b. Embedded:

- 1) Obtain County approval.
- 2) Materials: Concrete or metal.
- 3) Ends of metal spreaders coated with plastic coating 2-inches from each end.
- 8. Deposit concrete as nearly as practicable in its final position to avoid segregation.
 - a. Maximum free fall: 4 feet.
 - b. Free fall exceeding 4 feet: Place concrete by means of hopper, elephant trunk or tremie pipe extending down to within 4 feet of surface placed upon.
- 9. Perform the following operations before bleeding water has an opportunity to collect on surface:
 - a. Spread.
 - b. Consolidate.
 - c. Straightedge.
 - d. Darby or bull float.

B. Admixtures:

1. All admixtures to be introduced at the batch plant in accordance with manufacturer's recommendations.

C. Cold Weather Concrete Placement:

- 1. For this Detailed Provision Section, "cold weather" is defined as a period when for more than three (3) successive days, the average daily outdoor temperature drops below 40 Deg F. Calculate average daily temperature as the average of the highest and the lowest temperature during the period from midnight to midnight.
- 2. Batch, deliver, place, cure and protect concrete during cold weather in compliance with the recommendations of ACI 306R and the additional requirements of this Section.
- 3. Review the cold weather concreting plan at the preconstruction meeting. Include the methods and procedures for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete and the procedures to be implemented upon abrupt changes in weather conditions or equipment failures.
- 4. Do not place concrete or substrates that are below 32 Deg F or contain frozen material.
- 5. Maintain all materials, forms, reinforcement, subgrade and any other items which concrete will come in contact with free of frost, ice or snow at time of concrete placement.

6. The minimum temperature of concrete immediately after placement and during the protection periods shall be:

Minimum Concrete	Minimum Concrete
Temperature for Sections with	Temperature for Sections with
Dimension Less than 12-	Dimension 12-inches to 36-
inches	inches
(Deg F)	(Deg F)
55	50

The temperature of the concrete in place and during the protection period shall not exceed these values by more than 20 Deg F. Prevent overheating and non-uniform heating of the concrete.

- 7. Protect concrete during periods of cold weather to provide continuous warm, moist curing (with supplementary heat when required by weather conditions) for a total of at least 350 degree-days of curing.
 - a. Degree-days are defined as the total number of twenty-four (24) hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g. 7 days at an average 50 Deg F = 350 degree-days).
 - b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 Deg F as 0 Deg F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.
- 8. Do not use salt, manure or other chemicals for protection.
- 9. At the end of the protection period, allow the concrete to cool gradually to the ambient temperature. If water curing has been used, do not expose concrete to temperatures below those listed in this Section until at least twenty-four (24) hours after water curing has been terminated and air dry concrete for at least three (3) days prior to first exposure to freezing temperatures.
- 10. Heat subgrade, forms, and reinforcement so the temperature of the subgrade, forms, and reinforcement will be between 45 and 70 Deg F, when temperature of surrounding air is 40 Deg F or below at time concrete is placed.
 - a. Remove all frost from subgrade, forms and reinforcement before concrete is placed.
- 11. Do not place slabs on ground if temperature is below 40 Deg F or if temperature surrounding the slab will be below 40 Deg F before structure is enclosed and heated.
- 12. During periods not defined as cold weather, but when freezing temperatures are expected or occur, protect concrete surfaces from freezing for the first seventy-two (72) hours.

D. Hot Weather Concrete Placement:

- 1. For this Detailed Provision Section, "hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation as estimated in ACI 305R, approaching or exceeding 0.2 pounds per square foot per hour (lb/sq ft/hr).
- 2. Batch, deliver, place, cure and protect concrete during hot weather in compliance with the recommendations of ACI 305R and the additional requirements of this Section.
 - a. Temperature of concrete being placed shall not exceed 90 Deg F. Maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall not cause loss of sump, flash set or cold joints.
 - b. Promptly deliver concrete to the site and promptly place the concrete upon its arrival at the site, not exceeding the maximum time interval specified in Paragraph 3.02.A.10. Provide vibration immediately after placement.
 - c. The County may direct the Contractor to immediately cover concrete with sheet curing material.
- 3. Review the hot weather concreting plan at the preconstruction meeting. Include the methods and procedures for use during hot weather including production, placement, and curing.
- 4. Cool ingredients before mixing, or add flake ice or well crushed ice of a size that will melt completely during mixing for all or part of mixing water if high temperature, low slump, flash set, cold joints, or shrinkage cracks are encountered.
- 5. Temperature of concrete when placed:
 - a. Not to exceed 90 Deg F.
 - b. Not so high to cause:
 - 1) Shrinkage cracks.
 - 2) Difficulty in placement due to loss of slump.
 - 3) Flash set.
- 6. Temperature of forms and reinforcing when placing concrete:
 - a. Not to exceed 90 Deg F.
 - b. May be reduced by spraying with water to cool below 90 Deg F.
 - 1) Leave no standing water to contact concrete being placed.

E. Consolidating:

- 1. Consolidate in accordance with ACI 309R except as modified herein.
- 2. Consolidate by vibration so that concrete is thoroughly worked around reinforcement, embedded items and into corners of forms.

a. Eliminate:

- 1) Air or stone pockets.
- 2) Honeycombing or pitting.
- 3) Planes of weakness.

3. Internal vibrators:

- a. Minimum frequency of 8,000 vibrations per minute.
- b. Insert and withdraw at points approximately 18-inches apart.
 - 1) Allow sufficient duration at each insertion to consolidate concrete but not to cause segregation.
- c. Use in:
 - 1) Beams and girders of framed slabs.
 - 2) Columns and walls.
- d. Size of vibrators shall be in accordance with ACI 309R, Table 5.1.5.
- 4. Obtain consolidation of slabs with internal vibrators, vibrating screeds, roller pipe screeds, or other approved means.
- 5. Do not use vibrators to transport concrete within forms.
- 6. Provide spare vibrators on jobsite during all concrete placing operations.
- 7. Bring a full surface of mortar against form by vibration supplemented if necessary by spading to work coarse aggregate back from formed surface, where concrete is to have an as-cast finish.
- 8. Use suitable form vibrators located just below top surface of concrete, where internal vibrators cannot be used in areas of congested reinforcing.
- 9. Prevent construction equipment, construction operations, and personnel from introducing vibrations into freshly placed concrete after the concrete has been placed and consolidated.
- F. Handle concrete from mixer to place of final deposit by methods which will prevent segregation of loss of ingredients and in a manner which will assure that required quality of concrete is maintained.
 - 1. Use truck mixers, agitators, and non-agitating units in accordance with ASTM C94.
 - 2. Horizontal belt conveyors:
 - a. Mount at a slope which will not cause segregation or loss of ingredients.
 - b. Protect concrete against undue drying or rise in temperature.
 - c. Use an arrangement at discharge end to prevent segregation.
 - d. Do not allow mortar to adhere to return length of belt.
 - e. Discharge conveyor runs into equipment specially designed for spreading concrete.

3. Metal or metal line chutes:

- a. Slope not exceeding 1 vertical to 2 horizontal (1V:2H) and not less than 1 vertical to 3 horizontal (1V:3H).
- b. Chutes more than 20 feet long and chutes not meeting slope requirements may be used provided they discharge into a hopper before distribution.
- c. Provide end of each chute with a device to prevent segregation.
- 4. Pumping or pneumatic conveying equipment:
 - a. Designed for concrete application and having adequate pumping capacity.
 - b. Control pneumatic placement so segregation is avoided in discharged concrete.
 - c. Loss of slump in pumping or pneumatic conveying equipment shall not exceed 1½-inch.
 - d. Do not convey concrete through pipe made of aluminum or aluminum alloy.
 - e. Provide pumping equipment without Y sections.

3.04 JOINTS AND EMBEDDED ITEMS

A. Construction Joints – General:

- 1. Locate joints as indicated on Contract Drawings or as shown on approved Shop Drawings.
 - a. Where construction joint spacing shown on Drawings exceeds the joint spacing indicated in Paragraph B below, submit proposed construction joint location in conformance with this Detailed Provisions Section.
- 2. Unplanned construction joints will not be allowed.
 - a. If concrete cannot be completely placed between planned construction joints, then it must be removed.
- 3. In general, locate joints near middle of spans of slabs, beams and girders unless a beam intersects a girder at this point, in which case, offset joint in girder a distance equal to twice the width of the beam.
- 4. Locate joints in walls and columns at underside of floors, slabs, beams, or girders, and at tops of foundations or floor slabs, unless shown otherwise.
 - a. At Contractor's option, beam pockets may be formed into concrete walls.
 - b. Size pockets to allow beam reinforcing to be placed as detailed on Drawings.
- 5. Place beams, girders, column capitals and drop panels at same time as slabs.
- 6. Make joints perpendicular to main reinforcement with all reinforcement continuous across joints.

- 7. Provide roughened construction joints at all construction joints unless indicated otherwise.
 - a. Clean the previously hardened concrete interface and remove all laitance.
 - b. Intentionally roughen the interface to a full amplitude of ¼-inch.
 - c. Provide recessed flat surface as required to install strip type waterstops.
- 8. Provide continuous keyways only where indicated.
 - a. Construction joint keyways in walls, as indicated on Drawings.
 - b. Construction joint keyways in footings, foundations, base slabs, and structural or elevated slabs as indicated.
- 9. Allow a minimum of forty-eight (48) hours before placement of adjoining concrete construction.
- B. Construction Joints Spacing:
 - 1. Structures not intended to contain liquid:
 - c. Base slab, floor, and roof slab construction joints as indicated on Drawings.
- C. Construction Joints Bonding:
 - 1. Obtain bond between concrete pours at construction joints by thoroughly cleaning and removing all laitance from construction joints.
 - a. Before new concrete is placed, all construction joints shall be coated with cement grout, or dampened.
 - 1) General: Use cement grout or dampening for all construction joints.
 - 2. Roughened construction joints:
 - a. Roughen the surface of the concrete to expose the aggregate uniformly.
 - b. Remove laitance, loosened particles of aggregate or damaged concrete at the surface, or at the Contractor's option, use an approved chemical retarder which delays but does not prevent setting of the surface of the mortar in accordance with the manufacturer's recommendations.
 - 1) Retarded mortar shall be removed within twenty-four (24) hours after placing to produce a clean exposed aggregate bonding surface.
 - c. Cover the hardened concrete of horizontal joints with a coat of cement grout of similar proportions to the concrete, except substitute fine aggregate for coarse aggregate.
 - d. Place 1-inch layer of grout in bottoms of wall or column lifts immediately before placing concrete.
 - 1) Vibrate grout and first layer of concrete simultaneously.
 - e. Place fresh concrete before the grout has attained its initial set.

3. Other keyed construction joints:

- a. Thoroughly clean construction joints and remove all laitance.
- b. Dampen the hardened concrete (but do not saturate) immediately prior to placing of fresh concrete.

D. Locate control joints in slabs on grade as indicated on Drawings.

- 1. Time cutting properly with set of concrete, if saw cut joints are required or permitted.
 - a. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates being dislodged by saw.
 - b. Complete before shrinkage stresses become sufficient to produce cracking.
- 2. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - a. Grooved Joints: Form joints after initial floating by grooving and finishing each edge of joint to a radius of ½-inch. Repeat grooving of joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - b. Sawed Joints: Form joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random cracks. Seal all sawed joints with polyurea joint filler.

E. Isolation Joints in Slabs on Grade:

1. After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

F. Expansion Joints:

- 1. Do not permit reinforcement or other embedded metal items bonded to concrete (except smooth dowels bonded on only one (1) side of joint) to extend continuously through an expansion joint.
- 2. Use neoprene expansion joint fillers, unless noted otherwise.
- 3. Seal expansion joints with sealant backer rod and/or compressible filler as shown on the Drawings.

G. Other Embedded Items:

- 1. Place sleeves, inserts, anchors, and embedded items required for adjoining Work or for its support, prior to initiating concreting.
- 2. Do not place electrical conduit, drains, or pipes in of thru concrete slabs, walls, columns, foundations, beams or other structural members unless approved by the County.

H. Placing Embedded Items:

1. Position expansion joint material and other embedded items accurately.

- 2. Support against displacement.
- 3. Fill voids in sleeves, inserts and anchor slots temporarily with readily removable material to prevent entry of concrete into voids.

3.05 FINISHING

- A. See Detailed Provisions Section 03 3132 Concrete Finishing and Repair of Surface Defects.
- B. Coordinate mixing and placing with finishing.

3.06 INSTALLATION OF GROUT

- A. Grout Schedule of Use:
 - 1. Sand cement grout:
 - a. General use.
 - 2. Non-shrinking, non-metallic grout:
 - a. Filling form tie holes.
 - b. Under column and beam base plates.
 - c. Other uses indicated on the Drawings.
 - 3. Epoxy grout:
 - a. Patching cavities in concrete.
 - b. Other uses indicated on the Drawings.

B. Grout Installation:

- 1. Sand cement grout:
 - a. Cure grout by one (1) of methods specified.
- 2. Non-shrink, non-metallic grout:
 - a. Clean concrete surface to receive grout.
 - b. Saturate concrete with water for twenty-four (24) hours prior to grouting.
 - c. Mix in a mechanical mixer.
 - d. Use no more water than necessary to produce flowable grout.
 - e. Place in accordance with manufacturer's instructions.
 - f. Provide under beam, column, and equipment base plates, in joints between precast concrete filter slabs, and in other locations indicated on the Drawings.
 - g. Completely fill all spaces and cavities below the top of base plates.
 - h. Provide forms where base plates and bed plates do not confine grout.
 - i. Where exposed to view, finish grout edges smooth.

- j. Except where a slope is indicated on the Drawings, finish edges flush at the base plate, bed plate, member or piece of equipment.
- k. Coat exposed edges of grout with cure or seal compound recommended by the grout manufacturer.

3. Epoxy grout:

- a. Mix and place in accordance with manufacturer's instructions.
- b. Apply only to clean, dry, sound surface.
- c. Obtain manufacturer's field technical assistance as required to assure proper placement.

3.07 CURING AND PROTECTION

- A. Protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury immediately after placement, and maintain with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement, hardening, and compressive strength gain.
 - 1. Comply with ACI 306R for cold-weather protection during curing.
 - 2. Comply with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lbs/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. In accordance with ACI 308.1, apply one of the following curing procedures immediately after completion of placement and finishing, for concrete surfaces not in contact with forms.
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven (7) days.
 - 2. Moisture-Retaining Cover Curing: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12-inches, and sealed by waterproof tape or adhesive. Cure for not less than seven (7) days. Immediately repair any holes or tears during curing period using cover material and waterproof tape. Application of waterproof sheet materials, conforming to ASTM C171.
 - 3. Curing Compound: Application of a curing compound conforming to ASTM C309.
 - a. Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's recommendations immediately after any water sheen which may develop after finishing has disappeared from concrete surface.
 - b. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.

- c. Do not use on any surface against which additional concrete or other material is to be bonded unless it is proven that curing compound will not prevent bond.
- d. Where a vertical surface is cured with a curing compound, the vertical surface shall be covered with a minimum of two (2) coats of the curing compound.
 - 1) Apply the first coat of curing compound to a vertical surface immediately after form removal.
 - 2) The vertical concrete surface at the time of receiving the first coat shall be damp with no free water on the surface.
 - 3) Allow the preceding coat to completely dry prior to applying the next coat.
 - 4) A vertical surface: Any surface steeper than 1 vertical to 4 horizontal (1V:4H).

D. Curing Concrete in Contact with Forms:

- 1. Minimize moisture loss from and temperature gain of concrete placed in forms exposed to heating by sun by keeping forms wet and cool until they can be safely removed.
- 2. After form removal, cure concrete until end of time prescribed.
 - a. Use one (1) of methods listed above.
- 3. Forms left in place shall not be used as a method of curing in hot weather.
- 4. In hot weather, remove forms from vertical surfaces as soon as concrete has gained sufficient strength so that the formwork is no longer required to support the concrete.
- E. Continue curing for at least seven (7) days for all concrete except high early strength concrete for which period shall be at least three (3) days.
 - 1. If one of curing procedures indicated above is used initially, it may be replaced by one of other procedures indicated any time after concrete is one (1) day old, provided concrete is not permitted to become surface dry during transition.

F. Cold Weather:

- 1. Follow recommendations of ACI 306R.
- 2. Maintain temperature of concrete between 50 and 70 Deg F for required curing period, when outdoor temperature is 40 Deg F, or less.
- 3. Use heating, covering, insulating, or housing of the concrete work to maintain required temperature without injury due to concentration of heat.
- 4. Do not use combustion heaters unless precautions are taken to prevent exposure of concrete to exhaust gases which contain carbon dioxide.
- 5. Interior slabs in areas intended to be heated shall be adequately protected so that frost does not develop in the supporting subgrade.

G. Hot Weather:

- 1. Follow recommendations of ACI 301.
- 2. Make provision for cooling forms, reinforcement and concrete, windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material.
- 3. Provide protective measures as quickly as concrete hardening and finishing operations will allow.

H. Rate of Temperature Change:

- 1. Keep changes in temperature of air immediately adjacent to concrete as uniform as possible, during and immediately following curing period.
- 2. Do not exceed a temperature change of 5 Deg F in any one (1) hour or 50 Deg F in any twenty-four (24) hour period.

I. Protection from Mechanical Injury:

- 1. Protect concrete from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration.
- 2. Protect finished concrete surfaces from damage by construction equipment, materials, or methods, and by rain or running water.
- 3. Do not load self-supporting structures in such a way as to overstress concrete.

3.08 CLEAN UP

- A. Upon completion of all concrete work and before Substantial Completion, the Contractor shall remove all tools, surplus materials, apparatus, debris, etc., from the site and the site shall be left in a clean, neat, and acceptable condition to the County.
- B. Hardened concrete material accumulated in the designated washout area for the Project shall be recycled by the Contractor, using a "no charge" account, at the Blythe and Oasis Sanitary Landfills. The Contractor shall break-up material to the County's satisfaction, load, and haul the material through the Blythe and Oasis Sanitary Landfills fee booth/scale and unload material in an area within the landfill unit designated for construction and demolition (C&D) debris recycling. The material shall be accepted by the County as "beneficial reuse" material for future use at the landfill for soil stabilization projects.

3.09 FIELD QUALITY CONTROL

- A. Tests in accordance with Detailed Provisions Section 03 0505 Concrete Testing.
 - 1. Perform a strength test on all concrete to which water or superplasticizer, above the amount stated in the approved concrete mix design, has been added.
 - a. Perform sampling after water or superplasticizer has been added and additional mixing has been performed.

B.	All cracks wider than ¹ / ₆₄ -inch in new concrete appearing within six (6) months of concrete placement shall be repaired using epoxy adhesive injection by the Contractor at no cost to the County.
	END OF SECTION 03 3131
	CONCRETE MIXING, PLACING, JOINTING, AND CURING



SPECIFICATIONS – DETAILED PROVISIONS SECTION 03 3132: CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS

CONTENTS

PART 1	I GENERAL	1
1.01	SUMMARY	1
	QUALITY ASSURANCE	
1.03	DEFINITIONS	2
1.04	SUBMITTALS	2
1.05	DELIVERY, STORAGE AND HANDLING	3
PART 2	2 PRODUCTS	3
2.01	ACCEPTABLE MANUFACTURERS	3
	MATERIALS	
	MIXES	
PART 3	S EXECUTION	4
3.01	PREPARATION	4
3.02	INSTALLATION AND APPLICATION	6
3.03	FIELD QUALITY CONTROL	8





SECTION 03 3132 CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: This Work consists of providing concrete surface finishes and repairing surface finishes of all defects.
 - 1. This Work includes but is not limited to:
 - a. Structural Foundations/Footings.
 - b. Structural Slabs, girders, beams, and columns.
 - c. Structural walls, stem walls, and curbs.
 - d. Mow-strips.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Section 03 1113 Formwork Structural Cast-In-Place Concrete
 - 2. Section 03 3100 Cast-In-Place Structural Concrete
 - 3. Section 03 3131 Concrete Mixing, Placing, Jointing and Curing

1.02 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. ACI 301 Specification for Structural Concrete.
 - b. ACI CT Concrete Terminology.
 - 2. American Society for Testing and Materials (ASTM):
 - a. ASTM C150 Standard Specification for Portland Cement.
 - b. ASTM D4258 Standard Practice for Surface Cleaning Concrete for Coating.
 - c. ASTM D4259 Standard Specification for Abrading Concrete.
 - 3. The Society for Protective Coatings/NACE International (SSPC/NACE):
 - a. SSPC/NACE No. 6 Surface Preparation of Concrete

B. Qualifications:

- 1. Manufacturer of acrylic epoxy surface/filler shall have minimum of five (5) years of experience in manufacturing of same with documented performance history for similar installations.
- 2. Installer/applicator of acrylic epoxy surfacer/filler shall have minimum of three (3) years of experience installing similar materials and shall be licensed or approved in writing by manufacturer to install/apply this product.

CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS

1.03 **DEFINITIONS**

A. Vertical Surface Defects:

- 1. Any void in the face of the concrete deeper than \%-inch, such as:
 - a. Tie holes.
 - b. Air pockets (bug holes).
 - c. Honeycombs.
 - d. Rock holes.
- 2. Scabbing:
 - a. Scabbing is defect in which parts of the form face, including release agent, adhere to concrete.
- 3. Foreign material embedded in face of concrete.
- 4. Fins $\frac{1}{16}$ -inch or more in height.
- B. Installer or Applicator:
 - 1. Installer or applicator is the person actually installing or applying the product in the field at the Project Location.
 - 2. Installer or applicator are synonymous.
- C. Other words and terms used in this Detailed Provisions Section are defined in ACI CT.

1.04 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. Product technical data, including, but not limited to:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
- C. Quality Assurance Submittals:
 - 1. Certifications:
 - a. Certification of aggregate gradation.
 - b. Certification that products being used will not interfere with bonding of future floor or wall finishes.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's recommendations and requirements for materials used.
- B. Materials shall be delivered to the jobsite in sealed, undamaged containers. Each container shall be clearly marked with manufacturer's label showing type of material, color and lot number.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Bonding agents:
 - a. Euclid Chemical Company; www.euclidchemical.com
 - a. L&M Construction Chemicals a part of LATICRETE, Inc.; www.lmcc.com
 - b. Master Builders Solutions by BASF; www.master-builders-solutions.basf.us
 - c. Or approved equal.
- B. Submit request for substitution in accordance with Detailed Provisions Section 01 6000
 Product Requirements.

