a minimum of five (5) business days prior to the installation date to allow performance of the services included in this subsection.

3.05 PROTECTION

- A. Prior to site stabilization, the TCD shall be reasonably protected from construction debris and excessive sediment runoff entering the device.
- B. Prior to transfer of operational responsibility to the Owner, the contractor shall remove all loose material from the TCD and clean the unit, power washing as needed.
- C. All materials collected within the TCD shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements.