

CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
COUNTY OF RIVERSIDE PARKS DEPARTMENT

5. Ambient conditions at the time of sample taking and inspecting or field testing.
6. Names of individuals taking the sample or making the inspection or test.
7. Product and test method.
8. Inspection or test data including interpretation of test results and comments or professional opinion on whether inspected or tested work complies with requirements.
9. Recommendations on re-testing or re-inspection.
10. Name and signature of professional laboratory inspector.

D. TESTING AGENCY QUALIFICATIONS:

Testing agencies shall specialize in the types of inspections and tests to be performed. Testing agencies must be acceptable to the Parks Representative and authorities having jurisdiction.

E. TESTING AGENCY RESPONSIBILITIES:

Testing agencies shall cooperate with the Parks Representative, authorities having jurisdiction, and the Contractor in performing its duties and shall provide qualified personnel to perform inspections and tests.

1. Agency shall promptly notify the Parks Representative and Contractor of deficiencies in the work observed during performance of its services.
2. Agency shall not release, revoke, alter, or enlarge requirements of the Contract Documents nor approve or accept any portion of the work.
3. Agency shall not perform duties of the Contractor.

F. AUXILIARY SERVICES:

The Contractor, at their expense, shall cooperate with all testing and inspection agencies, including the Parks Representative, and provide auxiliary services as requested, including, but not limited to the following:

1. Access to the Work.
2. Incidental labor and facilities to assist with inspections and tests.
3. Adequate quantities of materials for testing, and assistance in taking samples.
4. Facilities for storing and curing test samples.
5. Security and protection for samples and test equipment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01400

**SECTION 01725
PRESERVATION OF PROPERTY****PART 1 - GENERAL****1.01 WORK INCLUDED**

- A. Work under this section includes protecting from harm or damage, all existing improvements and facilities that are not to be removed, including providing suitable safeguards during the construction activities.

PART 2- PRODUCTS (Not Applicable)**PART 3 - EXECUTION****3.01 PRESERVATION OF PROPERTY**

- A. The Contractor shall protect existing structures, pavements, light standards, utilities, fences, and all other appurtenances that are not indicated for removal. The Contractor shall promptly notify the Parks Representative of any damage to existing facilities not indicated for removal. The Parks Representative will direct the Contractor how to proceed repairing the damage at the expense of the Contractor. Damage shall be corrected to the satisfaction of the Parks Representative. It is highly recommended that the Contractor take pictures and/or video of the project site and surrounding areas prior to construction in order to protect themselves against damage claims that may arise.
- B. In performing the work, the Contractor shall exercise due care and caution necessary to avoid damage to or impairment of the use of any existing utility lines, wet or dry, which may be above or below grade, intended to remain in service. Any damage inflicted on existing utility lines resulting from the Contractor's operations shall be immediately repaired to original condition and appearance at the Contractor's expense. The Parks Representative shall be immediately notified and inspection of the repaired utility lines shall take place prior to backfilling, if applicable. Prior to commencement of work, it is recommended that the Contractor contact the Underground Service Alert (USA) at 811 or 1-(800)-227-2600 to verify underground utility placement.
- C. Existing vegetation that are not to be removed and are injured or damaged by reason of the Contractor's operations shall be replaced by the Contractor at the Contractor's expense.
- D. Damaged or injured plants shall be removed and disposed of outside the project limits in accordance with the provisions in Section 5-1.36B of the State of California Department of Transportation Standard Specifications. At the option of the Contractor, removed trees and shrubs may be reduced to chips.
- E. Replacement planting shall be completed not less than twenty one (21) calendar days prior to the project end date per the Standard Agreement Form (STD 213) or the scheduled final walkthrough project acceptance date and agreed to by the Contractor and the Parks Representative. Replacement plants shall be watered as necessary to maintain the plants in a healthy condition.

END OF SECTION 01725

DIVISION 2 – SITE CONSTRUCTION**SECTION 02110
SITE CLEARING****PART 1 - GENERAL****1.01 DESCRIPTION**

Work per this section shall include all clearing, grubbing, and stripping, including, but is not necessarily limited to:

- A. Removal of trees, tree stumps, roots and tree debris.
- B. Felling and removal of trees, stumps, roots, and tree debris.
- C. Removal of surface organic topsoil layer.

1.02 SECTION REQUIREMENTS**A. LIMITS OF WORK**

Perform demolition, clearing, grubbing, and stripping operations to the following limits:

- 1. **CLEARING:** Clearing operations shall be limited to areas upon which facilities, structures, landscaping or structural fill will be placed. A tree inventory identifying trees within or near the project area will be provided to the Contractor as part of the Contract Drawings if applicable. The Contractor shall clearly flag all trees and vegetation to remain or to be relocated and prior to construction shall notify the Parks Representative to confirm removal of such items.
- 2. **GRUBBING:** Perform grubbing operations at all locations identified for clearing.
- 3. **STRIPPING:** Perform stripping operations at all locations identified for clearing except those areas delineated as wetlands. These areas will be identified on the Contract Drawings and shall not be disturbed.

B. CLEARING

Remove and dispose of trees, snags, stumps, shrubs, brush, limbs, and other vegetative growth to the limits defined in Section A above. Remove all evidence of branches greater than 1-inch in diameter of thickness. Remove and dispose of trash piles and rubbish in a timely manner. Protect structures and piping above and below ground, trees, shrubs, and vegetative growth and fencing which are not designated for removal or which exist outside project limits.

C. GRUBBING

After clearing, remove and dispose of wood or root matter, including stumps, trunks, roots, or root systems greater than 1-inch in diameter to the limits defined in Section A above.

D. STRIPPING

After grubbing, strip the organic material to the limits defined in Section A above to a depth of not less than 2-inches. Upon completion of the stripping operation, the remaining material, if utilized for structural fill, shall not exceed a concentration of organics in excess of 5 percent by dry weight. Dilution shall be accomplished by means of diskings. The Contractor shall provide, at their expense, a Geotechnical Engineer to oversee and document the grading operation if stripping material is to be utilized as structural fill.

E. JOB CONDITIONS

- 1. **DUST CONTROL:** Use all means necessary to prevent the spread of dust during performance of the work. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other

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work on the site. Wind in excess of 10 MPH causing dust to leave site will require Contractor to limit dust causing activities.

2. **BURNING:** On-site burning will not be permitted.
3. **PROTECTION:** Use all means necessary to protect existing objects designated to remain and, in the event of damage, immediately notify the Parks Representative. The Contractor shall make all repairs and replacements necessary, at their expense. All repairs must be performed to the satisfaction of the Parks Representative.

F. SALVABLE IMPROVEMENTS

Carefully remove items indicated to be salvaged if applicable. Salvable items shall be stored by the Contractor, at the Contractor's expense, until the items are re-installed in their permanent location, unless the Parks Representative directs otherwise. If damage to salvable items occurs, it shall be the responsibility of the Contractor to replace the items in kind.

G. UNDERGROUND SERVICE ALERT

The Contractor shall notify the Underground Service Alert (USA) at 811 prior to site clearing activities to verify the location of underground utilities that may or may not be shown on the Contract Drawings. Provide the Parks Representative with the USA ticket number and notify the Parks Representative of any discrepancies or potential conflicts.

PART 2 - PRODUCTS**2.01 TEMPORARY BARRICADES**

Unless otherwise specifically approved by the Parks Representative, use only orange construction fencing to construct temporary barricades around the objects designated to remain.

2.02 PRUNING PAINT

Use only a pruning paint specially formulated for horticultural application to cut or damaged plant tissue and approved by the Parks Representative for use on this work.

2.03 EXPLOSIVES

Do not use explosives on this work.

2.04 OTHER MATERIALS

All other material not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to approval of the Parks Representative.

PART 3 EXECUTION**3.01 PREPARATION****A. NOTIFICATION:**

The Contractor shall notify the Parks Representative at least five (5) full working days prior to commencing the work of this section.

B. SITE INSPECTION

Prior to all work of this section, carefully inspect the entire site and all objects designated to be removed and to be preserved

Locate all existing inactive utility lines to be encountered by the new work and determine all requirements for disconnecting and capping. Abandonment of piping requires capping at each end or plugging with concrete to the satisfaction of the Parks Representative.

Locate all existing active utility lines traversing the site and determine the requirements for their protection.

C. CLARIFICATION

The drawings do not purport to show all objects existing on the site.

Before commencing the work of this section, verify with the Parks Representative all objects to be removed and all objects to be preserved.

D. SCHEDULING

Schedule all work in a careful manner with all necessary consideration for neighbors, operation of the existing facilities, and the public.

Avoid interference with the use of, and passage to and from, adjacent buildings and facilities.

E. DISCONNECTION OF UTILITIES

Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed, performing all such work in accordance with the requirements of the utility company and/or Owner involved.

F. PROTECTION OF UTILITIES

The Contractor shall preserve in operating condition all active utilities traversing the site.

3.02 STRUCTURE AND DEMOLITION**A. SAFETY REQUIREMENTS**

The Contractor's attention is directed to the provisions of Subpart T of the OSHA Safety and Health Standards for Construction and the provisions of Article 31 of the Construction Safety Orders of the California Division of Industrial Safety governing the work of demolition. The Contractor shall perform all the work hereunder in accordance with said provisions, and where in conflict, the more stringent shall apply.

B. BACKFILL AND GRADING

After facilities have been demolished and all material removed, any remaining depression or holes shall be backfilled and the area finish graded. Rubble and broken concrete will not be allowed to be used as fill material.

Facilities so designated on the plans shall be demolished, and all materials obtained as a result of the operation shall become the property of the Contractor and shall be removed and disposed of at a proper location away from the site. Any equipment or pipe work connected within a structure which is designated to be removed, salvaged or relocated shall be removed before demolition begins. All other equipment within the structure shall become the property of the Contractor.

All concrete and rock shall be removed to a depth of at least 2.5 feet below the finished grade unless otherwise noted and shall be disposed of at a proper location off-site. Concrete not removed, shall be broken to prevent entrapment of water as directed by the Parks Representative. Concrete includes all reinforcement and embedded items. Pipe work and conduit within 10 feet of a structure shall also be removed to a depth of 2.5 feet below existing grade unless otherwise noted.

C. PAVEMENT AND CONCRETE DEMOLITION

1. Where shown on the Contract Drawings, the Contractor shall remove the entire structural section including base material if applicable. The Parks Representative reserves the right to direct the Contractor to perform additional work where deemed necessary when washouts, settlement, damage, vandalism, etc. has caused a loss of structural integrity. Existing base material may be stockpiled and reused where appropriate and only with the approval of the Parks Representative.

2. Asphalt concrete, and all concrete work including but not limited to ramps, abutments, sidewalks, concrete curb, and gutter materials required to be demolished, shall be broken up and removed from the site by the Contractor at no additional cost to the State.

D. UTILITY DEMOLITION

1. Unless otherwise specified, or in conflict with a proposed utility, pipeline or structure, all utilities shown to be demolished, shall be abandoned in place. Pipelines that are to be abandoned in place shall have each end capped with at least a 24-inch long plug of concrete or grout material within the pipe. Piping subject to internal pressure upon abandonment shall be capped with pressure retaining caps or plugs.
2. All utility, pipeline or structure material shall be removed, including but not limited to, all reinforcement, footings, pipes, fittings, valves, and thrust blocking shall be taken from the site by the Contractor at no additional cost.

3.03 SITE WORK

A. CLEARING AND GRUBBING

1. AREA TO BE CLEARED AND GRUBBED

- a. The Contractor shall restrict clearing and grubbing to the areas designated for new construction or adjustment of grades as shown on the plans. Surrounding trees shall be protected from damage at all times. In areas not to be further excavated, fill depressions resulting from site clearing. Place and compact satisfactory soil materials (no organics) in 6-inch thick layers to density of surrounding original ground.
- b. Where limbs or roots of trees designated to remain extend into work areas, the limbs or roots shall be trimmed in accordance with the provisions of this section.

2. FELLING OF TREES

- a. Use all necessary care to protect the roots and branches of trees designated to remain, and to prevent damage to persons and properties.
- b. Immediately after felling a tree, remove the trunk, branches and limbs as necessary for removal, and clear the debris.

3. TRIMMING OF TREES

- a. In company with the Parks Representative, determine the limbs and roots which are to be trimmed and clearly mark them to designate the approved point of cutting.
- b. Cut evenly, using proper tools and skilled workmen, to achieve neat severance with the least possible damage to the tree.
- c. Promptly coat the cut area with the approved pruning paint in strict accordance with the manufacturer's recommendations.
- d. In the case of root cuts, apply burlap or other protection approved by the Parks Representative, as required, to prevent roots from drying out.

B. GRUBBING

Remove all surface rocks and all stumps, roots, and vegetation within the limits of construction. Roots shall be removed to at least 3 feet below proposed finish grade.

C. DISPOSAL OF STRIPPINGS

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All stripped materials shall be removed from the project site at the contractor's expense. Stripping materials may be stockpiled and stored onsite only when directed by the Parks Representative

D. CONSTRUCTION OF BARRICADES

1. LAYOUT

- a. At all locations consisting of trees, wetlands, and other areas designated to be preserved, the Contractor shall install a minimum 4-foot high orange fence, or approved equal as deemed by the Parks Representative, shall be installed at the outermost edge of the protected zone of each protected tree or group of trees. The fence shall remain in place for the life of the project, but may be removed after all grading activities for the site have been completed, and then it shall only be removed as needed for construction purposes.
- b. Barricades blocking vehicle traffic and/or pedestrians entering the project site shall be at least 3-foot high, consisting of two inch by four inch or larger posts set at least 18 inches into the ground at not more than six feet on centers, joined at the top by one inch by six inch or larger boards firmly nailed to the posts. Metal post with orange safety fencing may also be used if allowed by the Parks Representative.

2. PROTECTION

- a. Take special care in setting posts to not damage tree roots.
- b. Do not permit stockpiling of materials or debris within the barricaded area nor permit the earth surface to be changed in any way except as specifically approved by the Parks Representative.

3. MAINTENANCE

All protective fencing shall be inspected and maintained by the Contractor at weekly intervals. Any damaged fencing shall be immediately restored at no additional cost to the Parks.

4. REMOVAL OF BARRICADES

All protective fencing including posts and fabric shall be removed from the site at the completion of the work at the Contractor's expense.

E. REMOVAL OF DEBRIS

1. Remove all debris from the project sites and leave in a neat and orderly condition to the approval of the Engineer. Dispose of debris off site at a location approved by the Engineer.
2. Removal of demolished materials shall be included in the applicable lump sum base bid item and shall not be paid on a unit cost basis.

END OF SECTION 02110

**SECTION 02200
DEMOLITION AND REMOVAL****PART 1 GENERAL****1.01 DESCRIPTION**

Work per this section shall include all demolition, including, but is not necessarily limited to:

- a. Demolition
- b. Site Restoration
- c. Hauling of Disposed Material

1.03 SECTION REQUIREMENTS**A. DEMOLITION**

The Contractor shall remove and dispose of all items as shown on the drawings, which may include but are not limited to, existing utilities, asphalt pavement, concrete rubble, concrete curbs, sidewalks, precast panels and all other existing debris within project limits. Unless otherwise indicated, demolished and excavated materials become Contractor's property.

B. The Contractor shall protect the general public from all demolition activities at all times. The Contractor shall be responsible for the erection, maintenance and, after use, removal of temporary safeguards such as fencing, barricades, guard rails, signs, lights, flares and all necessary items as required for protection and safety of personnel, and for security of property.

C. Any safeguards protecting existing facilities and controls shall remain in place for the duration of the project.

1.02 JOB CONDITIONS**A. WATER REMOVAL**

Provide and operate all necessary equipment for water removal to maintain excavations and construction areas free of subsurface and storm water. It shall be the responsibility of the Contractor to account for any associated costs required for dewatering during the bidding process. No extra cost will be awarded to the Contractor after the contract has been executed for dewatering purposes.

B. UTILITY SERVICES

1. The Contractor shall arrange with the utility provider to shut off utilities when necessary.
2. Cut off pipe or conduit for utilities to be abandoned or discontinued a minimum of 24-inches below grade. Cap, valve, or plug and seal the remaining portion of pipe or conduit.
3. At no times shall the Contractor interrupt existing utilities that serve occupied or active facilities, except when authorized in writing to do so by the Parks Representative.

C. The Contractor shall provide all shoring, sheeting and bracing required to retain excavations and to prevent slides and cave-ins. Refer to General Conditions for related paragraphs concerning safety precautions and operations for construction.

D. Perform all operations to avoid breakage, marring, bending or other damage to existing structures or utilities, which are to remain. Brace sides of excavation and shore structures when needed for stability.

E. Explosives: The use of explosives will not be permitted.

F. If damage is done to any adjacent facilities caused by demolition operations, the Contractor shall promptly repair the damage. All repairs performed shall be inspected and accepted by the Parks Representative at no additional cost to the Parks.

PART 2 PRODUCTS (Not Applicable)**PART 3 EXECUTION****3.01 DEMOLITION****A. Demolish and remove the following within the project limits:**

1. **ABANDONED UTILITIES:** Abandoned utility lines may exist within project site which are not shown on the Contract Drawings. The Contractor shall contact the Parks Representative upon discovery of any utilities encountered that are not shown on the plans that affect the work. The Contractor shall demolish and remove these items, if required, upon approval by the Parks Representative.
2. **DEBRIS:** The Contractor shall remove all existing debris that exists on-site as required to complete the work.
3. **CONCRETE RUBBLE:** The Contractor shall remove all concrete rubble and debris and recycle all material.

B. HAUL ROUTES

Haul routes may be limited to certain areas within the project site. The Contractor shall provide a hauling route to the Parks Representative if so directed. The Contractor shall take all steps required to prevent spillage when transporting waste materials to a disposal site. The Contractor shall be solely responsible for any costs required for cleanup and damage resulting from the Contractor's haul spillage.

C. CLEANING

1. Promptly remove from the property and legally dispose of all demolished materials. Remove all equipment, debris and rubbish from the property.
 2. During progress of this work, maintain the site in a presentable condition. Clean up spillage and debris at the site and on haul routes and public roads.
 3. Promptly repair any items damaged during the progress of this work, including any damage to pavement, sidewalks, haul routes, public roads or adjacent ground caused by transporting materials or equipment.
 4. All debris resulting from work shall become property of Contractor.
- D.** Bring to the Parks Representative's attention, any obstructions which are not noted or shown on the plans or described herein. Protect such facilities until further direction is received from the Parks Representative. Additional work required due to unforeseen conditions shall be performed as directed by the Parks Representative and will be paid for as extra work in accordance with the General Conditions.
- E.** The Contractor shall maintain all erosion and pollution controls during demolition operations. Discharge of water into the existing waterways and/or drainage systems shall be clean and turbidity levels shall meet or exceed guidelines allowed by the California Regional Water Quality Control Board or as mentioned in any permits associated with the project.

3.02 SITE RESTORATION

- A.** Completely fill below grade areas and voids resulting from structure demolition operations with onsite soil materials.
- B.** Uniformly rough grade areas of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent grades and new grades.

3.03 CLEANING AND DISPOSAL OF DEMOLISHED MATERIALS

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Remove debris and all other deleterious material resulting from demolition operations and legally dispose of off the project site at an approved disposal site.

END OF SECTION 02200

SECTION 02221**GRADING FOR PAVING AND CONCRETE WORK****PART 1 GENERAL****1.01 DESCRIPTION**

Grading for paving and concrete work consists of excavating, filling, and compacting as required to bring the surface of subgrade to cross sections and grades shown on the plans.

1.02 SUBGRADE

Subgrade is defined as the surface upon which pavement, base, or sub-base is to be placed.

1.03 QUALITY ASSURANCE

Evaluation of all fill materials and testing required to determine compliance for the work of this section will be the responsibility of the Contractor and at the Contractor's expense. All areas where test results indicate noncompliance shall be corrected before placing additional backfill. Additional costs for re-testing shall be paid by the Contractor.

1.04 RELATIVE COMPACTION TEST

A. The Contractor shall test for compaction at locations determined by the Parks Representative.

B. Relative compaction tests shall be in accordance with ASTM D-1557, latest edition or Caltrans CTM-216, latest edition.

1. A soils report is not provided, contractor is responsible for obtaining all lab tests to meet requirements set forth in these specifications.

C. Where compaction tests indicate a failure to meet the specified compaction, the Contractor will take additional tests every 50 feet in each direction until the extent of the failing area is identified. Re-work the entire failed area until the specified compaction has been achieved and to the satisfaction of the Parks Representative.

PART 2.0 PRODUCTS**2.01 EXCESS EXCAVATION AND WASTE**

The Contractor shall remove and dispose of all earthen materials and/or waste products as described in the Contract Documents.

PART 3 EXECUTION**3.01 GRADING FOR PAVEMENT AND CONCRETE WORK**

a. Under all pavements, including asphalt and concrete, the Contractor shall:

1. Excavate to below subgrade, remove and dispose of organic material and unsuitable soils.

2. The top 2.5 feet of fill materials or top 1.0 feet of cut that are to support structural sections for asphaltic concrete roadway pavements, parking areas, sidewalks, and boat ramps above the water line shall be compacted at a moisture content of at least 2-percent above optimum to 95-percent minimum relative compaction.

3. Place engineered fill in 8-inch maximum loose lifts to obtain subgrade elevations.

b. Excavations shall be made to such widths outside the finished project area to be constructed to industry standards as needed to provide proper working methods including the erection of forms and the protection of the work.

3.02 EXCAVATION

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Top 8-inches of subgrade shall have a relative compaction of 95 percent obtained by thoroughly scarifying the area after it has been excavated to the required elevation and compacted with approved rolling equipment allowing for settlement of re-compacted subgrade. Where required during compaction, apply water with suitable equipment to insure even distribution of moisture content.

3.03 COMPACTION

Relative compaction of earthen materials composing each layer of soil shall be not less than 95 percent as determined by Test Method No. Calif. 216. It is the responsibility of the Contractor to provide testing for compaction at their expense. The Contractor shall immediately provide copies of the results to the Parks Representative for review upon receiving them from the testing agency. Any work covering the soil without test results is subject to being removed at the contractor's expense.

3.04 SUBGRADE PREPARATION

Where original ground conforms approximately to finished pavement surface, scarify basement material to depth of at least 8-inches below subgrade surface; remove vegetation or other unsuitable backfill material resulting from excavation with suitable material.

END OF SECTION 02221

**SECTION 02225
SITE GRADING****PART 1- GENERAL****1.01 DESCRIPTION**

The work of this section consists of excavation, fill placement, and removal and disposal of excess and unsuitable material all as required to establish site grades as shown on the plans. Excavation includes excavation and grading for roadways, areas adjacent to structures, parking areas, slope rounding, benching, waterways, furrow and interception ditches, embankments, unsuitable material from the roadbed and beneath fill areas.

The Contractor shall utilize the material as specified herein and uniformly spread and compact any surplus, or off haul from the project site where so directed by the Parks Representative.

1.02 QUALITY ASSURANCE

Testing is required to determine compliance for the work of this section. All testing shall be the responsibility of the Contractor and at the Contractor's expense. Areas where test results indicate noncompliance shall be corrected before placing additional fill. Additional costs for re-testing shall be paid by the Contractor.

1.03 PROJECT CONDITIONS

Maintain fills, slopes, and ditches within the limits of the new construction until final acceptance. Repair areas damaged as a result of storms or construction. Take necessary precautions to prevent the entrance of soils and other materials into streambeds, lakes or water courses.

1.04 RELATIVE COMPACTION TEST

Where relative compaction densities are specified in these specifications, the maximum density shall be determined in accordance with the latest revision of either California Test 216 (California Department of Transportation), or ASTM D-1557.

PART 2 - PRODUCTS**A. GENERAL**

1. All fill material shall be subject to approval by the Parks Representative.
2. Material shall be free from detrimental quantities of organic materials and free of all debris, muck, and other unsuitable materials. Frozen material will not be permitted as fill.

B. BORROW SITES

Borrow sites, if needed to complete the work, shall be shown on the plans.

C. EROSION CONTROL

The Contractor is responsible for keeping all project areas free of erosion as detailed in Section 05000 of these specifications.

PART 3 - EXECUTION**3.01 GENERAL**

- A. Finish grades and existing or natural grades in the area adjacent to the structures are indicated on the plans. The Contractor shall do all grading, filling-in or excavating as required to completely grade the site to lines and grades shown, and to provide for the indicated drainage. Where finish grade corresponds practically with existing grade, the ground shall be worked up and graded off evenly with existing grade. The grading operation shall generally consist of moving and transporting materials within the area; however, the Contractor shall provide any additional fill material, if necessary, to complete the site grading to the elevations shown, or to uniformly spread any excess material on-site which may result as directed by the Parks Representative at no additional cost to the State. Clearing, grubbing and stripping shall be as detailed in Section 02110 of these specifications.

- B. Before commencing any earthwork operations:

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1. The Contractor shall verify shrinkage characteristics of imported soils and existing soils to be reused.
2. The Parks will not be responsible for additional costs associated with variations in shrinkage factors and related earthwork quantities.
3. Verify existing grades and conditions are as indicated on the drawings prior to commencing work.
4. Should indicated conditions conflict with actual conditions and contours, notify the Parks Representative and await their directions before proceeding. Commencement of work indicates acceptance of existing conditions.

3.02 GROUND SURFACE PREPARATION

Before excavating or placing fill material, complete all clearing, grubbing, and stripping and scarify ground surface to provide ample bond between old and new material.

3.03 PLACEMENT OF FILL

Place fill material in layers not exceeding 8-inches loose measurement. Compact each layer before placing the next layer. As the compaction of each layer progresses, continually level and manipulate to assure uniform moisture and density. Add water to obtain specified moisture content.

2.01 DENSITY REQUIREMENTS

The top 2.5 feet of fill materials or top 1.0 feet of cut that are to support aggregate base and asphaltic concrete roadway pavements, and parking areas shall be compacted to 95 percent of the maximum density determined by Calif. Test Method No. 216 or ASTM D-1557, and per Section 02221 of these specifications. All fill below the top 2.5 feet and all fill not supporting roadways, or parking areas shall be compacted to 90 percent of maximum density.

2.02 DITCHES

Construct drains, channels, and inlet and outlet ditches for culverts as shown or as directed. Round and trim ditch slopes neatly to grade. Final flow line elevations should be reasonably uniform and provide free drainage without ponding.

2.03 SLOPE FINISHING

Leave earth slopes with a roughened but reasonably uniform surface without noticeable breaks. The final surface should be similar to that obtained by using a farm disk or harrow parallel to the roadway. Blend slopes smoothly with the adjacent terrain. Grading shall provide for drainage away from all sides of structures.

2.04 DISPOSAL OF EXCESS MATERIAL

Excess material shall be hauled offsite and disposed of legally unless specified otherwise by the Parks Representative.

2.05 DISPOSAL OF UNSUITABLE MATERIAL

Unsuitable material shall be recycled if possible. If material cannot be recycled, it is to be properly disposed of offsite at the Contractor's expense. Records of disposal and/or chain of custody forms, if needed, shall be made available to Parks Representative upon request.

END OF SECTION 02225

**SECTION 02230
 AGGREGATE BASE COURSE**

PART 1 – GENERAL

1.01 DESCRIPTION

A. SUBGRADE

Shape, water and compact until firm with roller or other approved equipment as required in Section 02221 prior to placing aggregate base.

1.02 SUBMITTAL

The Contractor shall submit certification from the supplier stating that aggregate base material meets the requirements of this section.

One copy of certified weight tickets for each load of aggregate and crushed rock delivered to project site.

PART 2 - PRODUCTS

2.01 CLASS 2 AGGREGATE BASE

Use Class 2 aggregate base as specified in the Standard Specifications of the State Department of Transportation, latest edition, Section 26, Article 26-1.02 B.

A. MATERIAL

Quarry waste, broken stone, crushed gravel, or combination thereof, free from organic matter and other deleterious substances, and of such quality that it will compact thoroughly when watered and rolled, to form firm, well bonded base.

B. QUALITY

Class 2 aggregate shall conform to the following quality requirements:

QUALITY REQUIREMENTS

Test	Test Method (Calif No.)	Requirements
Resistance (R-value)*	301	78 Min.
Sand Equivalent	217	22 Min.
Durability Index	229	35 Min.

* (The "R" value requirement may be waived provided aggregate base conforms to specified grading and durability and has sand equivalent value of 33 or more.)

C. GRADING

Class 2 aggregate shall be uniformly graded, and at the option of the Contractor, may be either 1-1/2 inch maximum or 3/4 inch maximum, and shall conform to the following requirements:

AGGREGATE GRADING REQUIREMENTS

Sieve Sizes	Percentage Passing	
	1-1/2" Maximum	3/4" Maximum
2"	100	-
1-1/2"	90-100	-
1"	-	100
3/4"	50-85	90-100
No. 4	25-45	35-60
No. 30	10-25	10-30
No. 200	2-9	2-9

PART 3 - EXECUTION**3.01 SPREADING**

Deliver base material to subgrade as uniform mixture. Where required thickness is less than 6 inches, aggregate base material may be spread and compacted in one layer. Where required thickness is more than 6 inches, aggregate base material shall be spread and compacted in 2 or more layers where no layer shall exceed 6 inches.

3.02 COMPACTING

- a. A total of five (5) compaction tests, at locations determined by the Parks Representative, shall be performed by a testing firm and paid for by the Contractor. Additional testing may be required, if deemed necessary by the Parks Representative. All additional testing shall be performed at no additional cost to the Parks.
- b. Base material shall be watered as needed, and each layer compacted to 95 percent minimum relative compaction as determined by Test Method No. Calif 216 or ASTM D-1557.
- c. The surface of the finished base shall not vary more than 1/2-inch from the grades shown on the Construction Drawings. Any base material which does not conform to the above requirements shall be reshaped, watered, and thoroughly re-compacted to conform to specified requirements.

END OF SECTION 02230

SECTION 02270

ROCK AND SLOPE PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION

The work of this section consists of furnishing and placing rock slope protection as shown on the plans.

1.02 SUBMITTALS

Contractor shall submit rock gradation analysis to the Parks Representative for each source of rock slope protection.

PART 2 - PRODUCTS

2.01 RIPRAP

All riprap used shall be quarry rock, angular, close-grained and hard. Riprap shall be free of seams or thin layers of soft or decomposed material to the end that will not shatter, disintegrate, break down or open up on dumping or upon prolong exposure to weather and wave action.

- A. **ROCK GRADATION:** Conform to the gradation of Section 72-2, "Rock Slope Protection", of the State Standard Specifications. Slope protection class shall be per the contract drawings, and installed per Method "B" Placement.

Method "B" Placement, Percentage Larger Than								
Rock Size	Classes							
	1T	1/2T	1/4T	Light	Facing	No. 01	No. 02	No. 03
2 Ton	0-5	-	-	-	-	-		
1 Ton	50-100	0-5	-	-	-	-		
½ Ton		50-100	0-5	-	-	-		
¼ Ton	95-100	-	50-100	0-5	-	-		
200 lb	-	95-100	-	50-100	0-5	0-5		
75 lb	-	-	95-100	-	50-100	50-100	0-5	
25 lb	-	-	-	95-100	90-100	90-100	25-75	0-5
5 lb	-	-	-	-	-	-	90-100	25-75
1 lb	-	-	-	-	-	-		90-100

PART 3 - EXECUTION**3.01 PLACEMENT****a. GENERAL**

The Contractor shall sequence work to minimize the risk of damaging the new concrete boat ramp. In the event of damage, the Contractor shall remove and replace the damaged concrete panels at no additional cost to the Parks.

3.02 SPREADING

Rock slope protection fabric shall be placed prior to placing riprap as shown on the Contract Drawings and Section 02373 of the specifications. Riprap shall be placed uniformly across the planned areas as required to cover to a depth shown on the project Construction Drawings. Riprap shall extend, at a minimum, 5-feet past the toe of slope at the end of the boat ramp. Riprap shall be placed on all side slopes on the new boat ramp as shown on the project improvement plans.

b. INSPECTION

All riprap shall be placed in the presence of the Parks Representative. Any riprap misplaced and considered unacceptable by the Parks Representative shall be removed by and at the Contractor's expense prior to acceptance of the job.

3.03 MAINTENANCE

Maintain base course in a satisfactory condition until riprap is placed or until final acceptance.

END OF SECTION 02270

**SECTION 02373
 GEOTEXTILE FABRIC**

PART 1 - GENERAL

1.01 DESCRIPTION

Work includes furnishing and placing RSP fabric and concrete mat fabric.

1.02 SUBMITTALS

The Contractor shall submit:

- A. Manufacturer material specifications and product literature including certificate of compliance, test sample data representing each lot.
- B. Installation drawing showing geotextile sheet layout, location of seams, and direction of overlap.

PART 2 - PRODUCTS

2.01 ROCK SLOPE PROTECTION FABRIC

- A. Rock slope protection fabric shall be as specified in the State Standard Specifications of the State Department of Transportation, latest edition, Section 88, Article 88-1.021.
- B. RSP fabric shall be permeable, nonwoven, needle-punched geotextile, and manufactured from either polyester, polypropylene, or a combined polyester and polypropylene.
- C. When tested under the referenced ASTMs, the properties of Class 8 and Class 10 RSP fabric must have the values shown in the following table:

Property	Test	Value	
		Class 8	Class 10
Mass, oz/sq yd, min	ASTM D 5261	7.5	9.5
Grab breaking load, lb, 1-inch grip min, in each direction	ASTM D 4632	200	250
Apparent elongation, percent min, in each direction	ASTM D 4632	50	50
Permittivity, sec-1, min	ASTM D 4491	1.0	0.7
Apparent opening size, U.S. Standard sieve size: min and max	ASTM D 4751	70-100	70-100
Ultraviolet resistance, percent min retained grab breaking load, 500 hours	ASTM D 4355	70	70

PART 3 - EXECUTION

3.01 STORAGE AND HANDLING

- A. Rolls of RSP fabric shall be protected from construction equipment, chemicals, sparks and flames, ultraviolet rays, water, or any other environmental condition that may damage the physical properties of the RSP fabric.

- B. At the time of installation, the fabric shall be rejected if defects exist such as, rips, holes, deterioration, or other damage incurred during manufacturing, transportation, or storage.

3.02 SURFACE PREPARATION

- A. Prepare surface on which geotextile will be placed to a smooth condition in accordance with these specifications and the manufacturers recommendation.
- B. Surface shall be free of debris, depressions, erosion features, or vegetation. Remove irregularities to ensure continuous contact of the geotextile with the surface. Loose materials, soft, or low density pockets of material shall be removed.

3.03 INSTALLATION

- A. Place geotextile smooth and free of tension, folds, wrinkles, creases, and any combination thereof.
- B. Place geotextile with long orientation parallel to the direction of the slope.
- C. Continuously overlap geotextile panels a minimum of 18 inches at all longitudinal and transverse joints, with upstream panels overlapping downstream panels, and upper panels overlaying lower panels.
- D. Secure the geotextile to the embankment or foundation soil by pins to prevent movement prior to placement of riprap. Other appropriate means to prevent movement such as staples, sand bags, and stone may be used. Insert securing pins or staples through both strips of overlapped geotextile along the line passing through midpoints of the overlap, and 6 inches from free edges. Remove pins as riprap is placed to prevent tearing of geotextile or enlarging holes.
- E. The pin spacing shall be two feet on center maximum

END OF SECTION 02373

SECTION 02380
TURBIDITY CURTAIN**PART 1 - GENERAL****1.01 DESCRIPTION**

The work of this section includes furnishing, placing, maintaining, and removing turbidity curtains/silt barriers that totally enclose construction activities within a watercourse therefore confining sedimentation within the construction area. The Contractor shall provide a floating turbidity curtain, not silt fence, for water depths. The turbidity curtain shall be a pre-assembled system, including a heavy vinyl coated fabric skirt supported by a floatation device encased in vinyl coated fabric. Connection and securing mechanisms, anchors, ballast chains, and other necessary accessories shall be included to make the turbidity curtain operational. The Contractor shall provide a system which meets this specification, appropriate for the site conditions such as depth, current, tide, and wind or waves.

1.02 SUBMITTALS

The Contractor shall submit a sample of the barrier fabric, accompanied by certificates of compliance certifying that the turbidity screen meets the requirements of these specifications.

PART 2 - PRODUCTS**2.01 FABRIC**

18 Ounce Vinyl PVC

2.02 FLOATATION

Floatation devices shall be closed-cell polystyrene

2.02 HARDWARE

- A. All hardware such as anchors, ballast chains, connection bolts, reinforcement plates, and tension cables shall be galvanized, stainless steel, aluminum, or otherwise corrosion resistant.

Tension Cable

Tension cable shall be a 5/16-inch galvanized steel cable, sheathed in vinyl and seamed into the fabric below the floatation. The breaking strength of the tension cable shall be a minimum of 10,540 lbs. The cable shall be terminated at the end of each section and shackled to the section connectors for uniform tension load transfer.

Ballast

The ballast/tension member is a 5/16-inch galvanized steel chain enclosed in a double layer fabric pocket at the bottom of the skirt. The ballast chain enables the skirt to hang vertically in the water column. The ballast chain shall be shackled to a stainless steel stress plate at the end of each section. A hook and ring arrangement shall be provided to transfer the load from one section to the next through the stress plates.

PART 3 - EXECUTION**3.01 TRANSPORTATION, STORAGE AND HANDLING**

The turbidity screen shall be transported, stored, and handled according to the manufacturer's instruction.

3.02 INSTALLATION

The turbidity screen shall be placed according to locations as shown on the plans, details, and according to the manufacturer's published installation guidelines or as directed by the Parks

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Representative. The Contractor shall be responsible to provide and maintain sufficient anchors, tie-downs, or other mechanisms to insure proper position and performance of the turbidity curtain.

Any visible plume of cloudy water outside the protected construction area shall constitute inadequate performance of the turbidity curtain. The Contractor shall immediately modify, adjust or repair any portion of the turbidity curtain to correct inadequate performance and eliminate any sediment plume.

The turbidity curtain shall maintain continuous contact with the bottom of the watercourse throughout the entire construction area. Excess curtain shall lie without wrinkles on the ground, turned towards the construction activity to avoid interference resulting in sediment discharge to the unprotected area.

The Contractor shall maintain the turbidity curtain until the construction activity within the watercourse is completed and the turbidity is reduced to acceptable levels as approved by the Parks Representative. Maintaining shall include keeping a tight alignment around the work area or shoreline and sediment removal as necessary.

END OF SECTION 02380

**SECTION 02400
CONCRETE BLOCK MAT****PART 1 - GENERAL****1.01 DESCRIPTION**

The Contractor shall furnish all labor, materials, equipment, and incidentals required and perform all operations in connection with the installation of concrete block mats in accordance with the lines, grades, design and dimensions shown on the Contract Drawings and as specified herein.

1.02 SUBMITTAL

- A. The Contractor shall submit to the Parks Representative all manufacturers' hydraulic testing and calculations in support of the proposed concrete block mat system and geotextile.
- B. The Contractor shall furnish the manufacturer's certificates of compliance for concrete blocks/mats, revetment cable, and any revetment cable fittings and connectors as specified in this document. The Contractor shall also furnish the manufacturer's specifications, literature, shop drawings for the layout of the mats, and any recommendations, if applicable, that are specifically related to the project.

1.03 MANUFACTURER

Concrete block mat shall be Armorflex as manufactured and sold by Armortec, A Contech Company, 9025 Centre Pointe Dr., Suite 400, West Chester, OH 45269, or approved equal.

PART 2 - PRODUCTS**2.01 GENERAL**

- A. All cellular concrete mats shall be prefabricated as an assembly of concrete blocks, with specific hydraulic capacities, laced with revetment cables. Cellular concrete mats may be assembled on-site by hand-placing the individual units with the subsequent insertion of cables.
- B. Individual units in the system shall be staggered and interlocked for enhanced stability. The mats shall be constructed of closed cell units as shown on the contract drawings. Parallel strands of cable shall extend through two (2) cable ducts in each block allowing for longitudinal binding of the units within a mat. Each row of units shall be laterally offset by one-half of a block width from the adjacent row so that any given block is cabled to four other blocks (two in the row above and two in the row below).
- C. Each block shall incorporate interlocking surfaces that minimize lateral displacement of the blocks within the mats when they are lifted by the longitudinal revetment cables. The interlocking surfaces must not protrude beyond the perimeter of the blocks to such an extent that they reduce the flexibility or articulation capability of the cellular mats or become damaged or broken when the mats are lifted during shipment or placement. Once the mats are in place, the interlocking surfaces shall minimize the lateral displacement of the blocks even if the cables should become damaged or removed. The mats must be able to flex a minimum of 18 degrees between any given row or column of blocks in the uplift direction and a minimum of 45 degrees in the downward direction.
- D. The cables inserted into the mats shall form lifting loops at one end of the mat with the corresponding cable ends spliced together to form a lifting loop at the other end of the mat. The Parks Representative shall approve appropriate sleeves for use in order to splice the lifting loop. The cables shall be inserted after sufficient time has been allowed for the concrete to complete the curing process.

- E. The cellular concrete mats shall be placed on a filter fabric as specified in Section 02373. Under no circumstances shall the filter fabric be affixed (i.e. chemically bonded to the blocks) to the mattress in a manner in which would jeopardize the functionality of the filter fabric. Specifically, the filter fabric shall be independent of the block system.

2.02 CONCRETE BLOCKS

- A. Concrete blocks shall be open cell, 4.75 inches in height, 17.4 inches in length, and 15.5 inches in width.
- B. Concrete blocks shall have a compressive strength of 4,000 psi minimum

2.03 REVETMENT CABLE AND FITTINGS

- A. Revetment cable shall be constructed of preformed galvanized aircraft cable. The cables shall be made from individual wires and strands that have been formed during the manufacture into the shape they have in finished cable.
- B. Cable shall consist of a core construction comprised of seven (7) wires wrapped within seven (7) or nineteen (19) wire strands. The revetment cable shall have the following minimum physical properties:

Galvanized Cable					
Nominal Cable Dia. (in.)	Type	Approx. Ave. Strength		Weight per Length	
		(Lbs)	(kN)	(Lbs)/100ft	(kg/m)
1/4	7x7	6,100	27.1	10.6	0.16

The revetment cable shall exhibit resistance to mild concentrations of acids, alkalis, and solvents. Fittings such as sleeves and stops shall be aluminum, and the washers shall be galvanized steel. Furthermore, depending on material availability, the cable type (7x7 or 7x19) can be interchanged while always ensuring the required factor of safety for the cable.

PART 3 - EXECUTION

3.01 GENERAL

Concrete block mats shall be constructed within the specified lines and grades shown on the Contract Drawings.

3.02 PREPARATION

- A. The slope shall be graded to a smooth plane surface. All slope deformities, roots, grade stakes, and stones which project normal to the local slope face must be re-graded or removed. Crushed rock shall be placed and graded as shown in the Contract Drawings. No holes, "pockmarks", slope board teeth marks, footprints, or other voids greater than 1 inch in depth normal to the local slope face shall be permitted. The slope and slope face shall be uniformly compacted.
- B. Excavation and preparation for anchor trenches, flanking trenches, and toe trenches or aprons shall be done in accordance to the lines, grades and dimensions shown in the Contract Drawings. The width of the anchor trench hinge-point shall also be graded uniformly to assure intimate contact between all cellular concrete blocks and the underlying grade at the hinge-point.
- C. Immediately prior to placing the filter fabric and cellular concrete blocks, the prepared subgrade shall be inspected by the Parks Representative

- D. The filtration geotextile will be placed directly on the prepared area, in intimate contact with the crushed rock, and free of folds or wrinkles. The geotextile will not be walked on or disturbed when the result is a loss of intimate contact between the cellular concrete block and the geotextile or between the geotextile and the subgrade. The geotextile filter fabric will be placed so that the upstream strip of the fabric overlaps the downstream strip.

3.03 PLACEMENT

- A. The concrete blocks will be prepared subgrade in such a manner as to produce a smooth plane surface in intimate contact. No individual block within the plane of placed cellular concrete blocks will protrude more than one-half inch or as otherwise specified by the Parks Representative. Cellular concrete blocks should be flush and develop intimate contact with the subgrade section, as approved by the Parks Representative.
- B. Proposed hand placing only is to be used in limited areas, specifically identified by the Parks Representative.
- C. If assembled and placed as large mattresses, the concrete block mats will be attached to a spreader bar or other approved device to aid in the lifting and placing of the mats in their proper position by the use of a crane or other approved equipment. The equipment used should have adequate capacity to place the mats without bumping, dragging, tearing or otherwise damaging the underlying fabric. The mats will be placed side-by-side and/or end-to-end, so that the mats abut each other. Mat seams or openings between mats greater than two (2) inches will be backfilled with 4000 p.s.i. non-shrink grout, concrete or other material approved by the Parks Representative. Whether placed by hand or in large mattresses, distinct changes in grade that results in a discontinuous revetment surface in the direction of flow will require backfill at the grade change location so as to produce a continuous surface.
- D. Termination trenches and side trenches will be backfilled and compacted flush with the top of the blocks. The integrity of the trench backfill must be maintained so as to ensure a surface that is flush with the top surface of the cellular concrete blocks for its entire service life. Toe trenches will be backfilled as shown on the Contract Drawings.
- E. The cells or openings in the cellular concrete blocks will be backfilled and compacted with suitable material, as specified by the Parks Representative.

END OF SECTION 02400

SECTION 02510**ASPHALT CONCRETE PAVEMENT****PART 1 - GENERAL**

The work of this section shall consist of furnishing, spreading, placing and compacting asphalt concrete for asphalt concrete surfacing, and applying a fog seal coat, in accordance with the details shown on the plans and this specification. All work shall be in conformance with the 2010 State of California Standard Specifications in addition to these special provisions.

1.01 SUBMITTALS**A. TESTING**

1. **MIX DESIGN:** The Contractor shall submit to the Engineer a proposed mix design for each asphalt concrete mixture to be used at least two weeks prior to production of that asphalt concrete mixture. The proposed mix designs shall conform to the asphalt concrete mixture quality requirements specified in Section 39-2 of the State Standards and this specification.
2. **FIELD:** The Contractor, at their expense, shall provide an approved, independent testing laboratory to perform field testing, and collect corings onsite as the asphalt concrete is being installed. The Contractor shall submit all test results to the Parks Representative.

B. CERTIFICATES

The Contractor shall submit to the Parks Representative the manufacturer's Certificate of Compliance for asphalts, liquid asphalts and asphaltic emulsions.

PART 2 - PRODUCTS**2.01 ASPHALT CONCRETE****a. AGGREGATE**

Aggregate material shall conform to the specifications of Section 39 of the State Standard Specifications for 3/4-inch maximum aggregate (medium) or 1/2-inch maximum aggregate (medium). Where more than 2-1/2 inches of AC are required the gradation shall conform to 3/4-inch maximum aggregate (medium). Where less than 2-1/2 inches of AC are required, the gradation shall conform to 1/2-inch maximum aggregate (medium).

b. TYPE

Asphalt concrete shall be Type "B" Medium gradation. Store, proportion and mix material in accordance with the applicable provisions of the State of California, Department of Transportation, Standard Specifications, Section 39-3.

c. ASPHALT BINDER

Asphalt binder to be mixed with aggregate shall be Grade PG 70-10 conforming to the State of California, Department of Transportation, Standard Specification Section 92.

ASPHALTIC EMULSION**d. TACK COAT**

Tack coat shall be Grade SS-1 or SS-1H conforming to the State of California, Department of Transportation Standard Specification, Section 94. The rate applied shall be .02-.04 g/sy residual binder.

2.02 MIXING.

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- a. Mix asphalt concrete at central mixing plant by batch or continuous mixing. Aggregates may be proportioned by weight or by volume.
- b. Use between 5 and 8 percent of asphalt binder by weight of mineral aggregate in mixture. Exact percentage shall be as approved by the Parks to obtain optimum asphalt content.
- c. Add asphalt binder to aggregate at temperature between 275 and 375 degrees F. Maintain aggregate temperature at time of adding binder between 250 and 325 degrees F.

PART 3- EXECUTION

3.01 BASE COURSE PREPARATION

The base course shall conform to the compaction and elevation tolerance specified, be free of loose or extraneous material, and the surface shall be damp but not contain any free water prior to application of prime coat.

3.02 TACK COAT

Immediately before applying tack coat (paint binder), clean existing surfaces to be paved or to be joined to new A.C. paving, remove loose material from surface with power broom, supplemented if necessary with hand brooming or blowers. Before placing a layer of asphalt concrete on any other type of asphalt concrete or on an existing bituminous pavement, tack coat (paint binder) shall be applied in one application leaving a residual binder of from 0.02 gallon to 0.10 g/sy of surface covered. Exact rate shall be as determined by the Parks Representative.

3.03 ASPHALT CONCRETE

SPREADING AND COMPACTION

Compacted layer thickness, feet	Atmospheric, °F		Surface, °F	
	Unmodified asphalt binder	Modified asphalt binder	Unmodified asphalt binder	Modified asphalt binder
	<0.15	55	50	60
0.15-0.25	45	45	50	50

Spread and compact the asphalt concrete in conformance with the provisions of Section 39-03 and Section 39-4 of the Standard Specifications. Compaction effort shall achieve 95% of the mixture unit weight as determined per the Marshal or Hveem design methods, or 92% of the maximum theoretical unit weight of the mixture.

If the asphalt binder for HMA Type A and Type B is unmodified asphalt binder, complete:

- 1. First coverage of breakdown compaction before the surface temperature drops below 250°F.
- 2. Breakdown and intermediate compaction before the surface temperature drops below 200°F.
- 3. Finish compaction before the surface temperature drops below 150°F.

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If the asphalt binder for HMA Type A and Type B is modified asphalt binder, complete:

1. First coverage of breakdown compaction before the surface temperature drops below 240°F.
2. Breakdown and intermediate compaction before the surface temperature drops below 180°F.
3. Finish compaction before the surface temperature drops below 140°F.

a. **CONSTRUCTION JOINTS**

Longitudinal and transverse joints in asphalt concrete shall be staggered between lifts. The joint line of the lower lift shall be at least one foot from the joint line of the overlying lift (six inch offset is permitted at crowned portions of the pavement). A joint binder shall be applied to cold joints and the fresh mixture raked against the joint and thoroughly compacted. The exposed lift at a joint shall be trimmed vertical if the lift surface is not dense and uniform, degrading the quality of the complete joint, as determined by the Parks. Before placing the top layer adjacent to a cold transverse joint, such joints shall be trimmed to a vertical face and to a neat line.

Surface grades for ADA parking spaces and designated path of travels (POT) as shown on the plans shall not exceed a 2 percent slope in any direction. It is the Contractor's responsibility to verify the elevations to accomplish a grade that is less than 2 percent in any direction.

1. Skin patching may be acceptable in minor areas where grades can be obtained by minimal areas and grade differences, as determined by the Parks Representative. When skin patching is determined acceptable by the Parks Representative, the contractor must fog seal.
2. If a skin patch is not deemed acceptable a must-grind shall be completed and a plan must be submitted to the Parks Representative for approval.

3.04 **ADJUSTING FRAMES, COVERS, GRATES, VALVE BOXES AND MANHOLES**

Set manhole frames and other such frames within areas to be paved, either existing frames or new frames furnished under other Sections, to final grade hereunder.

After pavement has been constructed, necessary portions of sub-base, base, and pavement shall be neatly cut away, manholes or other structures built up, and cover frames set to grade flush with surface of adjacent pavement.

Backfill surrounding area from which pavement, base or subbase has been removed to within 2-inches of surface with Portland cement concrete.

END OF SECTION 02510

**SECTION 02528
SIDEWALKS AND CURBS****PART 1 - GENERAL****1.01 DESCRIPTION**

The work of this section shall consist of preparing subgrade, constructing forms, and placing and finishing all concrete walks, curbs and gutters as required in completing the work.

PART 2 - PRODUCTS**2.01 FORMS**

Any species wood, 2 inches nominal thickness by width equal to thickness of walks, curbs and gutters; top edge surfaced. Laminated forms may be used where necessary for curved work.

2.02 CONCRETE MIX, REINFORCEMENT, CURING COMPOUND, EXPANSION JOINT MATERIAL

As specified in Section 03310 "CAST-IN-PLACE CONCRETE".

PART 3 - EXECUTION**3.01 SUBGRADE**

- A. Construct true to grade and cross sections, thoroughly water and roll, or hand tamp until hard and solid as required by Section 02221. Remove soft, spongy or other unsuitable material to provide stable subgrade at least 6 inches below required subgrade elevation. Deposit approved fill material in low areas, compact thoroughly and grade to required finish subgrade elevation.
- B. Provide templates for testing grade and cross section of subgrade. Extend template full width between forms and support on side forms.

3.02 FORMS

Set in true alignment and parallel, top edge true to grade. Secure with sufficient wood or metal stakes and spreaders. Splice joints or otherwise stake to prevent offset.

3.03 EXPANSION JOINTS

Place at 20 feet on center unless otherwise indicated, at curb returns, where walk or curb and building adjoin and between existing and new work. Neatly trim or recess slightly below finish slab surface.

3.04 WEAKENED PLANE JOINTS

Provide when specifically indicated to depth of 1/5 to 1/4 thickness of slab unless otherwise indicated. Construct weakened plane joints a minimum possible width.

3.05 PLACING CONCRETE

- A. Remove wood sticks, chips and rubbish within forms; wet forms and subgrade before placing concrete. Carefully deposit concrete in approximate final location to avoid excessive transporting and separation of ingredients. Maintain reinforcing steel in required position. Screed, vibrate, push coarse aggregate slightly below finished surface with grid tamper, thoroughly compact concrete to finish surface.
- B. Float with wood floats and trowel smooth with steel trowels. Unless otherwise indicated, lightly brush surface of sidewalks with fine hair push broom drawn across direction of traffic. Finish edges and joints slightly round with proper edging tool; mark off surface of sidewalks into rectangles no larger on any side than width of sidewalk, unless otherwise indicated. Top of curbs and flow line of gutters shall not vary more than 1/8 inch in 10 feet, except at grade changes.

3.06 FINISHING

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Finish shall be a medium broom finish where longitudinal slopes are less than 6%, and a heavy broom finish where longitudinal slopes are greater than 6%.

3.07 CURING

- A. Spray entire surface with curing compound while surface still retains visible film of water. If visible film of water is not present after finishing process, apply water in form of a mist, not a spray. Maintain visible film of water until application of compound.
- B. Spray compound at 1 gallon per 150 square feet of area. When delayed, apply water immediately in mist form until application of compound is continued.

3.08 DAMAGE AND REPAIRS

- A. All damage done or openings cut in concrete walks, curbs, or gutters during the progress of the work shall be repaired by the Contractor to the satisfaction of the Parks Representative. Patching of damaged areas shall not be allowed. Damaged areas shall be removed and replaced to the satisfaction of the Parks Representative without additional cost to the Parks.

3.09 REMOVAL OF FORMS

- A. Immediately after removing front curb forms, trowel face of curb smooth to minimum depth of 2 inches below gutter lines, or to flow line of integral curb and gutter, and finish with steel trowel.

END OF SECTION 02528

SECTION 02600
BOARDING FLOAT**PART 1 - GENERAL**

1.01 The work described in this section includes furnishing all material, equipment, and labor necessary to manufacture at manufacturing plant, deliver, and install six (6) fully operational boarding floats having the dimension as shown on the plans.

1.02 The Contractor shall verify at site all existing conditions and dimensions relating to the work of this section. Notify the Parks Representative in writing of any discrepancies or unsuitable conditions. Commencement of work without such notification shall be construed as acceptance of all conditions.

1.02 EXPERIENCE

The Fabricator must be able to furnish adequate evidence of minimum of 5 years of ongoing successful experience in fabricating boarding float structures and show that all workmen employed in boarding float fabrication are properly experienced and skilled in the work they are called to perform.

1.03 SUBMITTALS

A. Drawings and Design Calculations for the boarding floats shall be submitted to the State for approval and shall bear the seal of a California Registered Professional Engineer (stamped drawings required since floatation and counterweights to be sized by the contractor as part of the contract). Drawings and Design Calculations shall demonstrate the floats conform to all design requirements. All work shall conform to the approved Shop Drawings. Construction details and finishing details of the boarding float shall be consistent throughout.

B. The Contractor shall make the following submittals to the Project Engineer for approval prior to purchase, fabrication, or installation:

1. Certification of Compliance for Fiberglass

- a. Resin
- b. Fiberglass

2. Cut Sheets and/or samples of:

- a. Type of cleats.
- b. Decking material.
- c. Surface coating
- d. UHMW Rub Strips
- e. HDPE Fender Board
- f. Corner Bumper

4. Floatation pontoon and floatation foam source and technical data.**5. Weight/freeboard calculations for boarding float****6. Welder Certification.****1.04 DESIGN CRITERIA**

Information presented in this Specification is based upon the Department of Boating and Waterways' Layout, Design and Construction Handbook and the best estimate of those environment and physical factors that can reasonably be expected to affect the design, performance and durability of the Boarding Float. These criteria shall be considered as minimum requirements: however, mere

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conformance to the minimum size, strengths, and design parameters given herein will not automatically ensure approval. Final calculations shall furnish proof that the Boarding Floats, using the criteria specified herein as a minimum standard, is designed to withstand the loading without damage throughout the design life of the system. The final design layout and calculations shall be prepared under the supervision of and sealed by a Professional Engineer holding a valid Certificate of Registration in the state of California and submitted for approval.

- a. Span Length and Width: Shall be to length and width shown in plans.
- b. Dead Load Only (DL): Boarding floats are to float level in the water with the following limits. 1/8" per foot over the length of an individual boarding float section, not to exceed 1" in 10" and 1" maximum over the width of the boarding float.
- c. Uniform Live Load (ULL): Uniform Live Load shall be 20 lbs / ft².
- d. Live Point Load (LPL): The boarding floats shall support a live point load of 650 lbs applied at any point on the boarding float deck not closer than 12" from the edge of the dock.
- e. Freeboard:
 1. DL Only: Shall be not less than 14" and not greater than 20" from the deck with a 4" minimum to the bottom of the HPDE fender board.
 2. DL + ULL: Shall be 10" minimum to top of deck.
 3. DL + LPL: Shall be 13" minimum to top of deck.
 4. DL + UL + LPL: Shall be 8" minimum to the top of the deck
- f. Horizontal Loads:
 1. Boarding floats shall be designed to withstand wind, wave, current and impact loadings, applied to both floats and tied up boats that may reasonably occur during the life of the structures as the result of its location and exposure.
 2. Calculations shall demonstrate dock modules will withstand 70 pound per linear foot horizontal wind load on a vessel berthed to windward side of dock.
- g. Wave:
 1. Calculations demonstrating dock modules will withstand a one (1) foot wave with a wave length equal to the length of the module and the wave direction parallel to the lengthwise axis of the dock.
- h. Deflection:
 1. The maximum deflection under the combination of dead and live loads shall equal the span divided by 360.
- i. Safety and Disability Access:
 1. Design shall conform to Regulations of California OSHA and ADA Access Requirements.

1.05 CONNECTIONS BETWEEN DOCK MODULES

Connecting hardware (hinges) and its attachments between any adjacent dock modules shall be designed to support a bending moment in the horizontal plane of 3000 foot-pounds.

PART 2 - PRODUCTS

2.01 MATERIAL: Material can be any of the following listed below.

Fiber Reinforced Plastic (FRP): Molded surface coat over polyester resin laminated reinforced with glass fiber and structural reinforcing as required. Materials used shall meet or exceed the following criteria.

- a. Surface Coat: Ultraviolet inhibited NPG-ISO polyester gel coat, 20 mils thick (acceptable variation: +/-2.5 mils), nominal.
- b. Resin: Commercial grade polyester and shall be evaluated by a laminate test or determined by previous service to be acceptable for the intended use.
- c. Reinforcing Material: Commercial grade of fiber glass (continuous strand, chopped-strand, continuous mat and/or non-continuous mat) having a coupling agent, which will provide a suitable bond between the glass reinforcement and the resin.
- d. Glass Content shall be 25 to 30 percent by weight.
- e. FRP Shell Thickness (no core) shall be 1/4 inch minimum and 3/16 inch minimum on the top layer and 3/16 inch on the bottom layer.
- f. Material Properties
 1. Flexural Strength shall be 12,000 to 17,000 psi in accordance with D790
 2. Modulus of Elasticity shall be 0.9×10^6 psi in accordance with D790.
 3. Tensile Strength shall be 7,000 to 10,000 psi accordance with D638.
 4. Compressive Strength shall be 17,000 psi in accordance with D695.
 5. Thermal Expansion Coefficient shall be 10×10^{-6} per degree Fahrenheit.

2.02 DECKING

Decking shall be fiberglass non skid. Decking shall be coated with Gel Coat or approved equal (submit product information and sample for approval).

2.03 FLOATATION

1. The buoyant units of the docks shall be polystyrene foam. The foam shall be produced by a manufacturer who has been continuously engaged in production of polystyrene foam for flotation for at least five years.
2. Tubs shall be completely filled with expanded polystyrene. The expanded polystyrene shall have a density of 0.9-1.2 lbs. per cubic foot with water absorption not to exceed three pounds per cubic foot in accordance with the Hunt Water Absorption Test. EPS contents shall conform to the ASTM C-578. Tubs shall be completely filled. The tub polystyrene shall be produced by a manufacturer who has been continuously engaged in production of polystyrene for marine flotation for at least three years.
3. Flotation material shall be distributed as widely as possible under the floats for maximum stability and to meet requirements of design criteria.
4. The tubs shall be connected to the frame of the boarding float.
5. If upon installation of the docks in the water any design criteria is not achieved, the Contractor shall repair at no extra cost to the State. Contractor shall submit repair procedures for approval in conformance to that recommended by the float manufacturer.

CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
COUNTY OF RIVERSIDE PARKS DEPARTMENT**2.04 FENDERS**

1. Fenders shall be continues without splices, 10 foot minimum length, made of HDPE, yellow in color 2" by 3-1/2" weighing the 2 pounds per linear foot and attached to the side member in a dove tail groove and fastened on 2' centers with 3/8" carriage bolt.

2.05 HINGES & MISCELLANEOUS

1. All hinges shall be 2" diameter XXS steel pipe otherwise stated herein or on the plans. All hardware such as bolts and washers shall be hot-dipped galvanized in accordance with the Cal-Trans Specification 75-1.05 Galvanizing, unless otherwise stated on the plans. All bolts shall have washers and elastic locknuts unless otherwise stated on the plans. Elastic locknuts shall be zinc plated steel, heavyweight, standard height.
2. SILENT HINGE: Shall utilize same hinge and pin make up as in 2.03 B and add Trivar Tube as an insert inside the frame attached 2" diameter schedule 80 pipe. Tivar Tube to be ET181 and will need to be machined down to the inside diameter of the 2" diameter Sch 80 hinge material.

2.06 MOORING CLEATS

1. Mooring cleats shall be installed on the dock where shown on the plans. Cleats shall be 10 inches long, ductile iron (galvanized), fastened to the deck and channel as shown on the plans with 3/8 inch thru-bolts, 2 bolts per cleat. Cleats may be obtained from the following suppliers:
 - a. Thomas Sales, 10 inches heavy ship and dock cleat Henderson Marine, #05-08N 10 inch or an approval equal.

2.07 GRAB BARS

1. Grab bars shall be hot dip galvanized steel meeting the dimensions shown on the plans. Grab bars shall be installed on the dock where shown on the plans and be mounted to the frame able to support a minimum of a 200 lb load.

PART 3 - FABRICATION**3.01 FABRICATION**

A. Connections between members shall be tight, accurate and secure.

B. Welding

- i. All aluminum welding, welding procedures, testing and inspection shall be done in accordance with the requirements of the Structural Welding Codes Aluminum ANSI-AWS D12 (latest edition). All aluminum segments shall be subject to testing according to the above specifications. The Engineer has the right to test any part of the gangway he determined necessary to insure that it meets the requirements of the plans and specifications.
- ii. All welding procedure shall be submitted to the Engineer for approval, in writing prior to use.
- iii. All initial inspection and testing required by the Engineer on aluminum element will be paid by the Contractor. The cost of welding procedure approvals and welder certification will be paid for by the welding contractors. Retesting will be paid for by the Contractor/fabricator.
- iv. Steel welding shall be performed by welders certified by the State of California as being qualified in accordance with AWS D1.1 for full penetration groove welding in all positions, using the procedures, materials, and equipment of the type required for the work. All welding shall conform to AWS D1.1 and B2.1.

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3.02 QUALITY CONTROL

The finished FRP laminate shall have a BARCOL hardness of at least 90% of the resin manufacturer's specified hardness for fully cured resin. The BARCOL hardness shall be the same for both the interior and exterior surfaces.

3.03 WARRANTY

Each fiberglass dock component shall carry a warranty stating that the fiberglass dock sold under this contract will be free from defects in material and workmanship for a period of ten (10) years from the date of purchase. All accessories shall carry a (1) year warranty from date of purchase.

3.04 INSTALLATION

1. The contractor shall be responsible for obtaining and paying for any special transportation permits.
2. The contractor shall be responsible for delivery, unloading, floating and installing the boat boarding floats.
3. The contractor shall notify the engineer at least 3 business days in advance of the delivery, the time and date of the delivery of floats from manufacturer to enable the engineer to schedule inspection at manufacturer prior to shipping floats to work site. The expected completion of floats shall be supplied to the engineer at time of shipping floats from manufacturer.

The boarding floats shall be placed in water, flotation tested and left in water ready for use and connected to the new piles or as approved by engineer and as approved by submittal.

END OF SECTION 02600

**SECTION 02700
PROJECT SIGNS****PART 1 - GENERAL****1.01 DESCRIPTION**

This Section covers the construction of the project signs as shown on the contract drawings.

1.02 SUBMITTALS

Submit 3 copies of complete manufacturer's product literature, specifications, shop drawings, and installation recommendations.

PART 2 - PRODUCTS**2.01 MATERIALS****a. Facility Sign**

The project signs shall be an Outdoor Creations, Inc., (530) 337-6774 Model 726 precast concrete sign, Universal Precast or approved equal. Color, logos, lettering, and layout shall be as detailed in the drawings. The Parks shall furnish the manufacturer with electronic image logo templates.

b. Concrete.

- i. Footing concrete: refer to Section 03310-Cast in Place Concrete.
- ii. Non-shrink grout: 8,000 psi

PART 3 - EXECUTION**3.01 WORKMANSHIP**

Coordinate with other work as required. Check all field conditions for proper and complete preparation. Commencement of installation shall constitute acceptance of responsibility for the proper and complete execution of work.

3.02 INSTALL

Install work accurately, plumb, and neat.

Footing shall cure for 72 hours minimum prior to placing the sign.

Dowel/coil rods shall not be altered

Non-shrink grout shall be placed in grout sleeves immediately prior placement of sign so that grout pockets will not have voids.

Provide grout or silicone between sign and footing to prevent water from seeping from behind the sign.

Backfill a minimum of 24 hours after installing the sign.

3.03 FINAL CLEANING

Clean all surfaces of stains, marks, or other defects of any kind, using cleaning materials recommended by product manufacturer.

END OF SECTION 02700

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DIVISION 3 - CONCRETE

SECTION 03200
REINFORCING STEEL

PART 1 - GENERAL

1.01 WORK INCLUDED

The work under this section consists of furnishing labor, materials, appliances, tools, and equipment to install reinforcing steel as indicated on the Construction Drawings and as specified herein.

1.02 RELATED WORK

Requirements for concrete are contained in Section 03310, "Cast-in-Place Concrete".

1.03 REFERENCES

American Society for Testing and Materials (ASTM)

American Concrete Institute, Building Code Requirements for Reinforced Concrete (ACI318-11)

Concrete Reinforcing Steel Institute (CRSI)

American Welding Society (AWS)

PART 2- PRODUCTS

2.01 MATERIALS

2.02 GENERAL

Reinforcing steel shall conform to ASTM A706 for #6 bars and larger; #5 and smaller reinforcing bars may conform to ASTM A706 or ASTM A615, Grade 60 except that all bars to be welded shall conform to ASTM A706. Welding electrodes for reinforcing bars shall be in accordance with ANSI/AWS D1.4. Welding of bars is not permitted except where shown on the Construction Drawings or approved by the Parks Representative.

2.03 CHAIRS, SPACERS & DOBIES

Chairs and spacers shall be galvanized and plastic-coated or plastic. Bar supports shall have radius-bearing legs. Plastic coating shall not be less than 3/32" thick, shall extend to the full reinforcing and steel cover, and shall not chip, peel, crack or deform under ordinary job conditions and temperatures.

1 If dobies are used, they shall be of the same quality (strength, density, and durability) as the cast-in-place concrete.

2 Dobies shall not have embedded wire.

2.04 TIE WIRES

Tie wire shall be black annealed, minimum 16-gauge coated for corrosion protection.

2.05 COUPLERS

Mechanical couplers shall be manufactured by Bar Splice Products, Inc., Erico/Lenton, Bar-Lock or an approved equal. Couplers shall be capable of developing 125 percent of the yield strength of the bar.

2.06 DETAILINGS AND FABRICATION

a Detailing and fabrication or reinforcing steel shall conform to ACI 315 and to Chapter 7 of ACI 318.

- b For all bars except stirrups and ties, the diameter of bend shall be in accordance with Table 7.2 of ACI 318.
- c Hooks and bends shall conform to the provision of the Building Code Requirements for Reinforced Concrete of the American Concrete Institute. Where bar bends are shown but no length is called out, provide standard hooks as a minimum.

PART 3 - EXECUTION

3.01 PREPARATION

All reinforcing steel, at the time concrete is placed, shall be free from loose rust or scale, oil, grease or any other coating which could reduce its bond strength.

3.02 INSTALLATION

- A. All reinforcing steel shall be installed as shown on the Construction Drawings, and in conformance with the referenced standards.
- B. All reinforcing steel shall be shop fabricated. All bars shall be bent cold. Any necessary bedding at site shall also be performed cold, unless otherwise permitted by the Parks.
- C. All reinforcing steel shall be accurately placed and secured against displacement, and held in place by a sufficient number of chair supports as specified. Ties at intersections shall be made with the specified black annealed wire.
- D. Reinforcing steel located above earth may rest upon precast concrete blocks ("dobies") which are of a thickness that will provide the required cover and of concrete strength and density equal to that of the concrete being cast. Ends of the wire shall be pointed toward center of pour. Ends of tie wire shall not be located in the clear area between the reinforcing steel and the outside of the concrete. All loose pieces of tie wire shall be removed from formwork.
- E. Splices and laps shall be made and located only as called for on the Construction Drawings, or as otherwise approved by the Parks. All reinforcing steel shall be continuous around corners and shall have Class B splices in accordance with ACI 318, unless otherwise noted on the Construction Drawings.
- F. No welding of reinforcing steel to embedded items shall be performed without the Parks' approval. Welding shall conform to AWS D1.4, and Section 12.14 of ACI 318.
- G. Couplers, concrete bonding adhesive and any epoxy grout shall be installed in accordance with manufacturer's installation specification.

3.03 FIELD QUALITY CONTROL

The Contractor shall notify the Parks at least 48 hours in advance of concrete placement when reinforcing is completely fixed and ready for the inspection.

END OF SECTION 03200

SECTION 03310

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 DESCRIPTION

This section covers all cast-in-place concrete work.

1.02 REFERENCES

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 615	Deformed and Plain Billet Steel Bars for Concrete Reinforcement
ASTM C 31	Marking and Curing Concrete Test Specimens in Field
ASTM C 33	Concrete Aggregates
ASTM C 39	Compressive Strengths of Cylindrical Concrete Specimens
ASTM C 94	Ready-Mix Concrete
ASTM C 143	Slump of Portland Cement Concrete
ASTM C 150	Portland Cement
ASTM C 171	Sheeting Materials for Curing Concrete
ASTM C 172	Sampling Fresh Concrete
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	Air-Entraining Admixtures for Concrete
ASTM C 309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	Chemical Admixtures for Concrete
ASTM C 618	Fly Ash and Raw or Calcined Natural Pozzolan For Use as a Mineral Admixture in Portland Cement Concrete

1.03 SUBMITTALS

CONCRETE MIX DESIGN

The proportions of the concrete materials in the mix shall be the responsibility of the Contractor. At least 21 days prior to placement of concrete, the Contractor shall submit to the Parks for approval. Mixture proportions shall include dry weights of cement, saturated surface-dry weights of fine and coarse aggregates, and quantities, type and name of admixture (if any) and quantity of water in cubic yard of concrete. Also satisfactory evidence shall be concrete of the quality specified. All material included in the mixture proportions shall be of the same type and from the same source as will be used on the project. No admixture containing chloride shall be used.

1.04 QUALITY ASSURANCE

No concrete shall be placed without approval from the Parks Representative. Approval shall be given only after passing a form and rebar inspection.

The Contractor will employ a testing agency to perform tests and submit test reports. The Contractor shall pay for such tests.

Test specimens shall be taken as per requirements of ASTM C31. The Contractor shall supply one set of four (4) standard cylinders for every 20 cubic yards of concrete placed or for each major placement during the day. One specimen shall be tested at seven (7) days, two

specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
Compressive strength tests shall be performed as per requirements of ASTM C39.

PART 2 - PRODUCTS

2.01 CONCRETE AND GROUT MATERIALS

a. CEMENT

ASTM C150, Type II

b. FLY ASH AND POZZOLAN

ASTM C618, Type N, F, or C, except that the maximum allowable loss of ignition shall be 6 percent for Type N and F.

c. AGGREGATES

Aggregates shall comply with ASTM C 33. Grading for fine aggregate shall conform to the specified grading. The coarse aggregate shall conform to grading No. 67.

d. ADMIXTURES

Admixtures to be used, when required or approved, shall comply with the appropriate specification listed below:

- i. Air-Entraining Admixture: ASTM C 260 (no chlorides)
- ii. Chemical Admixtures: ASTM C 494

e. CALCIUM NITRATE

All concrete shall contain a calcium nitrite corrosion inhibiting solution that conforms to the requirements in ASTM C 494, as follow:

- i. The calcium nitrite admixture shall be as manufactured by W.R. Grace "DCI", or approved equal.
- ii. The corrosion inhibiting solution shall contain 30% plus or minus 2% of the calcium nitrite, by weight.
- iii. The calcium nitrite admixture shall be added to the concrete at the rate of 2.5 gallons per cubic yard.
- iv. The water in the corrosion inhibiting solution shall be considered as part of the mixing water.

f. REINFORCEMENT

See Section 03200 "REINFORCING STEEL".

g. CURING MATERIALS

All curing materials shall conform to the following:

- i. Imperious sheet materials ASTM C 171.
- ii. Membrane—forming curing compound ASTM C 309, Type 1-D or Type 2.

h. WATER

Water shall be clean, and free from deleterious quantities of acids, alkalis, salts, or organic materials.

i. CONCRETE QUALITY

Provide concrete conforming to Table 1. All concrete mix designs shall be submitted and approved by the Parks Representative. Concrete mix designs shall be in accordance with the

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latest edition of ACI codes 318, 301, 211, and the latest edition of the California Building Code Section 19, Method B or C.

28-Day Compressive Strengths (PSI)	*Slump (inches)	Sacks of Cement/ Cubic Yard	Air Content (Percent)
5,000 (boat ramp) & 3,000 (sidewalk)	4	6.5 Min – 8.0 Max	5.0 +/- 1.0

* In no event shall water be added to exceed the specified slump. If higher slumps are desired, the use of super plasticizer is acceptable.

j. GROUT

Grout shall consist of sand and cement at a ratio of three parts sand to one part cement by weight. Maximum slump shall be 2 inches.

PART 3- EXECUTION

3.01 PRODUCTION OF CONCRETE

Concrete shall be ready-mixed and shall conform to ASTM C 94 except as otherwise specified.

3.02 PREPARATION FOR PLACING

Framework shall be complete and mortar tight. Temporary access ramps and walkways, as necessary, shall be constructed to allow safe and expeditious access for concrete placement and workmen. Standing water, loose particles, debris and foreign matter shall be removed. Reinforcement shall be secured in place; joints, anchors and other embedded items shall be positioned. All equipment needed to place and consolidate the concrete shall be at the placement site and in good operating condition. Spare vibrators shall be available. The entire preparation shall be accepted by the Parks Representative prior to placing. Hot and cold weather concrete placement shall be per ACI 305 and 306.

3.03 PLACING

Concrete placement will not be permitted when weather conditions prevent proper placement and consolidation. Concrete shall be conveyed from the mixer to the forms as rapidly as practicable, by methods which prevent segregation or loss of ingredients. Concrete shall be placed within 15 minutes after discharge from the mixer. Concrete shall be carried close as possible to its final position in the forms. The placement shall be carried on at such a rate that the formation of cold joints will be prevented. Each layer of concrete (18 inches maximum thickness) shall be consolidated by internal vibrating equipment. Vibration shall be systematically accomplished by inserting the vibrator through the fresh concrete into the layer below at a uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator and overlay the adjacent, just vibrated area by a few inches. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the layer below if such exists. It shall be held stationary until the concrete is consolidated (normally 4 to 6 seconds but some mixes may require more time) and then withdrawn slowly.

3.04 FINISHING

Beginning no more than 24 hours after form removal, all fines and loose materials shall be removed and surface defects including tie holes shall be filled. All honeycomb and other defects shall be repaired. All unsound concrete shall be removed from areas to be repaired. Surface defects greater than 1/2 inch in diameter and holes left by removal of tie rods in all surfaces not to receive additional concrete shall be dampened, brush-coated with a neat cement grout and filled with grout or concrete.

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The cement used in grout or concrete for repairs to all surfaces permanently exposed to view shall be such that the final color when cured will be the same as adjacent concrete.

3.05 CURING AND PROTECTION

Beginning immediately after placement, and continuing for at least 7 days, all concrete shall be cured and protected from premature drying, extremes in temperature, rapid temperature change, freezing, mechanical damage and exposure to rain or flowing water. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to start of concrete placement. Preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days. If the forms are removed prior to concrete placement, preservation of moisture for concrete surfaces not in contact with forms shall be accomplished by one of the following methods:

Application of absorptive mats or fabrics kept continuous wet.

Application of imperious sheet materials.

Application of membrane forming curing compound, applied in accordance with manufacturer's instructions.

The preservation of moisture for concrete surfaces placed against wooden forms shall be accomplished by keeping the forms continuously wet for 7 days. If the forms are removed prior 7 days other curing methods shall be used for the balance of the 7 day period.

3.06 CONSTRUCTION / EXPANSION JOINTS

Place at 40±10 feet on center unless otherwise indicated, at curb returns, changes in direction, where walk or curb and building adjoin and between existing and new work. Neatly trim or recess slightly below finish slab surface. If proposed concrete is adjacent to existing, contractor shall match the expansion joints with the existing. If distances do not meet the spacing requirements listed above, the Parks Representative should give direction on joint spacing prior to concrete placement.

3.07 CONTRACTION JOINTS

Provide when specifically indicated to a depth of 1/5 to 1/4 the thickness of the slab, unless otherwise indicated. Construct weekend plane joints at a minimum possible width.

3.08 PUSH-SLAB CONCRETE

Push-slab shall cure in place until concrete breaks show that concrete reaches a minimum compressive strength of 4,000 psi. Contractor shall follow the appropriate methods of push slab as shown on the plans.

PART 4 - TEST PANEL

The contractor shall construct a 4 foot by 8 foot concrete test panel with V-groove finish. Prior to pouring of concrete push slab boat ramp or cast in place boat ramp, test panel must be approved and accepted by the Parks Representative. The test panel shall serve as a minimum standard of V-groove finish of boat ramp. Any section of push ramp or cast in place ramp not meeting minimum standard set by test panel will be rejected and replaced at contractor's expense. Test panel is to remain in place and undamaged until concrete boat ramps are completed and accepted by Parks Representative.

END OF SECTION 03310

SECTION 03400
CELLULAR CONCRETE MAT**PART 1 - GENERAL****1.01 DESCRIPTION**

This section covers product data and installation procedures for cellular concrete mats.

1.02 SCOPE OF WORK

The Contractor shall furnish all labor, materials, equipment, and incidentals required and perform all operations in connection with the installation of cellular concrete erosion control mats in accordance with the lines, grades, design and dimensions shown on the Contract Drawings and as specified herein.

1.03 SUBMITTALS

The Contractor shall submit to the Parks Representative all manufacturer's performance research results and calculations in support of the cellular concrete mat system, filter fabric and geogrid proposed for use as mentioned in these specifications.

Alternative materials may be considered. Such materials must be pre-approved in writing by the Parks Representative prior to bid date. Alternative material packages must be submitted to the Parks Representative a minimum of fifteen (15) days prior to bid date. Submittal packages must include, as a minimum, the following:

- Full-scale laboratory testing performed by the submitting manufacturer and associated engineered calculations quantifying the hydraulic capacity of the proposed cellular concrete mat system in similar conditions to the specific project.
- A list of 5 comparable projects, in terms of size and applications, in the United States, where the results of the specific alternate revetment system use can be verified after a minimum of five (5) years of service life.

PART 2 - PRODUCTS**2.01 GENERAL**

All cellular concrete mats shall be Armorflex® Class 50 open cell block as shown on the contract drawing, or approved equal.

All cellular concrete mats shall be pre-manufactured as an assembly of concrete blocks, with specific hydraulic capacities, bound into mats by the use of revetment cables. Cellular concrete mats may be assembled on-site by hand-placing individual blocks with subsequent insertion of cables.

Individual blocks in the cellular mats shall be staggered and interlocked for enhanced stability. The open cell version of the block has two (2) vertical openings of rectangular cross section with sufficient wall thickness to resist breakage during shipping and installation. The mats shall be constructed of open cell blocks as shown on the contract drawings. Parallel strands of cable shall extend through two (2) ducts in each block in a manner which provides for longitudinal binding of the blocks within the mats. Each row of blocks shall be laterally offset by one-half block width from the adjacent row so that any given block is cabled to four other blocks (two in the row above and two in the row below).

The gross area of each individual block in direct contact with the protected subgrade shall be no less than one square foot. Each block shall incorporate interlocking surfaces that prevent lateral displacement of the blocks within the mats when they are lifted by the longitudinal revetment cables. The interlocking surfaces must not protrude beyond the perimeter of the blocks to such an extent that they reduce the flexibility or articulation capability of the cellular mats or become damaged or broken when the mats are lifted during shipment or placement. Once the mats are in place, the interlocking surfaces shall prevent the lateral displacement of the blocks even if the cables should become

damaged or removed. The mats must be able to flex a minimum of 20 degrees between any given row or column of blocks in the uplift direction and a minimum of 45 degrees in the downward direction.

The cables shall be inserted into the mats in such a manner to form lifting loops at one end of the mat with the corresponding cable ends spliced together to form a lifting loop at the other end of the mat with sleeves approved by the Engineer.

The cellular concrete mats shall be placed on a filter fabric as specified herein. Under no circumstances shall the filter fabric be affixed (i.e. chemically bonded to the blocks) to the mattress in a manner in which would jeopardize the functionality of the filter fabric. Specifically, the filter fabric shall be independent of the block system.

Certification (Waves): All cellular concrete mats will only be accepted when accompanied by documented hydraulic performance characteristics, derived from tests under controlled wave conditions. Tests must have been conducted and monitored by an institution, public or private, which is experienced in performing wave attack studies on cellular concrete mats or similar hard-armor erosion protection products. The testing institution must have performed a minimum of three (3) such wave studies on hard-armor erosion protection systems.

2.02 CELLULAR CONCRETE BLOCK

A. SCOPE

This specification covers concrete blocks for erosion control mats used in revetments for soil stabilization.

B. MATERIALS

1. Cementitious Materials - Materials shall conform to the following applicable ASTM specifications:

- Portland Cements - Specification C 150, for Portland Cement.
- Blended Cements - Specification C 595, for Blended Hydraulic Cements.
- Hydrated Lime Types - Specification C 207, for Hydrated Lime Types.
- Pozzolans - Specification C 618, for Fly Ash and Raw or Calcined Natural Pozzolans for use in Portland Cement Concrete.

2. Aggregates shall conform to the following ASTM specifications, except that grading requirements shall not necessarily apply:

- Normal Weight - Specification C 33, for Concrete Aggregates.

C. PHYSICAL REQUIREMENTS

3. At the time of delivery to the work site, the units shall conform to the physical requirements prescribed in Table 1 below.

TABLE 1

Compressive Strength Net Area Min. p.s.i (mPa)		Water Absorption Max. lb/ft ³ (kg/m ³)	
Avg. of 3 units	Individual Unit	Avg. of 3 units	Individual Unit
4,000 (27.6)	3,500 (24.1)	10 (160)	12 (192)

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4. **DURABILITY** - The manufacturer shall satisfy the purchaser by proven field performance that the concrete units have adequate durability even if they are to be subjected to a freeze-thaw environment.
5. Sample and test units in accordance with ASTM Methods C 140, Sampling and Testing Concrete Masonry Units. All compressive strengths shall be tested by an approved independent laboratory.

D. VISUAL INSPECTION

- 3 All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Surface cracks incidental to the usual methods of manufacture, or surface chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.
- 4 Cracks exceeding 0.25 inches (.635 cm) in width and/or 1.0 inch (2.54 cm) in depth shall be deemed grounds for rejection.
- 5 Chipping resulting in a weight loss exceeding 10% of the average weight of the blocks shall be deemed grounds for rejection.

D. SAMPLING AND TESTING

The purchaser or his authorized representative shall be accorded proper access to facilities to inspect and sample the units at the place of manufacture from lots ready for delivery.

2.03 REVETMENT CABLE AND FITTINGS

a. STAINLESS STEEL REVETMENT CABLE AND FITTINGS

Revetment cable shall be constructed of preformed stainless steel cable. The cables shall be made from individual wires and strands that have been formed during the manufacture into the shape they have in finished cable.

Cable shall consist of a core construction comprised of six (6) or seven (7) wires wrapped within seven (7) or nineteen (19) wire strands. The revetment cable shall have the following physical properties:

Galvanized Cable					
Nominal Cable Dia. (in.)	Type	Approx. Ave. Strength		Weight per Length	
		(Lbs)	(kN)	(Lbs)/100ft	(kg/m)
1/8	7x7	1,700	7.5	2.8	0.04
3/16	7x7	3,700	16.4	6.2	0.09
1/4	7x7	6,100	27.1	10.6	0.16
5/16	7x19	9,800	43.6	17.3	0.26
3/8	7x19	14,400	64.1	24.3	0.36

The revetment cable shall exhibit good resistance to mild concentrations of acids, alkalis, and solvents. Fittings such as sleeves and stops shall be stainless steel.

Selection of cable and fittings shall be made in a manner that insures a safe design factor for mats being lifted from both ends, thereby forming a catenary. Consideration shall be taken for the

bending of the cables around hooks or pins during lifting. Revetment cable splicing fittings shall be selected so that the resultant splice shall provide a minimum of 75% of the minimum rated cable strength.

2. ANCHORS

Anchoring of the Cellular Concrete Mat shall be done with 2 sack concrete slurry and/or native backfill as shown on the plans.

3. GEOGRID

Geogrid shall be Tensar® BX1200 Biaxial Geogrid or approved equal. Geogrid shall be of such grades of polypropylene or copolymers that resist high, short-term dynamic loads or moderate loads over longer time periods and have the properties contained in Table 3.

TABLE 3 - BX1200			
Index Properties	Units	MD Values	XMD Values
Aperture Dimensions	mm (in)	25 (1.0)	33 (1.3)
Minimum Rib Thickness	mm (in)	1.27 (0.05)	1.27 (0.05)
Tensile Strength @ 2% Strain	kN/m (lb/ft)	6.0 (410)	9.0 (620)
Tensile Strength @ 5% Strain	kN/m (lb/ft)	11.8 (810)	19.6 (1,340)
Ultimate tensile Strength	kN/m (lb/ft)	19.2 (1,310)	28.8 (1,970)
Structural Integrity			
Junction Efficiency	%	93	
Flexural Stiffness	Mg-cm	750,000	
Aperture Stability	m-N/deg	0.65	
Durability			
Resistance to Installation Damage	%SC/%SW/ %GP	95 /93 / 90	
Resistance to Long term Degradation	%	100	
Resistance to UV Degradation	%	100	

The biaxial geogrid shall be delivered to the jobsite in roll form individually identified and nominally measuring 9.8 feet to 13.1 feet in width and 164 feet in length.

4. FILTER FABRIC

The geotextile filter shall meet the minimum physical requirements listed in Table No. 4 of these Specifications. Consultation with the manufacturer is recommended.

The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic, if necessary, to make the filaments resistant to deterioration due to ultraviolet and heat exposure. The edges of the geotextiles shall be finished to prevent the outer fiber from pulling away from the geotextiles.

The Contractor shall furnish the Parks Representative, in duplicate, manufacturer's certified test results showing actual test values obtained when the physical properties are tested for compliance with the specifications.

During all periods of shipment and storage, the filter fabric shall be protected from direct sunlight, ultraviolet rays and temperatures greater than 140 degrees Fahrenheit. To the extent possible, the fabric shall be maintained wrapped in its protective covering.

TABLE 4. PHYSICAL REQUIREMENTS		
Physical Property	Test Procedure	Minimum Value
Grab Tensile Strength (Non-aged Geotextile)	ASTM D4632	200 Lbs. (in any principal direction)
Breaking Elongation (Non-aged Geotextile)	ASTM D4632	50% max. (in any principal direction)
Burst Strength	ASTM D3786	400 psi
Puncture Strength	ASTM D4833	115 lbs.
A.O.S., U.S. Std. Sieve	ASTM D4751	see Design Manual
% Open Area	CWO-22125-86	See Design Manual
Permittivity	ASTM D4491	See Design Manual

At the time of installation, the filter fabric shall be rejected if it has been removed from its protective cover for over 72 hours or has defects, tears, punctures, flow deterioration, or damage incurred during manufacture, transportation or storage. With the acceptance of the Parks Representative, a torn or punctured section of fabric shall be repaired by placing a filter fabric patch over the damaged area prior to placing the mats. The patch shall be large enough to overlap a minimum of three (3) feet in all directions.

5. SIZE OF CELLULAR CONCRETE MATS

The cellular concrete blocks, cables and fittings shall be fabricated into mats to the width and length which is shown on the plans.

In the event pre-assembled panels of fabric are required, the panels of filter fabric shall be sewn together at the manufacturer or another approved location.

Part 3 - EXECUTION**3.01 FOUNDATION PREPARATION**

Areas where filter fabric and cellular concrete blocks are to be placed shall be constructed to the lines and grades shown on the Contract Drawings and to the tolerances specified in the Contract Documents, and approved by the Parks Representative.

a. GRADING

The slope shall be graded to a smooth plane surface to ensure that intimate contact is achieved between the slope face and the geotextile (filter fabric), and between the geotextile and the entire bottom surface of the cellular concrete blocks. All slope deformities, roots, grade stakes, and stones which project normal to the local slope face must be re-graded or removed. No holes, "pockmarks", slope board teeth marks, footprints, or other voids greater than 1.0 inch in depth normal to the local slope face shall be permitted. No grooves or depressions greater than 0.5 inches in depth normal to the local slope face with a dimension exceeding 1.0 foot in any direction shall be permitted. Where such areas are evident, they shall be brought to grade by placing compacted homogeneous material. The slope and slope face shall be uniformly compacted, and the depth of layers, homogeneity of the soil, as well as amount of compaction shall be as required by the Parks Representative.

Excavation and preparation for anchor trenches, side trenches, and toe trenches or aprons shall be done in accordance to the lines, grades and dimensions shown in the Contract Drawings. The anchor trench hinge-point at the top of the slope shall be uniformly graded so that no dips or bumps greater than 0.5 inches over or under the local grade occur. The width of the anchor trench hinge-point shall also be graded uniformly to assure intimate contact between all cellular concrete blocks and the underlying grade at the hinge-point.

b. INSPECTION

Immediately prior to placing the filter fabric and cellular concrete blocks, the prepared area shall be inspected by the Parks Representative, and by the manufacturer's representative. No fabric or blocks shall be placed thereon until that area has been approved by each of these parties.

3.02 PLACEMENT OF GEOTEXTILE FABRIC**GENERAL**

Filter Fabric, or filtration geotextile, as specified elsewhere, shall be placed within the limits shown on the Contract Drawings.

PLACEMENT

The filtration geotextile shall be placed directly on the prepared area, in intimate contact with the subgrade, and free of folds or wrinkles. The geotextile shall not be walked on or disturbed when the result is a loss of intimate contact between the cellular concrete block and the geotextile or between the geotextile and the subgrade. The geotextile filter fabric shall be placed so that the upstream strip of fabric overlaps the downstream strip. The longitudinal and transverse joints shall be overlapped at least two (2') feet. The geotextile shall extend at least one (1') foot beyond the top and bottom revetment termination points. If cellular concrete blocks are assembled and placed as large mattresses, the top lap edge of the geotextile should not occur in the same location as a space between cellular concrete mats unless the space is concrete filled.

3.03 PLACEMENT OF GEOGRID**GENERAL**

The geogrid shall be laid at the proper elevations and alignment as shown on the contract drawings

The geogrid shall be installed in accordance with the installation guidelines provided by the manufacturer or as directed by the Parks Representative

The geogrid may be temporarily secured in place with ties, staples, pins, sandbags or backfill as required by fill properties, fill placement procedures or weather conditions or as directed by the Parks Representative.

PLACEMENT

Granular fill material shall be placed in lifts and compacted to 95% relative compaction as directed in Section 02221. Granular fill material shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in the geogrid and/or movement of the geogrid.

A minimum loose fill thickness of 6-inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid. When underlying substrate is trafficable with minimal rutting, rubber-tired equipment may pass over the geogrid reinforcement at slow speeds (less than 5 mph). Sudden braking and sharp turning movements shall be avoided.

3.04 PLACEMENT OF CELLULAR CONCRETE BLOCKS/MATS

GENERAL

Cellular concrete block/mats, as specified in Section 2.01 of these Specifications, shall be constructed within the specified lines and grades shown on the Contract Drawings.

PLACEMENT

The cellular concrete blocks shall be placed on a minimum of 4-inch thick granular drainage layer consisting of 2 to 2.5-inch angular crushed rock followed by site-specific filter fabric in such a manner as to produce a smooth plane surface in intimate contact with the concrete unit. No individual block within the plane of placed cellular concrete blocks shall protrude more than one-half inch or as otherwise specified by the Engineer. To ensure that the cellular concrete blocks are flush and develop intimate contact with the subgrade, the blocks shall be "seated" with a roller or other means as approved by the Engineer.

If assembled and placed as large mattresses, the cellular concrete mats shall be attached to a spreader bar or other approved device to aid in the lifting and placing of the mats in their proper position by the use of a crane or other approved equipment. The equipment used should have adequate capacity to place the mats without bumping, dragging, tearing or otherwise damaging the underlying fabric. The mats shall be placed side by side and/or end to end, so that the mats abut each other. Mat seams or openings between mats greater than two (2) inches shall be filled with grout. Whether placed by hand or in large mattresses, distinct changes in grade that results in a discontinuous revetment surface in the direction of flow shall require a grout seam at the grade change location so as to produce a continuous surface.

Anchor trenches and side trenches shall be backfilled and compacted flush with the top of the blocks. The integrity of a soil trench backfill must be maintained so as to ensure a surface that is flush with the top surface of the cellular concrete blocks for its entire service life. Toe trenches shall be backfilled as shown on the Contract Drawings. Backfilling and compaction of trenches shall be completed in a timely fashion. No more than 500 lineal feet of placed cellular concrete blocks with non-completed anchor and/or toe trenches shall be permitted at any time.

FINISHING

The cells or openings in the cellular concrete blocks shall be backfilled and compacted immediately with suitable material to assure that there are not voids and so that compacted material extends from the filter fabric to one-inch above the surface of the cellular concrete

CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
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block. Backfilling and compaction shall be completed in a timely manner such that no more than 500 feet of exposed mats exist at any time.

3.05 INSPECTION

The Contractor shall inform the Parks Representative a minimum of 72 hours in advance prior to placement of the cellular concrete mats, and provide a detailed timeline for the entire installation process.

The Parks Representative may randomly inspect the installation at any time.

Any damaged or defective materials found prior to project acceptance shall be replaced by the Contractor, at no additional cost to the State.

3.06 PAYMENT

Payment for costs incurred under this section shall be at the contract price for: "CELLULAR CONCRETE MAT"

END OF SECTION 03400

DIVISION 5 – STORM WATER MANAGEMENT**SECTION 05000****STORM WATER BEST MANAGEMENT PRACTICES****PART 1 - GENERAL****1.01 DESCRIPTION**

This section describes the types of Construction Activity Best Management Practices (BMP) to be implemented by the Contractor at the project site to reduce or eliminate sediment and other pollutants in storm water and non-storm water discharges during all phases of construction.

PART 2 - PRODUCTS**2.01 FACILITIES AND EQUIPMENT**

The Contractor shall provide all necessary facilities and equipment for the selection, installation, inspection, maintenance, repair, and removal of any construction related storm water BMP implemented at the site.

PART 3 - EXECUTION**3.01 GENERAL REQUIREMENTS**

- A. The Contractor, in consultation with the Parks Representative will select BMP's based on existing and anticipated site conditions.
- B. The Contractor will be responsible for providing the necessary equipment and materials to install, inspect and maintain selected BMP's, as described in this section and related Specifications.
- C. The Contractor will be responsible for ensuring the selected BMP equipment and materials are available and onsite with sufficient time to be installed prior to their required installation dates per the Contractor-developed BMP Selection and Implementation Schedule.
- D. The Contractor shall be responsible for ensuring the installation, inspection, maintenance and repair, and removal (if required) of any selected construction related BMP is done by qualified personnel. All temporary BMP's must be removed after the project has been accepted by the Parks Representative unless directed otherwise by the Parks Representative. After removal of temporary BMP's the Contractor shall restore the area to its original condition.
- E. The selection, installation, maintenance and repair of any construction related BMP shall, at the minimum, be in accordance with the following control documents:
 - 1. Caltrans Storm water Quality Handbook: Construction Site BMPs Manual, latest edition
 - 2. Caltrans Storm water Quality Handbook: Construction Contractor's Guide and Specifications, latest edition
- F. The Contractor shall ensure that water conservation measures are implemented in accordance with Caltrans BMP# NS-1: Water Conservation Practices and Caltrans BMP# NS-7: Potable Water/Irrigation. At no time shall the use of water during construction create or contribute to an unapproved non-storm water discharge from the site.
- G. The Contractor shall ensure, to the extent practical, that clear water and run-on from offsite sources is directed around the construction site. Where it is not practical to divert run-on and/or concentrated flows around the construction site, the Contractor shall direct run-on

**CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
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and concentrated flows through the construction site in a non-erodible fashion. The diversion of run-on/concentrated flows shall be in accordance with Caltrans BMP# NS-5: Clear Water Diversion, and the following concentrated flow conveyance controls:

1. Caltrans BMP# SS-9: Earth Dikes/Drainage Swales and Lined Ditches
 2. Caltrans BMP# SS-10: Outlet Protection/Velocity Dissipation Devices
 3. Caltrans BMP# SS-11: Slope Drains
- H. Contractor is responsible to install and maintain BMP's until a Notice of Completion is issued by the Parks Representative.
- I. Erosion control devices using monofilament netting will not be permitted anywhere on site.

3.02 EROSION AND SOIL STABILIZATION CONTROLS

A. The Contractor shall prepare a Construction Activity Schedule that addresses the conditions described in Caltrans BMP # SS-01: Scheduling. The Schedule shall be provided to the Parks Representative upon award of Contract and prior to any construction related activity occurring at the site. The Schedule shall, at the minimum, accomplish the following conditions to the extent practical:

1. Minimize the length of time that soils are left exposed.
 - a. The Contractor shall ensure that protective erosion control measures, as described in this section, or equivalent BMP's, be implemented for any disturbed area that will remain exposed for more than 14 days.
 - b. All disturbed areas must be stabilized at least 48 hours prior to storm events utilizing the appropriate BMP's described in this section, or an equivalent BMP.

Reduce the total area of exposed soils during the raining season. Soil stabilization improvements shall be performed within 14 days after final grade is achieved or all other construction activity on that feature/region is inactive.

At all times protect critical areas, including but not limited to drainage channels, creeks, natural water courses and sensitive natural resources (i.e., wetlands).

- B. The Contractor shall ensure that existing vegetation is preserved, and preservation measures are inspected and maintained, in accordance with Caltrans BMP # SS-2: Preservation of Existing Vegetation.
- C. Soil stabilization BMP's shall be limited to the following, unless the Contractor can recommend alternative BMP's that are deemed as effective by the Engineer:
1. Hydraulic Mulch in accordance with Caltrans BMP# SS-3: Hydraulic Mulch.
 2. Hydroseeding shall be performed in accordance with Caltrans BMP# SS-4: Hydroseeding;
 3. Tackifiers/Soil Binders in accordance with Caltrans BMP# SS-5: Soil Binders, provides supporting information.
 4. Straw Mulch in accordance with Caltrans BMP# SS-6: Straw Mulch provides supporting information.
 5. Erosion control blankets and mats in accordance with Caltrans BMP# SS-7: Geotextiles, Plastic Covers and Erosion Control Blankets and Mats provides supporting information.

3.03 SEDIMENT CONTROL BMP'S

CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
COUNTY OF RIVERSIDE PARKS DEPARTMENT

- A. Sediment control BMP's shall only be used in conjunction with erosion control BMP's. The use of sediment control BMP's in the absence of erosion control BMP's is not considered Best Conventional Pollutant Control Technologies (BCT) / Best Available Technologies Economically Achievable (BAT) and will not satisfy the compliance requirements of the Clean Water Act (i.e., the General Permit).
- B. Sediment control BMP's shall be limited to the following, unless the Contractor can recommend alternative BMP's that are deemed as effective by Parks Representative:
 1. Silt Fence in accordance with Caltrans BMP# SC-1: Silt Fence.
 2. Fiber Rolls in accordance with Caltrans BMP# SC-5: Fiber Rolls.
- C. The use of sandbags and gravel bags are not approved due to the potential to add pollutants to stormwater discharges. Straw bales are discouraged due to the extensive effort to properly install and maintain straw bales as an effective sediment control BMP.
- D. The Contractor shall provide for control of offsite discharge of sediments from wind and wind erosion. The use of soil binders or water as a wind erosion BMP shall be in accordance with this specification Section A, Article 6 and/or Section B, Article 3 (c).
- E. The Contractor shall stabilize construction entrances and exits in accordance with Caltrans BMP# TC-1: Stabilized Construction Entrance/Exit.
- F. The Contractor shall stabilize construction roadways in accordance with Caltrans BMP# TC-2 : Stabilized Construction Roadway.

3.07 EQUIPMENT RELATED POLLUTANT BMP'S

3.07.1.1.1 Should the Contractor elect to conduct the following activities onsite at any time, the Contractor shall comply with the following BMP's:

1. Equipment and vehicle cleaning shall be done in accordance with Caltrans BMP# NS-8: Vehicle and Equipment Cleaning.
2. Fueling activities shall be done in accordance with Caltrans BMP# NS-9: Vehicle and Equipment Fueling. It is recommended that fuel trucks and equipment be equipped with "Cam-Loc" air tight vapor and liquid recovery systems to minimize fuel spills and releases.
3. At no time shall open containers of equipment fluids be left uncovered and unsecured. Secondary containment shall be provided for all chemical and waste containers. Stacking of open or closed equipment fluid containers on top of other fluid containers on secondary containment pallets is prohibited.

3.07.1.1.2 Equipment maintenance should be conducted as described below:

Prevent or reduce the discharge of pollutants from vehicle and equipment maintenance by running a "dry site". This involves using off-site facilities, performing work in designated areas only, providing cover for materials stored outside, checking for leaks and spills, containing and cleaning up spills immediately, and training employees and subcontractors.

Keep vehicles and equipment clean; don't allow excessive build-up of oil and grease.

Use off-site repair shops as much as possible. Maintaining vehicles and equipment outdoors or in areas where vehicle or equipment fluids may spill or leak onto the ground can pollute storm water. If you maintain a large number of vehicles or pieces of equipment, consider using an off-site repair shop. These businesses are better equipped to handle vehicle fluids and spills properly.

CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
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If maintenance must occur on-site, use designated service areas located a minimum of 300 feet away from drainage courses. Surface drainage shall be diverted away/around service and staging areas to prevent the run-on of storm water and the runoff of spills.

Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.

Place a stockpile of spill cleanup materials where it will be readily accessible.

Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.

Regularly inspect on-site vehicles and equipment for leaks, and repair immediately.

Do not allow leaking vehicles or equipment on-site. If fluid spills or leaking vehicles are detected, take immediate measures to stop the leak and/or properly clean the spill.

Repair and maintenance activity shall not take place during wet weather conditions or within 24 hours of a predicted rain event.

Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic, and transmission fluids.

Train employees and subcontractors in proper maintenance and spill cleanup procedures.

END OF SECTION 05000

CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
 COUNTY OF RIVERSIDE PARKS DEPARTMENT
 DIVISION 10 – MISCELLANEOUS MATERIALS

SECTION 10300

PILES

PART 1 - GENERAL

1.01. DESCRIPTION

- A. The work described herein consists of furnishing all materials, equipment and labor necessary to install new concrete and steel piles, as shown on the plans, as specified in these specifications and special provisions.
- B. The pile driving contractor shall have a minimum of 4 years of experience driving piles. An experience record shall be submitted to the Parks Representative for review and approval before an award is made.

1.02. SUBMITTAL

- A. The Contractor shall submit 3 copies of manufacturer's specifications. Submittals to include: detail drawings, Pile Design info (effective pre-stress), Concrete mix design, and a copy of the fabricators' license.
- B. The Contractor shall submit a pile driving plan including driving equipment, location of equipment while driving and any materials and requirements outlined in the permits for driving piles.

PART 2 – PRODUCTS

2.01. PILES

- A. STEEL PILES: All pipe piles as indicated on the drawings shall be electric-fusion steel pipe conforming to the requirements of the latest issue of the ASTM A252, Grade 2, Welded and Seamless Steel Pipe Piles. Piles shall be hot dipped galvanized. No rejected, substandard, or used pipe shall be used for the project.
 - i. All pipe piles as indicated on the drawings shall be extra strong 12" diameter galvanized pipe with a wall thickness not less than 1/4 (0.250) inch. Pipe piles shall be open.
 - ii. Splices in the field will need to be full penetration welds or have supporting PE calculations. At splices, pipes to have bevel cuts
- B. CONCRETE PILES: Piles shall be provided by a manufacturer with at least five (5) years experience with pre-stressed concrete piles prior to start of production. Piles shall be pre-stressed and meet all marine pile guidelines for concrete piles. Piles shall delivered to the site via conventional methods.
 - i. Pile Size: 12" round
 - ii. Area: 104 in²
 - iii. Effective Pre-stress: 600 psi
 - iv. Axial Working Capacity: 355 kips

2.02. PILE CAPS

- A. Floating Pier guide piles shall be provided with cone shaped piling caps; White caps for 12" diameter piles - high gloss, fiberglass, 1/8" minimum wall thickness with gel-cote finish, Henderson Marine, Richmond CA (510) 235-2050, (213) 977-0332; a durable, UV- resistant TPR synthetic rubber with an estimated life in excess of 7 years, Follansbee Dock Systems #PCCSW-type Cap, Color White, Wt. 1 pound each Follansbee WV, 1-800-223-3444, or approved equal.

2.03. CONCRETE

Four (4) sack concrete (min) should be used to fill the four 12" pipe piles after the pile is in its final place.

2.04. PILE ELEVATION

Piles tip and bottom elevations are shown on the plans.

2.05. MARKINGS

Mark piling with lines of high visibility removable paint or ink at one-foot intervals from bottom to top. Number every five feet. Markings to be visible to the naked eye at a distance of 100 feet.

2.06. DRIVING EQUIPMENT

- A. Use equipment that is generally used in standard piling driving practice according to permits. Driving hammers shall be vibratory or other low-impact pile driving methods, and of such size to consistently deliver effective dynamic energy suitable to drive piles to their tip elevations. Operate at manufacturers recommended speeds and pressures. Used fixed leads or other suitable means for holding pile firmly in position and in axial alignment with hammer. Take special precautions to ensure against buckling or leaning away from plumb or true position. Use suitable anvils or cushions depending on the type of pile to prevent damage to pile. Care should be taken during driving to prevent and correct any tendency of piles to deviate or walk.
- B. Piles materially out of line or damaged will be rejected. Rejected piles shall be removed at the contractor's expense.

PART 3 – EXECUTION**3.01 PILE DRIVING**

- A. All piles shall be installed to their design location, alignment and specified tip (bottom) depth and top (finish) elevation. The piles design is for tension/compression and bending loads and full-length installation of the piles to their specified tip elevation is required.
- B. Notify the inspector minimum of 3 business days prior to the start of pile driving operations. Drive piles to design tip elevations without driving interruptions. All piles to be driven in the presence of the inspector.
- C. Any obstruction shall be reported to the inspector. The inspector will determine whether the Contractor shall do any of the following options: (a) Remove the obstruction and drive the pile; (b) Leave the obstruction and relocate the pile; or (c) Leave the obstruction and drive the piles through obstruction that can be penetrated by the piles.
- D. Do not drive piles that are damaged, or suspected of damage, until inspected and approved by the inspector. All repair costs for pile and coating including additional materials and labor required shall be at the Contractors expense.
- E. Pile driving work must meet requirements outlined in the permits. See section 00300.

3.02 BEARING AND PENETRATION

CONSTRUCTION IMPROVEMENTS TO THE BOAT LAUNCH AND RELATED FACILITIES AT MAYFLOWER PARK
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Piles shall be driven to the minimum embedment shown on plans.

3.03 PILE DRIVING LOG

A. The contractor shall maintain a pile-driving log showing the following:

1. As Built Location Map: The contractor shall complete an as-built location map showing the actual location of the piles, their spacing, and the measured tolerances. All piles shall be referenced per the Contractor numbering system
2. Dimensions: Record all pile lengths as furnished and the length of pile in place. Include tip depth and top finish elevation.
3. Include in the record the type and size of the hammer used, the rate of operation, the stroke or equivalent stroke for the diesel hammer, the type of driving helmet, the type and dimension of the hammer cushion (cap block), and the pile cushion used, Record any unusual occurrence during driving of the pile.
4. Drilling or Jetting: Record the length of soil plug removed, pile tip elevation and final drill bit or jet tip elevation.
5. Driving Resistance: Maintain a complete record with the number of blows required to drive each foot and a record of driving resistance required for full length, including the number of blows for the last 6 inches of penetration or fraction thereof. Note any unusual occurrences in performance of pile or pile driving equipment during driving and notify the inspector immediately.
6. Time and Date.

3.04 TOLERANCES

For piles must be installed to allow a fully functioning boarding float system, with no binding for all historical water elevations. Install vertical pile within the following minimum tolerances from planned locations as shown on the plans.

- | | |
|-------------------------|-----------------|
| A. Horizontal location: | +/- 2 Inches |
| B. Vertical Cut-off: | +/- 4 Inches |
| C. Plumb: | +/- 0.2 Percent |

After installing piles, contractor to survey pile locations and finalize shop drawings to ensure that system is a fully functioning

3.05 PIPE PILE FILL

After the pile is driven and accepted, fill the pile with a 4-sack concrete/slurry to the top of the pile.

3.06 PILE CAP

Pile cap to be installed after pile is filled and to be tightly glued to the pile per pile cap manufacturer's recommendation for steel pile application.

END OF SECTION 10300

APPENDIX A

ADDITIVE ALTERNATE #1

TO PKARC- 183

Construction Improvements to the Boat Launch and Support
Facilities Mayflower Park
4980 Colorado River Road
Blythe, California 92225

July 21, 2015

Prefabricated Restroom Building Pad
and Utility Development
Plans and Specifications
for Additive Alternate #1

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**DESCRIPTION OF
ADD ALTERNATE #1
PKARC-183**

**Prefabricated Restroom Building
Pad and Utility Development**

As an additive alternate to the "Construction Improvements to the Boat Launch and Support Facilities Project", the County under **separate contract** is purchasing and having set a new pre-engineered/ prefabricated restroom and shower building for Mayflower Park and directly adjacent to the Boat launch improvement project.

The County is purchasing 36' x 24' prefabricated restroom/shower building and general design specifications are attached to this Additive Alternate for informational purposes only. Exhibit 2 provides the general overview of the building specifications and requirements and the layout of the new building. **IT IS PROVIDED FOR AS REFERENCE ONLY TO ASSIST THE CONTRACTOR AND ITS SUBCONTRACTORES PREPARING THE ADDITIVE ALTERNATE WORK BID.** The prefabricated building will be purchased by the County. The manufacturer will deliver and set the building.

Additive Alternate #1 is for site preparation required for the placement of a prefabricated restroom building and installation of the underground utilities to a place within six (6) feet of the proposed building location. The work is shown on Exhibit 1 and is to include but not be limited to: minor site clearing, light rough and finish grading, subgrade compaction, placement of base material and compaction, placement spreading and leveling of builder's sand, and the running of underground utilities (water, electric, sewer and propane) within six feet of the building location. The building manufacturer will be responsible for bringing the utilities into the building. The contractor will be responsible for the final connection of utilities provided by the building manufacturer.

SCOPE WORK: Site Scope of Work by General Contractor

The contractor shall prepare the restroom building pad to receive the prefabricated building in accordance with the bid plans and specifications, including Exhibits.

1. The building pad shall be excavated to 14" deep from the final building concrete slab elevation in accordance with the drawing titled "foundation pad design."
2. The building pad shall meet a 90% compaction of the existing subgrade, then in lifts using "Class 2 Base Material" (Complying with the most recent edition of the "**GreenBook**" **Standard Specifications for Public Works Construction: Section 200-2 Untreated Base Material**) for the first four inches and coarse sand for the last two inches of the pad, leaving the finished sub grade pad elevation at finished floor, minus 8".
3. The COUNTY shall provide water point of service at 30" below finished building slab; sewer at 24" below the finished building slab; and electrical at 36" below the finished building slab or other per bid location plans provided County and building manufacturer.
4. DISITRICT shall coordinate with restroom subcontractor to provide full site delivery access for a 70' tractor-trailer and hydro crane to the final building site.

5. If the final site access is over existing sidewalks, utilities, or landscaping, the County/Contractor shall be responsible for plating and or tree trimming, utility line removal, or other to protect any existing conditions.
6. The hydro crane must be able to locate no greater than 35' from the center point of the building to the center point of the crane.
7. The utilities shall be furnished per bid site plans provided by the prefabricated building manufacturer at specified points of connection (POC) nominally 6' from the building line.
8. COUNTY shall furnish and install final grading, landscaping and sidewalks.

Connection to Utilities

1. The design/build/installer prefabricated building manufacturer will furnish Electrical, Water, and Sewer at the proper POINT OF CONNECTION AND AT THE PROPER ELEVATION BELOW GRADE, for this project. Restroom prefabricated building manufacturer shall provide final hook up of the water from building to POC; sewer hookup to POC; and electrical sleeve from building panel to POC only. **Final utility connections shall be by the contractor prior to the prefabricated building manufacturer leaving the site. The contractor shall flush the water lines thoroughly before making final water connection to the building.**

All work and materials shall be in full accordance with the latest applicable (or otherwise noted) codes, rules, and regulations including, but not limited to, the following:

- Uniform Building Code
- Uniform Plumbing Code
- Uniform Mechanical Code
- Uniform Fire Code
- State Fire Marshal
- State Industrial Accident Commission's Safety Orders
- Rules of Local Utilities

All work will be done in accord with "Standard Specification for Public Works Construction" "The Greenbook" latest edition.

SPECIAL PROVISIONS

01660 STORAGE AND PROTECTION**PART 1 - GENERAL****1.01 SUMMARY**

Protect materials scheduled for use in the work by means as described in this Section or as otherwise required for the Prefabricated Restroom Building Pad and Utility Development.

1.02 MANUFACTURERS' RECOMMENDATIONS

Except as otherwise approved by the COUNTY PM, determine and comply with manufacturers' instructions on material handling, storage and protection.

1.03 PACKAGING

A. Deliver materials to the job site in their manufacturer's original container, with the labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.
2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements.

B. The COUNTY PM may reject as non-complying such material and products that do not bear identification satisfactory to the COUNTY as to the manufacturer, grade, quality and other pertinent information.

1.04 STORAGE AND PROTECTION

- A. Store materials and products in a safe and dry manner at a location designated by COUNTY PM to protect building materials from inclement weather.
- B. Provide adequate site protection and security before, during and after each pour of asphalt concrete.

1.05 REPAIRS AND REPLACEMENTS

In event of damage to stored materials or other items, promptly provide replacements and repairs to the approval of the COUNTY PM and at no additional cost to the COUNTY.

End of Section

01740 CLEANING**PART 1 - GENERAL****1.01 SUMMARY**

Throughout the construction period, maintain the project site in a proper standard of cleanliness.

PART 2 - PRODUCTS**2.01 CLEANING MATERIALS AND EQUIPMENT**

Provide required personnel, equipment and materials needed to maintain the proper standard of cleanliness.

2.02 COMPATIBILITY

Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

PART 3 - EXECUTION**3.01 PROGRESS CLEANING****A. General:**

1. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage, and providing required protection of materials.
2. Do not allow accumulation of scrap, debris, waste material and other items not required for construction of work.
3. At least twice each month, and more often if necessary, completely remove all scrap, debris and waste material from the job site.
4. Provide adequate storage for all items awaiting removal from the job site, observing requirements for fire prevention and environmental protection.

B. Site:

1. Daily, and more often if necessary, inspect the site and pick up scrap, debris and waste material. Remove such items to the place designated for their storage.
2. Maintain the site in a neat and orderly condition at all times.
3. At least weekly sweep and clean site. "Clean" for the purpose of this paragraph shall be interpreted as meaning free from material capable of being removed by reasonable effort.

3.02 FINAL CLEANING

- A. Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste.
- B. Unless otherwise directed by the COUNTY PM, broom clean paved areas on the site and public paved areas adjacent to the site. Completely remove resultant debris.
- C. Schedule final cleaning, as approved by the COUNTY PM, to enable the COUNTY PM to accept completely clean work.

End of Section

02230 SITE CLEARING**PART 1 - GENERAL****1.01 SUMMARY**

- A. Removal and/or clearing of debris from the building pad area that is to be excavated for compaction.
- B. Mobilize equipment and coordinate the work schedule with the COUNTY PM.

1.02 SUBMISSION

- A. Proposed removal activities in phases and work schedule.
- B. Photographs: Before starting work, file with the COUNTY PM, photographs documenting existing conditions that later could be mistaken for damages caused by removal operations.

1.03 PROJECT CONDITIONS

Lake Skinner Recreation Area is open to the public seven day a week. The Multi-Species Reserve Office is open to the public Monday thru Friday 8:00 AM to 5:00 PM. Public Programs and Special Events throughout the park are scheduled months in advance; therefore, coordination of the work schedule may be modified or altered for those activities.

PART 2 - PRODUCTS**2.01 MATERIALS**

Provide materials, not specifically described but required for proper completion of the work of this Section, as selected by the CONTRACTOR subject to the approval of the COUNTY PM.

PART 3 - EXECUTION/EXAMINATION**3.01 SURFACE CONDITIONS**

- A. Examine the areas and conditions under which the work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.
- B. Insofar as is practicable, arrange operations to reveal unknown or concealed structural conditions for examination and verification before removal.

3.02 PREPARATION

- A. Provide for the protection of persons passing around or through the project work areas.
- B. Provide protective measures to ensure free and safe passage of persons and vehicles by signage or other means to and from occupied areas.
- C. Perform removal so as to prevent damage to adjacent improvements to remain.
- D. Protect existing roadway asphalt, concrete walks, slabs, landscaping and structures from damage during its construction.

3.03 POLLUTION CONTROL

- A. Control the spread of dust and much as practicable.
- B. Observe and comply with all environmental protection regulations.
- C. Do not allow water usage that results in freezing or flooding.
- D. Do not allow remaining adjacent improvements become soiled by its operations.

3.04 MOBILIZE EQUIPMENT/PROTECTION

- A. Mobilization of equipment and materials shall be in the designated work site area. Protect existing utilities, existing irrigation and structures as indicated or made

- known.
- B. Protect trees, shrubs irrigation lines and heads, where indicated or made known.
 - C. Protection of persons and property:
 - 1. Barricade open depressions and holes occurring as part of this Work.
 - 2. Protect irrigation heads, structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by operations under this Section.
 - D. Use means necessary to prevent dust becoming a nuisance to the public, to Neighbors and to other work being performed on or near the site.
 - E. Maintain access to the site at all times.

3.05 CLEARING

In areas that are to be excavated, clean out roots one inch in diameter and larger to a depth of at least six (6) inches below the existing ground surface or subgrade of new graded surface, whichever is lower. Treat roots remaining in the soil with a weed killer approved by the COUNTY PM.

3.06 CONSERVATION OF TOPSOIL

- A. After the area has been cleared of vegetation, strip the existing topsoil in those areas to be excavated.
- B. Stockpile in an area clear of new construction.

3.07 DISPOSAL

- A. General:
 - 1. Remove brush, grass, roots, trash, and other material from clearing operations.
 - 2. Dispose of away from the site in a legal manner.
 - 3. Do not store or permit debris to accumulate on the job site.
- B. Do not burn debris at the site.

3.08 UTILITIES

- A. Coordinate with utility companies and agencies as required.
- B. Where utility cutting, capping or plugging is required, perform such work in accordance with requirements of the utility or governmental agency having jurisdiction.

End of Section

02300 EARTHWORK**PART 1 – GENERAL****1.1 RELATED DOCUMENTS**

Drawings and general provisions of the Contract, including General and Supplementary Conditions and General Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes the following: Adjust list below to suit Project.

1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
2. Excavating and backfilling for buildings and structures.
3. Capillary barrier course for floor slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course for asphalt paving.
6. Excavating and backfilling trenches within building lines.
7. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections include the following: List below only products and construction that the reader might expect to find in this Section but are specified elsewhere.

1. General Provisions for a schedule of unit prices.
2. Division 2 Section "Site Clearing" for site stripping, grubbing, removing topsoil, and protecting trees to remain.
3. Division 2 Section "Tree Protection and Trimming" for protecting and trimming trees to remain.
4. Division 2 Section "Excavation Support and Protection."
5. Division 2 Section "Foundation Drainage Systems" for drainage of footings, slabs-on-grade, and walls.
6. Division 2 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and plantings.
7. Division 3 Section "Concrete Floors" for granular course and vapor retarder.

1.3 UNIT PRICES

Unit prices for rock excavation include replacement with approved materials.

1.4 DEFINITIONS

Backfill: Soil materials used to fill an excavation.

A. **Initial Backfill:** Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

B. **Final Backfill:** Backfill placed over initial backfill to fill a trench.

Base Course: Layer placed between the subbase course and paving.

Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

Capillary barrier: Layer supporting floor slab-on-grade used to minimize capillary flow of pore water.

Excavation: Removal of material encountered above subgrade elevations.

A. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

B. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

Fill: Soil materials used to raise existing grades. Retain definitions of rock in paragraphs below for classified excavation.

Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.

Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 QUALITY ASSURANCE

Geotechnical Testing Agency: The Owner will retain a testing agency qualified according to ASTM E 329 to conduct soil materials testing and inspection services Refer to Section 1400.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than three days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. Coordinate soil materials with geotechnical engineer's written recommendations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 4 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Expansion Index: Not more than 20 as measured by UBC Std. 29-2 and ASTM D4829.

2. Upper 18 inches of subgrade fill under landscaped areas: Soil containing not more than 10% stones or lumps larger than 1-1/2 inches.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols, or soil classified as expansive by UBC Std. 29-2 and ASTM D4829.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

F. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve. Pea gravel bedding shall be 3/8 inch.

Capillary Barrier: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 4 sieve.

2.2 ACCESSORIES

Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

- A. Red: Electric.
- B. Yellow: Gas, oil, steam, and dangerous materials.
- C. Orange: Telephone and other communications.
- D. Blue: Water systems.
- E. Green: Sewer systems.

PART 3 – EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
3. Rock excavation includes removal and disposal of rock.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections. Revise subparagraph below if footings and foundations are placed on fill.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work. Delete subparagraph below if not required.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

1. Clearance: 12 inches on each side of pipe or conduit.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

- A. Notify Testing Agency when excavations have reached required subgrade.
- B. If Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by rain, accumulated water, or construction activities, as directed by Testing Agency.

3.9 UNAUTHORIZED EXCAVATION

Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.

- A. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

- A. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

Place and compact backfill in excavations promptly, but not before completing the following:

- A. Construction below finish grade including, where applicable, dampproofing and waterproofing.
- B. Surveying locations of underground utilities for record documents.
- C. Inspecting and testing underground utilities.
- D. Removing concrete formwork.
- E. Removing trash and debris.
- F. Removing temporary shoring and bracing, and sheeting.
- G. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

A. Place and compact 6 inch bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

1. Provide bedding for sanitary sewer in accordance with SDRSD S-4, type C. SDRSD S-4 shall be used for storm drain piping if PVC, HDPE or ABS material is specified. For RCP storm drain piping provide bedding per SDRSD D-60 except that $\frac{3}{4}$ crushed rock shall extend to pipe springline/centerline.
2. Sand bedding may be used for other than sewer piping.

B. Backfill trenches excavated under footings and within 18 inches of bottom of footings; with concrete to elevation of bottom of footings.

C. Provide concrete encasement per SDRSD S-7 for piping or conduit less than 24 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 6 inches of concrete before backfilling or placing roadway subbase.

D. Place and compact initial pipe zone backfill, bedding, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit in accordance to section 306-1.2 of the SSDWC.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

E. Coordinate backfilling with utilities testing.

F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

G. Place and compact final backfill of satisfactory soil material to final subgrade.

H. Install warning tape at the top of pipe zone or a max. 36" below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact satisfactory fill material in layers to required elevations.

3.14 MOISTURE CONTROL

Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.

A. Do not place backfill or fill material on surfaces that are muddy.

B. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum density according to ASTM D 1557: Percentages of maximum density are examples only; revise to comply with geotechnical report.

1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 92 percent.
3. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 90 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1/2 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE COURSES

Under pavements and walks, place subbase course on prepared subgrade and as follows:

A. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum density according to ASTM D 1557.

B. When thickness of compacted subbase course is 6 inches or less, place materials in a single layer.

C. When thickness of compacted subbase course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.18 CAPILLARY BARRIER

Under floor slabs-on-grade, prior to placement of vapor barrier, place capillary barrier on prepared subgrade and as follows:

A. Compact capillary barrier to required cross sections and thickness to not less than 95 percent of maximum density according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing. Refer to Section 01410.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 1000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 50 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 50 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and re-compact.
- C. Where settling occurs before Project warranty period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 02300

02310 SITE GRADING**PART 1 - GENERAL****1.01 SUMMARY**

In accordance with this Section and other applicable requirements, existing soil shall be compacted to a minimum of 90% compaction and graded to drain away from building pad.

Final grade must be determined in the field for final building elevation, as needed to meet County Code, Standard Specifications for Public Works and ADA requirements for the construction shown in the Contract Documents.

PART 2 - PRODUCTS**2.01 SOIL MATERIALS**

All exposed vegetation including brush, grass, organic debris, and other unsuitable materials underneath sub-grade and within the area of concrete slabs, door stoops and drive apron shall be removed and disposed of offsite. These removals must be concluded prior to placing fill. Existing fill, soil, alluvium, colluvium, or rock materials shall be removed prior to fill placement. Depending upon the soil conditions, these materials may or may not be able to be reused as compacted fill.

2.02 SOIL STERILANT (OMITTED FROM PROJECT)**PART 3 - EXECUTION****3.01 SURFACE CONDITIONS**

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 PROCEDURES

- A. Utilities:
1. Prior to excavation, and unless shown to be removed, protect active utility Lines shown on the Drawings or otherwise made known to the CONTRACTOR. If damaged, repair or replace utility lines at no additional cost to the COUNTY.
 2. If active utility lines are encountered, and are not made known to the CONTRACTOR, promptly take necessary steps to assure that service is not interrupted.
 3. If service is interrupted as a result of work under this Section, immediately Restore service by repairing the damaged utility at no additional cost to the COUNTY.
 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the COUNTY PM and secure its instructions.
 5. Do not proceed with permanent relocation of utilities until written instructions are received from the COUNTY.
- B. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors and to other work being performed on or near the site.
- C. Maintain access to adjacent areas at all times.

3.03 EXCAVATING

- A. Perform excavation within the limits of the work to the lines, grades and Elevations required.
- B. Satisfactory excavated materials shall be transported to and placed in fill or

- embankment areas within the limits of the work.
- C. Surplus or unsatisfactory excavated materials shall be removed from the site and disposed of by CONTRACTOR.
 - D. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

3.04 FILLING

Ground surface preparation:

All required fill and backfill areas shall not exceed six (6) inches loose depth without a compaction to at least 90% of the maximum density obtainable by the A.S.T.M. designation (D-1557-70T) method of compaction. Flooding or jetting is not permitted. Provide fill materials required for proper completion of the work of this Section (even if not specifically described), as selected by CONTRACTOR subject to the approval of COUNTY PM.

3.05 GRADING

- A. General:
Uniformly grade the areas within limits of grading, including adjacent transition areas. Smooth the finished surfaces within specified tolerance. Compact with uniform levels or slopes between points where elevations are known, or between such points and existing grades.
- B. Grading outside building lines:
Grade areas adjacent to shade shelter slabs and walkways to achieve drainage away from structures and to prevent ponding.
- C. Finish the surfaces to be free from irregular surface changes.

3.06 MAINTENANCE

Protection of newly graded areas:

Protect newly graded areas from traffic and erosion, and keep free from trash and weeds. Repair and reestablish grades in settled, eroded and rutted areas to the specified grades.

Where completed compacted areas are distributed by subsequent construction operations or adverse weather, scarify the surface, reshape and compact to the required density prior to further construction.

End of Section

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and General Provisions apply to this Section.

1.2 SUMMARY

This Section includes sanitary sewerage system outside the building.

- A. This Section covers materials, labor and equipment required to connect and extend the existing four (6) inch ABS waste water line from an existing septic tank to the new prefabricated restroom shower building.
- B. The CONTRACTOR will provide the proper elevation for drainage and to be verified by the Inspector or COUNTY PM prior to backfill.
- C. The existing 6" gravity waste line drains into a 2,500 gallon septic tank located at the rear of the restroom to be abandon

1.3 SUBMITTALS

Product Data: For sewerage system materials and products.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.
- B. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

- A. Notify Owner not less than three days in advance of proposed utility interruptions.
- B. Do not proceed with utility interruptions without Owner's written permission.

PART 2 – PRODUCTS

2.1 PIPES AND FITTINGS

PVC Sewer Pipe and Fittings: According to the following:

- A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.

- 1. Gaskets: ASTM F 477, elastomeric seals.

2.2 SPECIAL PIPE COUPLINGS AND FITTINGS

Provide couplings and adapters to make joints between different pipe materials and between different sizes of pipe with standard manufactured adapters and fittings intended for that purpose.

2.3 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for rubber gasketed joints.

1. Diameter: 60 inches minimum, unless otherwise indicated.
2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: ASTM C 443, rubber.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 36-inch-diameter frame and cover.
8. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 60 inches deep.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Manhole Frames and Covers: Use County of Riverside Standard Frames and Covers.

C. Manhole Cover Inserts: Manufactured, plastic form, of size to fit between manhole frame and cover and designed to prevent stormwater inflow. Include handle for removal and gasket for gastight sealing.

2.4 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.5 CLEANOUTS

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:

1. Medium Duty: In un-paved foot-traffic areas.
2. Heavy Duty: In on-site paved areas.
3. Extra-Heavy Duty: In roads.
4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

PART 3 – EXECUTION

3.1 EARTHWORK

Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 IDENTIFICATION

Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

- A. Use detectable warning tape over nonferrous piping and over edges of underground structures.
- B. Use detectable warning tape over ferrous piping.

3.3 PIPING APPLICATIONS

- A. General: Include watertight joints.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: Use the following:

1. PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

3.4 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.

2. Install piping with 36-inch minimum cover, unless otherwise indicated.

3.5 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.

B. PVC Sewer Pipe and Fittings: As follows:

1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.

2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.

3. Install according to ASTM D 2321.

C. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

D. Install with top surfaces of components, except piping, flush with finished surface.

3.6 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

F. Install PE sheeting on earth where cast-in-place-concrete manholes are to be built.

G. Install FRP manholes according to manufacturer's written instructions.

H. install manhole cover inserts in frame and immediately below cover.

3.7 CONCRETE PLACEMENT

Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.8 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping and box so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in No. 3 meter box. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in pavement with tops flush with pavement surface.

3.9 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.
- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
- C. Make branch connections from side into existing piping, NPS 21 or larger, or to underground structures by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
 2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
- D. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 1. Place plug in end of incomplete piping at end of day and when work stops.
 2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Video-tape the interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project. Video-tape in the presence of the inspector.
 1. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.

- b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 95 percent of piping diameter.
- c. Crushed, broken, cracked, or otherwise damaged piping.
- d. Infiltration: Water leakage into piping.
- e. Exfiltration: Water leakage from or around piping.
- f. Failed: Air pressure test per SSPWC section 306

- 2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
- 3. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

- 1. Do not enclose, cover, or put into service before inspection and approval.
- 2. Test completed piping systems according to authorities having jurisdiction.
- 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.

END OF SECTION 02530

15410 Domestic Piping**PART 1- GENERAL****1.01 SUMMARY**

This section covers materials, labor and equipment required to connect and extend the main water line and install a concrete valve box with a main shut-off valve. The work will include, the installation of two exterior hose bibs with ball valve shut-offs.

1.02 WORK INCLUDED

- A. Pipe and pipe fittings.
- B. Valves.
- C. Domestic water piping system.

1.03 REFERENCES

DISINFECT ION OF POTABLE WATER SYSTEM SHALL COMPLY WITH ANSI/AWWA C651-92.

1.04 QUALITY ASSURANCE

Valves: Manufacturer's name and pressure rating marked on valve body.

1.05 SUBMITTALS

- A. Submit product data for all domestic piping equipment used.
- B. Include data on pipe materials, pipe fittings, valves and accessories.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site.
- B. Store and protect products.
- C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS**2.01 ACCEPTABLE MANUFACTURERS - BALL VALVES/HOSE BIBBS**

As indicated on the plans.

PART 3 - EXECUTION**3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Group piping whenever practical at common elevations.
- B. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- C. Establish elevations of buried piping outside the building to ensure not less than 1.5 ft. of cover.

3.03 APPLICATION

Ball valves for shut-off and to isolate equipment or part of system.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect ion of potable water system shall comply with ANSI/AWWA C651-92.
- B. When hot and cold water piping, including fixtures, have been installed, tested and accepted. Disinfect the system using any of the three methods of chlorination explained in AWWA C651-92 standard.
- C. The basic disinfection procedure shall consists of:
 - 1. Preventing contaminating materials from entering the water piping system during storage, construction or repair.
 - 2. Removing, by flushing or other means, those materials that may have entered the water piping system.
 - 3. Chlorinating any residual contamination that may remain, and flushing the chlorinated water from the piping system.
 - 4. Protecting the existing distribution system from backflow due to hydrostatic pressure test and disinfection procedures.
 - 5. Determining the bacteriological quality by laboratory test after disinfect ion. At least one water sample from the existing distribution system shall be tested.
 - 6. Final connection of the water piping system to the active distribution system.
- D. Submit Record of Compliance: The record of compliance shall be the bacteriological test results certifying the water sampled from the water piping system to be free of coliform bacteria contamination, and to be equal to or better than the bacteriologic water quality in the distribution system.
- E. Submit Record of Compliance: The record of compliance shall be the bacteriological test results certifying the water sampled from the new water piping to be free of coliform bacteria contamination.

3.05 TESTS

- A. Test entire piping systems, including valves and fittings in accordance with governing codes and ordinances, conduct testing in the presence of Owner's Representative and the local Inspector until satisfactory to both.
- B. Domestic Cold Water Piping Systems: The system shall be tested and proved tight under a water pressure not less than 125 P.S.I.G. The piping shall withstand the test without leaking for a period of not less than one hour.

3.06 CLEANING PIPING SYSTEMS

After piping systems have been tested and proved tight, clean piping systems of dirt, scale, oil, grease, waste and other foreign substances that may have accumulated during the process of installation.

End of Section

16000 ELECTRICAL**PART 1 - GENERAL****1.01 SUMMARY**

This section covers electrical design, materials, labor and equipment required to extend and connect service from the existing electrical main meter pedestal to a new 100 amp, interior sub-panel in the workshop with breakers and the required grounding. All other breaker spares will be for future interior lighting and receptacle outlets. The work will include galvanized rigid conduit and three exterior lights at all doors with interior switches.

1.02 WORK INCLUDED

- A. General Requirements, Division 1, are part of this section.
- B. Electrical equipment, materials, and appurtenances shall be listed by an independent testing laboratory for the purpose for which they are to be used. Three such organizations are Underwriters Laboratories, Inc. (UL), Canadian Standards Association (CSA), and Electrical Testing Laboratories (ETL). The independent testing laboratory shall be acceptable to the Government.
- C. Electrical equipment and supports shall be braced in accordance with ICC -2007 for Seismic Zone 4.
- D. CONTRACTOR shall provide all labor, tools, materials, power, and other services necessary to provide the specified test.

1.03 SUBMITTALS

- A. Submit catalog information demonstrating conformance for all products for approval. Clearly identify each item being submitted and delete extraneous or non-applicable literature on items.
- B. Submittals for all applicable power equipment and devices shall indicate fault current withstand and interrupting ratings.

PART 2 - PRODUCTS**2.01 GENERAL**

Equipment and materials shall be new and free from defects. All equipment of the same or similar type shall be of the same manufacturer throughout the work. Standard production materials shall be used wherever possible.

2.02 RACEWAY, FITTINGS, AND SUPPORTS

- A. GENERAL: Conduit shall be provided for all wiring including power, control, instrumentation, grounding, lighting and receptacles.
- B. RACEWAY: Exposed conduit shall be threaded, galvanized, rigid steel conduit. Minimum size shall be 3/4-inch. Bushings shall be galvanized, malleable iron with insulated collars. Grounding bushings shall be locked type with a feed through compression lug.
- C. Liquidtight, flexible steel conduit shall be formed from spiral wound, galvanized steel strip with successive convolutions securely interlocked and jacketed with liquidtight, plastic cover. Fittings for liquidtight conduit shall have cadmium-plated, malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral and O-ring seals around the conduit and box connection and insulated throat. Forty-five and ninety degree fittings shall be used where applicable.
- D. Embedded or encased conduit shall be Schedule 40, high impact, polyvinyl chloride (PVC) Fittings for PVC conduit shall be solvent welded type.

- E. **BOXES:** Boxes for use outdoors and in process areas shall be hot-dip, galvanized cast ferrous alloy type FD with integrally cast threaded hubs for conduit entry. Boxes larger than FD boxes shall be welded steel and hot-dip galvanized after fabrication.
- F. Boxes installed in areas where electrical metallic tubing is specified shall be standard UL approved electrogalvanized sheet steel, 4-inch square or octagon minimum trade size.
- G. Conduit bodies shall be ferrous alloy type with screw taps for fastening covers. Gaskets shall be made of neoprene.
- H. **RACEWAY SUPPORTS:** Hot-dip galvanized framing channel shall be used to support groups of conduit. Individual conduit supports shall be one-hole galvanized malleable iron pipe straps with galvanized iron clamp backs and nesting backs where required. Ceiling hangers shall be adjustable, galvanized carbon steel rod hangers. Straps or plumbers tape are not acceptable. Hanger rods shall be ½-inch all thread rod.

2.03 CONDUCTORS, WIRE, AND CABLE

- A. **GENERAL:** Conductors, wires, and cable shall be provided for power, control, lighting, receptacles and rounding. The quantity and size of conductors shall be specified.
- B. **POWER AND CONTROL CONDUCTORS:** Power and control conductors shall be single conductor, stranded, annealed copper with 600-volt THWN/THHN polyvinyl chloride (PVC) insulation.
- C. **LIGHTING AND RECEPTACLE CIRCUIT CONDUCTORS:** Conductors for lighting and receptacle circuits shall be single conductor, annealed copper with 600-volt THWN/THHN PVC insulation. Conductor size No. 10 AWG and larger shall be stranded. No. 12 AWG shall be solid conductor. Minimum conductor size shall be No. 12 AWG.
- D. **GROUNDING CONDUCTORS:** Grounding conductors shall be concentric stranded, annealed bare copper. Cable size shall be as shown on the drawings.
- E. **SPLICING AND TERMINATING MATERIALS**
- F. **CONNECTORS:** Connectors for stranded conductors shall be tool applied, tinned copper, compression type of the correct size and UL approved for the application.
- G. Connectors for wire sizes No. 10 AWG and smaller shall be nylon self-insulated, ring tongue or locking-spade terminals. Connectors for wire size No. 8 AWG and larger shall be one-hole lugs up to size No. 3/0 AWG and two-hole or four-hole for size 4/0 AWG and larger. Mechanical clamp, dimple, or screw-type connectors are not acceptable.

2.04 WIRING DEVICES

- A. **GENERAL:** Receptacles, plugs, switches, and appurtenances shall be provided as specified on the drawings. Wiring devices shall be UL approved for the current and voltage specified. Receptacles and switches shall be premium, specification grade.
- B. **RECEPTACLES:** Receptacles shall be grounding type, with cover plates, Hubbell or equal.
- C. **SWITCHES:** Switches shall be 20 amp, toggle type, Hubbell, Arrow-Hart, or equal.

2.05 GROUNDING MATERIAL

- A. **GROUND RODS:** Ground rods shall be copper-covered steel, ¾-inch diameter, and 10-feet long. Rods shall have threaded type, removable caps so that extension rods of the same diameter and length may be added where necessary.
- B. **COMPRESSION CONNECTORS:** Compression connectors shall be cast copper as

manufactured by Thomas and Betts, or equal.

- C. **BOLTED CONNECTORS:** Bolted connectors shall be Burndy, O.Z. Gedney, or equal.

2.06 LIGHTING FIXTURES

- A. **GENERAL:** Lighting fixtures shall be provided where specified, and as shown on the plans.
- B. Fixtures shall be directly and rigidly mounted on their supporting structures. Unless otherwise specified, conduit system shall not be used to support fixtures.

2.07 LAMPS

- A. **ACCEPTABLE PRODUCTS:** Lamps shall be General Electric, North American Phillips (Norelco), Sylvania, Venture Lighting International, or equal.
- B. **GENERAL:** Lamps shall be as specified on the drawings. Unless otherwise specified, high-pressure sodium lamp envelopes shall be clear.

2.08 DISTRIBUTION EQUIPMENT

- A. **PANELBOARDS:** Panel board shall be circuit breaker, dead front type with bus bar construction. Panel board shall be composed of individually mounted circuit breakers designed to be removed without disturbing other breakers.
- B. Bus shall be tin-plated copper and shall have a current rating as shown on the panel schedule sized in accordance with UL 67. Panel fault withstand rating shall be equal to the interrupting rating of the smallest circuit breaker in the panel and as shown on the plans.
- C. Sub-panel board shall be provided with a separate ground bus and a full capacity neutral bus. Neutral bus shall be mounted on insulated standoffs with removable link connector to ground bus.
- D. **CIRCUIT BREAKERS:** Minimum 3-20 amp single pole breakers and 1- 40 amp 2 pole 240volt circuit breaker shall be molded-case type rated for the current ratings and pole configurations specified on a standard single phase, 100 amp sub-panel. Circuit breakers rated 120/110 volts. Circuit breakers shall be listed in accordance with UL-489 for the service specified Load terminals of circuit breakers shall be solderless connectors. Circuit breakers and sub-panel board shall be products of the same manufacturer.
- E. **NAMEPLATES:** Nameplates shall be made from laminated phenolic plastic. The nominal size of the nameplates shall be 3/4 inch high by 2 inches long. Nameplates shall have black backgrounds with 3/16 inch white letters. If abbreviations are required because of space limitations, abbreviations shall be submitted to the COUNTY PM prior to manufacture. Nameplates shall be fastened using self-tapping stainless steel screws. The use of adhesives will not be permitted on the outside of enclosures.

PART 3 - EXECUTION

3.01 GENERAL

- A. Unless otherwise detailed or dimensional, electrical layout drawings are diagrammatic. The contractor shall coordinate the location of electrical material and equipment with the work.
- B. Electrical equipment shall be protected from dust, water, and damage.

3.03 CONDUCTORS, WIRE, AND CABLE

- A. **GENERAL:** Raceway construction shall be complete, cleaned, and protected from the weather prior to wire and cable being installed. Pulling wire cable into conduit shall be completed without damaging or putting undue stress on the cable

- insulation. Soapstone, Talc, or UL listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable. Nylon pull rope shall be pulled through the conduit immediately after concrete pour.
- B. Each power, control, signal, and instrumentation conductor shall be identified at each terminal to which it is connected utilizing the wire markers specified.
 - C. 600-VOLT CONDUCTOR AND CABLE: Slack shall be provided in junction and pull boxes. Slack shall be sufficient to allow cable or conductors to be routed along the walls of the boxes. Raceway fill limitation shall be as defined by NEC and the following: Lighting and receptacle circuits may be together in the same Conduit accordance with derating requirements of the NEC. However, lighting and receptacle circuits shall not be in conduit with low voltage or signal / data circuits.
 - D. Solid wire shall not be lugged nor shall electrical spring connectors be used on any except for solid wires in lighting and receptacle circuits. Lugs and connectors shall be installed with a compression tool.
 - E. Conduit, wiring, or mounting of devices not shown on the electrical or instrumentation drawings but required for a complete and operable system shall be provided under this section.

3.04 WIRING DEVICES

Unless otherwise specified, switches shall be mounted forty eight (48) inches above the floor. Receptacles shall be mounted sixteen (16) inches above the floor.

3.05 MISCELLANEOUS CONTROL DEVICES

Control stations shall be mounted forty eight (48) inches above the floor unless otherwise specified.

3.06 GROUNDING

- A. Electrical equipment and enclosures, metal surfaces of equipment, and metal structural members shall be grounded. Grounding systems shall be provided in compliance with the NEC and as specified on the drawings.
- B. Grounding conductors which extend beyond concrete surfaces for equipment connection shall be extended a sufficient length to reach the final connection point without splicing.

3.07 GROUNDING CONDUCTOR RUNS

- A. A separate ground shall be run in each power conduit. The conductor shall be sized in accordance with NEC Table 250-95. The conductor bonded to the inside of the device junction box.

3.08 LIGHTING FIXTURES

- A. GENERAL: The location and type of fixtures and receptacles are shown on the drawings. Raceways and wire shall be provided from the fixture, switches, and receptacles to the lighting panel in accordance with the NEC.
- B. Fixtures labeled to require conductors with a temperature rating exceeding 75 degrees C shall be spliced to circuit conductors in a separately mounted junction box. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal to or greater that that of fixture.
- C. Photoelectric cells shall be oriented toward the north.
- D. Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned when the project is ready for acceptance.

End of Section

16110 CONDUIT AND FITTINGS**PART 1 – GENERAL****1.1 SUMMARY**

Furnish and install conduit and fittings as shown on the drawings and as specified herein.

1.2 COORDINATION

A. It shall be the responsibility of the Contractor to consult the other trades before installing conduit and boxes. Any conflict between the location of conduit and boxes, piping, ductwork, or structural steel supports shall be adjusted before installation. In general, large pipe mains, waste, drain, and steam lines which pitch, large air ducts, and all structural steel shall be given priority.

B. Conduit size shall be such that the required number and sizes of wires can be easily pulled in and the Contractor shall be responsible for the selection of the conduit sizes. Conduit sizes shown on the drawings are minimum sizes in accordance with appropriate tables in the CEC. If, because of bends or elbows, a larger conduit size is required, the Contractor shall so furnish without further cost to the Owner.

C. The Contractor shall be entirely responsible for the proper protection of this work from the other trades on the project. When conduit becomes bent, holes are punched through same, or outlets are moved after being roughed-in, the Contractor shall replace same, without additional cost to the Owner.

PART 2 - PRODUCTS**2.1 GENERAL**

A. Conduit sizes for various numbers and sizes of wire shall be as required by the CEC Chapter 9, but shall not be smaller than 1 inch size except for underground conduit and 3/4 inches for above grade or as otherwise noted.

B. Each length of conduit shall be stamped with the name or trademark of the manufacturer and shall bear the UL label.

C. All concrete inserts and pipe clamps shall be galvanized. All steel bolts, nuts, washers, and screw shall be galvanized or cadmium plated. Individual hangers, trapeze hangers, and rods shall be prime-coated.

D. Calibrated pull string/measuring tape shall be Greenlee Part No. 435, or as accepted.

2.2 CONDUIT

A. Rigid galvanized steel (RGS) and electrical metallic tubing (EMT) shall be Allied Tube & Conduit, Republic Conduit, Western Tube & Conduit Corp., or as accepted.

B. PVC coated RGS shall be Robroy Industries Inc., or as accepted.

C. Polyvinyl chloride (Schedule #40 and #80 PVC) conduit shall be Carlon, Cantex, or as accepted.

D. Liquid-tight flexible metallic conduit shall be Anaconda Sealtite Type UA, or as accepted.

2.3 FITTINGS

- A. Couplings and connectors for RGS conduit shall be steel or malleable iron, threaded, and rain- and concrete-tight. Couplings and connectors that are exposed, installed in hollow construction, or above ceilings shall be threaded, uncouple or compression type. Compression-type, steel, watertight fittings shall be used for EMT. Die-cast or pressure-cast EMT fittings shall not be allowed. EMT conduit shall not be allowed exposed to the weather.
- B. Bushings and locknuts shall be malleable iron with sharp, clean-cut threads.
- C. Fittings shall be Appleton, Crouse-Hinds, Steel City, T & B, or as accepted.
- D. Expansion joint fittings on RGS conduit shall be Crouse-Hinds type XJ, or as accepted. Expansion joint fittings on PVC conduit shall be Carlon type E945, or as accepted.
- E. Couplings and connectors for PVC conduit shall be of the same manufacturer as the conduit to be coupled or connected. Fittings shall be provided in accordance with the manufacturer's recommendations.

PART 3 - EXECUTION

3.1 CONDUIT

A. Applications:

1. PVC conduit may be used for all exterior underground systems, below slab on grade, and in exterior concrete or masonry walls. PVC conduit shall not be placed in slab. All plastic conduit shall be rigid, Schedule 40 and 80, heavy wall PVC. All PVC conduit shall be UL listed. Install bell ends at all conduit terminations in manholes and pull boxes. All risers shall be made with PVC #80 or PVC coated RGS conduit. All plastic conduit, except that used for telephone, shall contain a code-sized bond wire.
2. Rigid galvanized steel (RGS) conduit shall be used where it is specified on plans and where placed exterior exposed installations.
3. PVC-coated rigid galvanized steel (PVC-RGS) conduit shall be used in corrosive areas where exposed to physical damage, where specified on the plans and elbows extending from underground runs to above grade.
4. Liquid-tight flexible metallic conduit, in lengths not exceeding 4 feet, shall be used to connect motors and transformers. Installation shall be such that considerable slack is realized. The conduit shall contain a separate grounding conductor. Connectors shall be steel or malleable iron.

B. Conduit shall be continuous from outlet to outlet, cabinet or junction box, and shall be so arranged that wire may be pulled in with the minimum practical number of junction boxes.

C. All conduit shall be concealed wherever possible. All conduit runs may be exposed in mechanical equipment rooms, electrical equipment rooms, and electrical closets, and where indicated on the drawings. No conduit shall be run exposed in finished areas without specific acceptance by the Architect.

D. Conduit runs shall be installed to maintain the following minimum spacing wherever practical:

1. Water and Waste Piping: Not less than 3 inches
2. Steam and Condensate Lines: Not less than 12 inches
3. Radiation and Reheat Lines: Not less than 6 inches

E. All underground conduit outside of any buildings shall be a minimum of 24 inches below finished grade, except where noted otherwise on the drawings.

F. All underground feeder conduit outside of any buildings shall be sand encased.

G. PVC-coated rigid galvanized steel (PVC-RGS) joints must be sealed in accordance with the coating manufacturer's published instructions.

H. Empty conduit shall be provided with a nylon pull string installed in each.

I. Bending: Changes in direction shall be made by bends in the conduit wherever possible, and these bends shall be made smooth and even without flattening the pipe or flaking the finish. Bends shall be of as long a radius as possible, but in no case less than shown in CEC Table 346-10 (2002 edition).

J. Not more than four 90 degree bends will be allowed in one raceway run. Where more bends are necessary, a pull box shall be installed. All bends in 1 inch and smaller conduit shall be made with a conduit bender, and all larger conduit sizes shall have machine bends.

K. Plastic conduit joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected. Conduit joint couplings shall be made watertight. Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of a plastic coupling fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Transition from plastic to steel conduit shall be with PVC female threaded adaptors.

L. Plastic conduit shall be stored on a flat surface and protected from the direct rays of the sun.

M. The ends of all conduit shall be securely plugged, and all boxes temporarily covered to prevent foreign material from entering the conduit. All conduit shall be thoroughly swabbed out with a dry swab to remove moisture and debris before conductors are drawn into place.

3.2 FITTINGS

A. Bushings and Locknuts: Where conduit enters boxes, panels, cabinets, etc., it shall be rigidly clamped to the box by locknuts on the outside and inside, and a bushing on the inside of the box. All conduit shall enter the box squarely.

B. Provide insulated bushings per CEC Article 373-6(C) on all conduit. The use of insulated bushings does not exclude the use of double locknuts to fasten conduit to the box.

C. Provide expansion fittings for all conduit where it crosses building expansion joints, or not to exceed 100 feet apart. Fittings shall be complete with bonding jumpers and clamps and shall be suitably bonded to conduit.

D. Provide weatherproof fittings in exterior installations or as noted on the plans.

3.3 SUPPORTS

A. All raceways that are not buried or embedded in concrete shall be supported by straps, clamps, or hangers to provide a rigid installation.

B. Conduit shall be supported at intervals no greater than 8 feet, within 3 feet of any bend, and within 3 feet of every outlet, junction box, panel, etc. This shall apply to vertical runs as well as horizontal runs. Where conduit is run individually, it shall be supported by approved conduit straps or beam clamps. Conduit installed exposed in damp locations shall be provided with clamp backs under each conduit clamp, to prevent accumulation of moisture around the conduit. Where a number of conduits are to be run exposed and parallel, one with another, they shall be grouped and supported by trapeze hangers. Hanger rods shall be fastened to structural steel members with suitable beam clamps or to concrete inserts set through the opening provided in the concrete inserts. Each conduit shall be clamped to the trapeze hanger with conduit clamps.

END OF SECTION 16110

16120 WIRE AND CABLE**PART 1 - GENERAL****1.1 SUMMARY**

Furnish and install wire and cable for branch circuits and feeders as specified herein and as shown on the drawings.

PART 2 - PRODUCTS**2.1 WIRE AND CABLE**

A. All wire and cable shall be new, 600-volt insulated copper, of types specified below for different applications. All wire and cable shall bear the UL label and shall be brought to the project in unbroken packages. Wire and cable shall be type THW.

B. Wire Pulling Lubricant: Richards "Gel Lube 7/5"; American Polywater A, C, G&J; Quelcor "Quelube"; American Colloid "Slip X-300"; Thomas/Jet Line "Slipry Loob"; Ideal "Wire Lube"; Mac "Wirepull"; Minerallac "Wire-Wax"; or Electro "Y-er Eas."

C. Metal-clad (MC) and armor-clad (AC) cable shall not be permitted to be used in this project.

D. Conductors for branch circuit lighting, receptacle, power, and miscellaneous systems shall be a minimum of #12 AWG. Provide stranded wire for all circuits sizes. Wire indicated specifically to be larger than #12 shall be increased the entire length of the circuit.

2.2 TERMINATIONS, SPLICES, AND JOINTS

A. Terminations at Circuit Breakers and Switches:

1. #10 and #8 AWG wire, locking tongue lug, Buchanan "Termend," or as accepted.
2. #6 AWG and larger wire, round flange solderless lug, Burndy "Quick-Lug" type QDA, or as accepted.

B. Fixture Connections: Pressure-type solderless connectors, Buchanan, Scotchlok, Wing Nut, or accepted equal.

C. Motor Connections: Solderless lug with RayChem GelCap, or as accepted.

D. Wire Splices:

1. Joints in Wire:

a. #8 AWG and smaller wire, pressure-type solderless connectors, Buchanan, Scotchlok, Wing Nut, or as accepted.

b. #6 AWG and larger wire, irreversible compression type, Burndy, IlSCO, or as accepted.

2. Wire Taps: Solderless lug, solderless compression lug, each with Raychem Gtap, IlSCO GTA, or GTT with insulating cover, or as accepted.

3. Exterior below Grade Joints in Wire: Solderless lug, solderless compression lug, each with Raychem GelCap or as accepted.

2.3 APPLIED INSULATION

Insulating materials shall be listed for the application. Voltage rating shall be equal to or greater than the factory-applied wire insulation. Raychem, 3M, IlSCO, or as accepted.

2.4 MARKERS AND TAGS

Plastic Wire Markers: T&B or Brady.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Conductors for branch circuit lighting, receptacle, power and miscellaneous systems must be a minimum of #12 AWG. Wire indicated to be larger than #12 AWG shall be increased the entire length of the circuit.
- B. Wire and cable shall be pulled into conduits without strain, using an approved lubricant.
- C. In no case shall wire be re-pulled if same has been pulled out of a conduit run for any purpose.
- D. No conductors shall be pulled into conduit until conduit system is complete, including junction boxes, pull boxes, etc. All wire shall be stranded.
- E. All connections to circuit breakers, switches, fixtures, motors, and all joints in wires shall be made as noted below:

1. Terminations at Circuit Breakers and Switches:

- a. #12 AWG wire formed around binding post or screw.
- b. #10 and #8 AWG wire, locking tongue lug.
- c. #6 AWG and larger wire, round flange, solderless lug.

2. Fixture Connections: Circuit wiring connections to fixture wire shall be made with pressure-type solderless connectors.

3. Motor Connections: Solderless lug.

4. Joints in Wire:

- a. #8 AWG and smaller wire, pressure-type solderless connectors.
- b. #6 AWG and larger wire, irreversible compression type.

5. Wire Taps: Solderless lug, solderless compression lug.

6. Exterior below Grade Joints in Wire: Solderless lug, solderless compression lug.

7. Solderless connectors not used for grounding shall be insulated. Applied wire insulation voltage rating shall be equal to or greater than the factory-applied wire insulation. Insulate by one of the following methods:

- a. One or more layers of rubber tape, equal in thickness to the conductor insulation, followed by two layers of electrical vinyl tape.

- b. Pre-manufactured insulating caps.
- c. Heat-shrink insulating sleeve or tape. Shrink in accordance with the manufacturer's recommendations.

F. Wire compression type sleeves or lugs shall be installed with the manufacturer's recommended tool, in accordance with their published instructions.

G. Drawings, in general indicate location of motor starting equipment. Exact locations of motors and other devices are to be determined in the field by the Contractor. Provide an electrical feed for all equipment, not smaller than shown or CEC size where size is omitted from drawings, together with a suitable circuit protective device. Verify panel schedules and layout maintaining number of spare branches indicated.

H. Conductor sizes for lighting, receptacles, and small motor branch circuits with less than a 20-ampere connected load are not shown. Conductors for such circuits are sized as follows:

- 1. For Branch Circuits (120/208V) 75 Feet in Length from Branch Circuit Panel to Center of Load: Not smaller than No. 12.
- 2. For Branch Circuits (120/208V) up to 150 Feet in Length from Branch Circuit Panel to Center of Load: Not smaller than No. 10.
- 3. For Branch Circuits (120/208V) up to 200 Feet in Length from Branch Circuit Panel to Center of Load: Not smaller than No. 8.

I. Verify location and mounting height of all receptacles, wall mounted fixtures, switches, and other equipment before roughing in. See drawings for pertinent information. Refer questionable cases to the Architect.

J. Complete rough-in requirements of all equipment to be wired under the Contract are not indicated. Coordinate with respective trades furnishing equipment or with the Architect, as the case may be, for complete and accurate requirements to result in a neat, workman-like installation.

K. Provide proper size and type of feeds from proper sources for all such items indicated, checking drawings of all trades to ensure inclusion of all items.

3.2 COLOR CODING AND MARKING

A. All insulation in AWG sizes 10 and below shall be impregnated with color according to the following:

	<u>480 Volt System</u>	<u>208 Volt System</u>
A Phase	Brown	Black
B Phase	Orange	Red
C Phase	Yellow	Blue
Neutral*	Grey	White
Ground	Green	Green

*Where multiple neutrals are installed within the same raceway, each individual neutral shall be distinctly identified by one or more color stripes.

B. All control wiring in a circuit shall be color-coded, each phase leg having a separate color, and with all segments of the control circuit, whether in apparatus or conduit, utilizing the same color-coding.

C. Where color other than black is not an integral part of insulation use 3M No. 35 tapes in the same color code to identify both ends of conductors No. 8 and larger. Use other colors as required to identify control or other special circuits. Ground conductor shall have green insulation for 1/0 or smaller conductors, green tapes on other colors of insulation are NOT acceptable.

D. Wiring must be color-coded throughout its entire length, except that feeders may have color-coded plastic tape at both ends and all accessible points.

E. At all terminations of control wiring, the wiring shall have a numbered wire marker.

END OF SECTION 16120

16131 UG PULL BOXES AND MANHOLES**PART 1 – GENERAL****1.1 SUMMARY**

Furnish and install underground pull boxes and manholes as specified herein and as required by the National Electrical Code, NFPA 70.

PART 2 - PRODUCTS**2.1 CONCRETE**

The concrete for pull boxes and manholes shall be in accordance with MAG Specification No. 725, "Portland Cement Concrete," using 3/4 inch maximum size coarse aggregate. Concrete shall be Class 4,000 psi.

2.2 STEEL

Reinforcing steel shall be deformed bars of intermediate grade meeting the requirements of MAG Specification No. 727, "Steel Reinforcement."

2.3 FRAMES AND COVERS

Frames and covers shall be structural steel conforming to the requirements of MAG Specification No. 770. Frames and covers shall be hot-dip galvanized.

2.4 GROUNDING

Ground rods shall be copper or copper-clad steel 1-in. diameter by 10 feet long. All non-current-carrying metallic components shall be bonded to the ground rods with minimum #6 copper wire.

EXECUTION (NOT USED)**END OF SECTION 16131**

16140 WIRING DEVICES**PART 1 – GENERAL****1.1 SUMMARY**

- A. Furnish and install all wiring devices as shown on the drawings and as herein specified.
- B. Manufacturer:
 - 1. Unless otherwise noted, device and plate numbers shown are Hubbell and shall be considered the minimum standard acceptable.
 - 2. Other acceptable manufacturers are Bryant and P&S.

PART 2 – PRODUCTS**2.1 MATERIALS**

- A. Switches:
 - 1. All line voltage switches shall be of the quiet mechanical type, specification grade, 20 amperes, 120/277 volt AC as follows:

Single pole:	1221-G
Two pole:	1222-G
Three-way	1223-G
 - 2. Switch color shall be selected by the Architect.
 - 3. All line voltage switches shall have the ON and OFF positions indicated on the handle.
 - 4. If switches of higher ampere ratings are required, they shall be of similar type and quality to those shown above.
 - 5. Switches shall be located at 3"-6" centerline above finish floor, except where otherwise indicated. Groups of switches shown at one location shall be installed under a single plate having the proper number of openings, and appropriate to the location.
- B. Receptacles:
 - 1. All convenience receptacles and special outlets throughout shall be grounding type.
 - 2. Generally, convenience receptacles shall be specification grade, back or side wired, parallel slot, two-pole, three wire, 20 amp as follows:

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Duplex receptacle:	5362
Tamper resistant:	HBLSG63H
Ground fault circuit interruptors:	5362 GF

3. If receptacles of higher ampere ratings are required, they shall be of similar type and quality to those shown above.

4. Receptacle color shall be by the Architect.

5. Receptacles shall be located at 15 inches centerline above finish floor, except where otherwise indicated.

6. Special receptacles shall be as noted on the drawings. Furnish caps for all special outlets.

7. Connect all conductors in clamp/blade holes of wiring device.

C. Time Clocks:

1. Refer to Sports Lighting Controls section for control of exterior lighting circuits.

D. Cover Plates:

1. Provide wall plates for all wiring devices and outlet boxes, including special outlets, sound, signal, and telephone outlets, etc., as required. All cover plates shall be appropriate for the type of device.

2. All plates throughout shall be specifications grade stainless steel cover plates.

PART 3 – EXECUTION (NOT USED)

END OF SECTION 16140