2.02 MATERIALS

- A. Bonding Agent:
 - 1. For use only on concrete surfaces not receiving liquid water repellent coating:
 - High solids acrylic latex base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.
 - 2. For use only on concrete surface receiving liquid water repellent:
 - a. Non-acrylic base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.
- B. Cement:
 - 1. ASTM C150, Type II Portland.
- C. Aggregate:
 - 1. Sand: Maximum size #30 mesh sieve.
 - 2. For exposed aggregate finish surfaces: Same as surrounding floor and/or wall.
- D. Water: Potable.
- E. Non-Shrink Grout: See Detailed Provisions Section 03 3100 Cast-In-Place Structural Concrete and Detailed Provisions Section 03 3131 Concrete Mixing, Placing, Jointing and Curing.

CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS

2.03 MIXES

- A. Bonding Grout: One (1) part cement to one (1) part aggregate.
- B. Patching Mortar:
 - 1. One (1) part cement to two and one-half $(2\frac{1}{2})$ parts aggregate by damp loose volume.
 - a. Substitute white Portland cement for a part of gray Portland cement to produce color matching surrounding concrete.

PART 3 EXECUTION

3.01 PREPARATION

- A. For methods of curing, see Detailed Provisions Section 03 3131 Concrete Mixing, Placing, Jointing and Curing.
- B. Preparation of Bonding Grout Mixture:
 - 1. Mix cement and aggregate.
 - 2. Mix bonding agent and water together in separate container in accordance with manufacturer's instructions.
 - 3. Add bonding agent/water mixture to cement/aggregate mixture.
 - 4. Mix to consistency of thick cream.
 - 5. Bonding agent itself may be used as bonding grout if approved by manufacturer and County.
- C. Preparation of Patching Mortar Mixture:
 - 1. Mix cement and aggregate.
 - 2. Mix bonding agent and water together in separate container in accordance with manufacturer's instructions.
 - 3. Add only enough bonding agent/water mixture to cement/aggregate mixture to allow handling and placing.
 - 4. Let stand with frequent manipulation with a trowel, until mix has reached stiffest consistency to allow placement.
- D. Clean surfaces in accordance with ASTM D4258 to remove dust, dirt, form oil, grease, or other contaminants prior to abrasive blasting, chipping, grinding or wire brushing.
 - 1. Abrasive blast surfaces in accordance with ASTM D4259 and SSPC/NACE No. 6 to completely open defects down to sound concrete and remove laitance.
 - a. If additional chipping or wire brushing is necessary, make edges perpendicular to surface or slightly undercut.
 - b. No featheredges will be permitted.

2. Rinse surface with clean water and allow surface water to evaporate prior to repairing surface defects.

E. Repairing Surface Defects:

- 1. Fill and repair using patching mortar mix specified in Paragraph 2.03.
 - a. Use non-shrink grout to fill tie-holes as outlined in this Detailed Provisions Section.
- 2. If required by bonding agent manufacturer, etch surfaces with a muriatic acid solution followed by a thorough rinse with clean water.
 - a. Test concrete to determine pH level and continue flushing with clean water until surface pH is within acceptable limits.
- 3. Dampen area to be patched and an area at least 6-inches wide surrounding it prior to application of bonding grout.
- 4. Brush bonding grout into the surface after the surface water has evaporated.
- 5. Allow bonding grout to set for period of time required by bonding agent manufacturer before applying premixed patching mortar.
- 6. Fill tie-holes with non-shrink nonmetallic grout.
 - a. Where exposed to view and scheduled to receive concrete Finish #2 or #5, hold grout below surface of concrete and fill with patching mortar to match surrounding concrete.
- 7. Fill all other defects with patching mortar.
 - a. Match color of surrounding floor and/or wall.
 - b. Do not use acrylic bonding agent in patching mortar for filling defects in surfaces to be treated with liquid water repellent.
- 8. Consolidate grout or mortar in place and strike off so as to leave patch slightly higher than surrounding surface.
- 9. Leave undisturbed for at least sixty (60) minutes before finishing level with surrounding surface.
 - a. Do not use metal tools in finishing a patch in a formed wall which will be exposed or coated with other materials.
- 10. Keep areas damp in accordance with grout manufacturer or bonding agent manufacturer's directions.

3.02 INSTALLATION AND APPLICATION

- A. Do not repair surface defects or apply wall or floor finishes when temperature is or is expected to be below 50 Deg F.
 - 1. If necessary, enclose and heat area to between 50 and 70 Deg F during repair of surface defects and curing of patching material.
 - a. Use only clean fuel, indirect fired heating apparatus.
- B. Concrete Finishes for Vertical Wall Surfaces:
 - 1. General: Give concrete surfaces finish as specified below after removal of formwork and repair of surface defects.
 - 2. Finish #1 As cast rough form finish:
 - a. Selected forming materials are not required.
 - b. Prepare surface in accordance with Paragraph 3.01 and repair the following surface defects:
 - 1) Tie holes.
 - 2) Honeycombs deeper than ¼-inch.
 - 3) Air pockets deeper than ½-inch.
 - 4) Rock holes deeper than 1/4-inch.
 - c. Chip or rub off fins exceeding 1/4-inch in height.
 - d. Use at unexposed surfaces such as foundations and backfilled surfaces of walls not to be waterproofed.
 - 3. Finish #2 As cast form finish:
 - a. Form facing material shall produce a smooth, hard, uniform texture.
 - Use forms specified for surfaces exposed to view in accordance with Detailed Provisions Section 03 1113 – Formwork – Structural Cast-In-Place Concrete.
 - b. Prepare surface in accordance with Paragraph 3.01 and repair the following surface defects.
 - 1) Tie holes.
 - 2) Honeycombs deeper than ¼-inch or larger than ¼-inch diameter.
 - 3) Air pockets deeper than ¼-inch or larger than ¼-inch diameter.
 - 4) Rock holes deeper than \(\frac{1}{4} \)-inch or larger than \(\frac{1}{4} \)-inch diameter.
 - 5) Scabbing.
 - c. Chip or rub off fins exceeding $\frac{1}{8}$ -inch in height.
 - 1) Finish shall provide uniform color and texture.

d. Provide this finish for:

- 1) Inside walls of wet walls, basins, secondary containment, maintenance vaults, and pipe trenches.
- 2) Walls being waterproofed and coated with some other material.
- 3) Exposed surfaces not specified to receive another finish.

C. Related Unformed Surfaces (Except Slabs)

- 1. Strike smooth and level tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces after concrete is placed.
- 2. Float surface to a texture consistent with that of formed surfaces.
 - a. If more than one (1) finish occurs immediately adjacent to unformed surface, provide surface with most stringent formed surface requirement.
- 3. Continue treatment uniformly across unformed surfaces.

D. Concrete Finishes for Horizontal Slab Surfaces:

1. General:

- a. Tamp concrete to force coarse aggregate down from surface.
- b. Screed with straightedge, eliminate high and low places, bring surface to required finish elevations; slope uniformly to drains.
- c. Dusting of surface with dry cement or sand during finishing processes not permitted.

2. Unspecified slab finish:

- a. When type of finish is not indicated, use following finishes as applicable:
 - 1) Floors: Broom, belt or trowled finish.
 - 2) Maintenance areas floors and ramps: Broom or belt finish.
 - 3) Exterior slabs, sidewalks, platforms, steps and landings, and ramps, not covered by other finish materials: Broom or belt finish.
 - 4) All slabs to receive a floated finish before final finishing.
- Scratched slab finish: After concrete has been placed, consolidated, struck off, and leveled to a Class B tolerance, roughen surface with stiff brushes or rakes before final set.

4. Floated finish:

- a. After concrete has been placed, consolidated, struck off, and leveled, do no further work until ready for floating.
- b. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operations.
 - 1) Use wood or cork float.

- c. During or after first floating, check planeness of entire surface with a 10-foot straightedge applied at not less than two (2) different angles.
- d. Cut down all high spots and fill all low spots to produce a surface with Class B tolerance throughout.
- e. Refloat slab immediately to a uniform texture.

5. Troweled finish:

- a. Float finish surface to true, even plane.
- b. Power trowel, and finally hand trowel.
- c. First troweling after power troweling shall produce a smooth surface which is relatively free of defects, but which may still show some trowel marks.
- d. Perform additional trowelings by hand after surface has hardened sufficiently.
- e. Final trowel when a ringing sound is produced as trowel is moved over surface.
- f. Thoroughly consolidate surface by hand troweling.
- g. Leave finished surface essentially free of trowel marks, uniform in texture and appearance and plane to a Class A tolerance.
- h. On surfaces intended to support floor coverings, remove any defects that would show through floor covering by grinding.
- 6. Broom of belt finish: Immediately after concrete has received a float finish as specified, give it a transverse scored texture by drawing a broom or burlap belt across surface.
- 7. Underside of concrete slab finish:
 - a. Match finish as specified for adjacent vertical surfaces.
 - b. If more than one (1) finish occurs immediately adjacent to underside of slab surface, provide surface with most stringent formed surface requirement.

3.03 FIELD QUALITY CONTROL

- A. Horizontal slab finishes will be accepted provided:
 - 1. Applicable specification requirements are satisfied.
 - 2. Water does not pond in areas sloped to drain.
 - 3. Gap between a 10-foot straightedge placed anywhere and the finished surface does not exceed:
 - a. Class A tolerance: 1/8-inch.
 - b. Class B tolerance: 1/4-inch.
 - c. Class C tolerance: ½-inch.
 - 4. Accumulated deviation from intended true plane of finished surface does not exceed ½-inch.

- 5. Accuracy of floor finish does not adversely affect installation and operation of movable equipment, floor supported items, or items fitted to floor (doors, tracks, etc.).
- B. Unacceptable finishes shall be replaced or, if approved in writing by County, may be corrected provided strength and appearance are not adversely affected.
 - 1. High spots to be removed by grinding and/or low spots filled with a patching compound or other remedial measures to match adjacent surfaces.

END OF SECTION 03 3132





SPECIFICATIONS – DETAILED PROVISIONS SECTION 08 7050: MULTI-USER GATE PADLOCKS CONTENTS

GENERAL	1
SUMMARY	1
SUBMITTALS	1
EXTENDED WARRANTY	
DELIVERY, STORAGE, AND HANDLING	1
PRODUCTS	2
ACCEPTABLE MANUFACTURERS	2
PADLOCKS AND SHIELDS	2
EXECUTION	3
EXAMINATION	3
INSTALLATION	
FIELD QUALITY CONTROL	3
	SUMMARY





SECTION 08 7050 MULTI-USER GATE PADLOCKS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Furnish all necessary hardware, supplies, tools, and labor for the installation of multi-user gate padlock systems.
- B. Related Specification Sections include, but are not limited to:
 - 1. Division 01 General Requirements.

1.02 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American National Standards Institute (ANSI)/Builders Hardware Manufacturers Associations (BHMA):
 - 2. California Building Code (CBC)

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. Product technical data for items listed under Part 2, including, but not limited to:
 - a. Manufacturer's product data sheets and installation instructions for all materials.
- C. Closeout Submittals:
 - 1. Extended Warranty: Provide two (2) executed copies of the Extended Warranty required by this Section in accordance with the provisions of Detailed Provisions Section 01 7700 Closeout Procedures.

1.04 EXTENDED WARRANTY

- A. In accordance with the provisions of Detailed Provisions Section 01 7700 Closeout Procedures, provide an Extended Warranty for the Work of this Section:
 - 1. Warranty period for multi-user gate padlock system is twenty (20) years commencing from the date of Final Completion.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually.

MULTI-USER GATE PADLOCKS

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Multi-User Gate Padlock System:
 - a. Tayhope; www.tayhope.com
 - b. Or approved equal.
- B. Submit request for substitution in accordance with Detailed Provisions Section 01 6000 Product Requirements.

2.02 PADLOCKS AND SHIELDS

- A. Multi-User Gate Padlock System:
 - 1. Provide manufacturer's standard hardware, which may include, but is not limited to:
 - a. 100% stainless steel body with forged high tensile padlock holders;
 - b. Catch on the end of one (1) 5/16-inch (8 mm) stainless steel 30-inch (750 mm) long chain sheathed in a protective nylon cover catch or one (1) bolt-on catch;
 - c. One (1) pin blanking kit;
 - d. One (1) standard fitting template.
 - 2. Shall accommodate a minimum of three (3) padlock spaces;
 - 3. Material Grade: 304 & 316 stainless steel;
 - 4. Padlock Shackel Size: Up to 9/16-inch (14 mm).
- B. Multi-User Gate Padlock Shield:
 - 1. Material Grade: 304 stainless steel;
 - 2. Can be fitted to multi-user padlock system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine gates, hardware, related items, and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's installation instructions.
- B. Multi-user gate padlock system and shield shall be installed at the locations indicated on Project Drawings and mounted per manufacturer's recommendations.

3.03 FIELD QUALITY CONTROL

- A. Adjust and check each operating item of hardware to assure proper operation or function.
 - 1. Lubricate moving parts with lubricant recommended by manufacturer.
 - 2. Report findings, in writing, outlining corrective actions and recommendations.

END OF SECTION 08 7050





SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0500: BASIC ELECTRICAL REQUIREMENTS CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
1.02		
1.03	DEFINITIONS	
1.04	UTILITY COMPANY REQUIREMENTS	
1.05	SUBMITTALS	3
1.06	PRODUCT DELIVERY, STORAGE, AND HANDLING	<i>6</i>
1.07	JOB CONDITIONS	
1.08	GUARANTEE AND WARRANTY	8
PART 2	PRODUCTS	8
2.01	MATERIALS AND EQUIPMENT	8
PART 3	B EXECUTION	9
3.01	GENERAL	
3.02	SUPERVISION	
3.03	WORKMANSHIP	
3.04	PREPARATION AND CLEAN UP	
3.05	PROTECTIVE DEVICE ADJUSTMENTS	10
3.06	INSPECTION AND TESTING	
3.07	COMPLETION	11





SECTION 26 0500 BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

- 1. Requirements of this Detailed Provisions Section apply to all electrical systems provided on the Project including those found in other Divisions even if not specifically referenced in individual Articles of those Detailed Provisions Sections.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Division 26 Electrical.

1.02 **QUALITY ASSURANCE**

A. Qualifications of Manufacturers

1. Furnish manufacturer's electrical equipment of type specified which has successfully operated for not less than the past two (2) years except where specific types are named by manufacturer and catalog or designation under other sections of Division 26.

B. Factory Tests

- 1. Factory tests are required for all electrical equipment and assemblies, i.e. applicable to the specific Project. Perform factory tests in accordance with the codes and standards specified as applicable to the equipment. Items to be factory tested shall include, but not limited to:
 - a. Solid State Starters
 - b. Induction Motors
 - c. Variable Frequency Drives (VFDs)
 - d. Motor Control Centers
 - e. Service and Distribution Boards
 - f. Programmable Logic Controllers (PLCs)
 - g. Referenced Codes and Standards
- 2. Provide electrical equipment and materials, including installation, conforming to the following latest codes and standards, as applicable. The equipment and materials shall bear labels to indicate manufacturing conformance to the specified standards or equal. Where two (2) codes or standards are at variance, conform to the more restrictive requirement:

- a. Aluminum Association (AA)
- b. American National Standards Institute (ANSI)
- c. American Society for Testing and Materials (ASTM)
- d. California Building Code (CBC), Title 24, Parts 1 and 2
- e. California Code of Regulations (CCR), Title 8, Subchapter 5
- f. California Electrical Code (CEC), Title 24, Part 3
- g. California Fire Code (CFC), Title 24, Part 9
- h. California Occupational Safety and Health Administration (CalOSHA)
- i. California State Fire Marshall
- i. Certified Ballast Manufacturers Standards
- k. Illuminating Engineering Society Handbook Standards
- 1. Institute of Electrical and Electronic Engineers (IEEE)
- m. Insulated Power Cable Engineers Association Standards
- n. International Electrotechnical Commission (IEC)
- o. National Electrical Code (NEC)
- p. National Electrical Manufacturers' Association (NEMA)
- q. National Electrical Safety Code
- r. National Electrical Testing Association (NETA)
- s. National Fire Protection Association (NFPA)
- t. Underwriters Laboratories (UL)

1.03 **DEFINITIONS**

- A. For the purposes of providing materials and installing electrical work the following definitions shall be used.
 - 1. Outdoor area: Exterior locations where the equipment is normally exposed to the weather and including below-grade structures, such as handholes, pull boxes, and vaults. This also includes structures that are not completely enclosed on all sides and are not provided with a climate control system.
 - 2. Architecturally finished interior area: Areas within enclosed buildings that are occupied workspaces such as offices, conference rooms, and other similar occupied spaces.
 - 3. Non-architecturally finished interior area: Electrical rooms, communication rooms, maintenance facilities, garage, shed, warehouses, and other similar process type rooms.
 - 4. Corrosive area: Areas identified in the Project Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or

- chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.
- 5. Hazardous areas: Class I, II, or III areas as defined in NFPA 70.

1.04 UTILITY COMPANY REQUIREMENTS

- A. The serving utility for the Blythe Sanitary Landfill (BLY) is Southern California Edison (SCE).
- B. Contractor shall comply with utility standards and coordinate installations with SCE as necessary. Contractor shall coordinate utility approval of switchboard Shop Drawings prior to ordering equipment.
- C. Comply with all SCE requirements for utility service as follows:
 - SCE Electrical Service Requirements, www.sce.com/nrc/aboutsce/regulatory/distributionmanuals/esr.pdf
 - 2. SCE Underground Structures Standards, www.sce.com/nrc/aboutsce/regulatory/distributionmanuals/ugs.pdf
- D. The serving utility for the Oasis Sanitary Landfill (OA) is Imperial Irrigation District (IID).
- E. Contractor shall comply with utility standards and coordinate installations with IID as necessary.

1.05 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. General Requirements:
 - 1. Provide manufacturer's technical information on products to be used, including product descriptive bulletin.
 - 2. Include data sheets that include manufacturer's name and product model number. Clearly identify all optional accessories.
 - 3. Acknowledgement that products are UL listed or constructed utilizing UL recognized components.
 - 4. Manufacturer's delivery, storage, handling, and installation instructions.
 - 5. Product schematic wiring diagrams and connection wiring diagram.
 - 6. See individual Detailed Provisions Sections for any additional requirements.

C. Shop Drawings

1. Time Schedules for Submission and Ordering: The Contractor shall prepare, review and coordinate their schedule of submissions carefully, determining the necessary lead time for preparing, submitting, checking, ordering and delivery of materials and equipment for timely arrival. The Contractor shall be responsible for

- conformance with the overall construction schedule. The Contractor shall not deliver any equipment or material before completion of submittal review and approval by the County.
- 2. Submit, for County approval, Shop Drawings to the extent required in the Contract Documents. Submit Shop Drawings for the following:
 - a. Switchboards/Panelboards
 - b. Induction Motors
 - c. Nameplates for Equipment
 - d. Pull Boxes (24-inches square and larger)
 - e. Solid State Starters
 - f. Programmable Logic Controllers (PLCs)
 - g. Transfer Switches
 - h. Variable Frequency Drives (VFDs)
- 3. Submittals will be checked for general compliance with specifications. The Contractor shall be responsible for deviations from the Drawings and/or Specifications and for errors or omissions of any sort in submittals.
- 4. Submit data for earthquake design and restraint with the Shop Drawing submittals for all switchgear and motor control centers. Include details for anchoring of same. Calculations and details shall be stamped by a California registered "Civil" or "Structural" engineer.
- 5. Submit a complete list of materials and equipment proposed for the job, including manufacturer's names and catalog numbers. Complete equipment description, operation, and installation data shall be submitted with Shop Drawings. Shop Drawings shall include, but are not limited to the following:
 - a. Dimensions and weights of equipment.
 - b. Nameplate data including the nameplate material, heights of letters and inscriptions.
 - c. Details showing enlarged views of small parts when required.
 - d. Plans showing the equipment assembly, space requirements, clearances, and locations for conduits and anchor bolts.
 - e. Elevations showing the vertical components, positions and arrangement of equipment.
- 6. Shop Drawings shall be submitted in completed groups of materials (i.e. switchgear).
- 7. Bind catalog cuts, plate numbers, descriptive bulletins and drawings, 11" x 17" or smaller, in sets with covers neatly showing titles. In addition to hard copies, provide digital copies of all Shop Drawings in Adobe Acrobat PDF format.
- 8. Where current limiting devices are specified, submit technical data to substantiate

- adequate protection of equipment cascaded downstream. Submittals shall not be reviewed unless supporting calculations and data are submitted.
- 9. For any material specified to meet UL of trade standards, furnish the manufacturer's or vendor's certification that the material furnished for the Work does in fact equal or exceed such Specifications.

D. Protective Device Coordination Study

- 1. Submit a protective device coordination study in accordance with IEEE Standard 242 (Buff Book).
- 2. Provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full-size log-log forms. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device, identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.
- 3. Include on curve sheet, power company relay and fuse characteristics, system medium-voltage equipment relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, pertinent motor and generator characteristics, and characteristics of other system load protective devices, include at least all devices down to largest branch circuit and largest feeder circuit breaker in each motor control center. Include all adjustable setting ground fault protective devices. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Show transformer full load and 150%, 400%, or 600% currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and symmetrical and asymmetrical fault currents at each switchgear and panel board. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current to which the device is exposed.

4. Arc Flash Hazard Analysis Study

- a. Submit an Arc Flash Hazard Analysis Study per requirement set forth in NFPA 70E Standard for Electrical Safety in Workplace. The Arc Flash Hazard Analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E Annex D.
- 5. See Detailed Provisions Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.

E. Record As-Built Drawings

1. Prepare and submit for all Work included in Divisions 26, 32, and 33.

F. Materials List

1. Submit material lists for County review prior to purchase. The material lists shall include all products described in Divisions 26, 32, and 33, including the equipment that shall have Shop Drawings.

G. Technical Data

1. Submit descriptive and instruction manuals to the extent required under this Section and other Sections of Division 26.

H. Manufacturers Certified Reports

- 1. The equipment manufacturer or their authorized representative shall submit a notarized written report with respect to their equipment certifying that:
 - a. The equipment has been properly installed, wired, and connected under their supervision;
 - b. The equipment is in accurate alignment;
 - c. Manufacturer was present when equipment was placed in operation;
 - d. Manufacturer checked, inspected, and adjusted the equipment as necessary;
 - e. The equipment has been operated under full load conditions and operated satisfactorily; and
 - f. The equipment is fully covered under the terms of the warranty. Copies of all warranties shall be submitted to the County.

I. Operation and Maintenance Manuals

1. Submit complete and at one time, prior to acceptance of installation, three (3) copies of manufacturer's instructions for operation and maintenance of electrical equipment, including replacement parts lists. In addition to hard copies, provide digital copies of all data in Adobe Acrobat PDF format.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver electrical materials and equipment in manufacturer's original cartons or containers with seals intact, as applicable. Unless otherwise specified, deliver conductors in sealed cartons or on sealed reels, ends of reeled conductors factory sealed. Deliver large multicomponent assemblies in sections that facilitate field handling and installation.
- B. Unless designed for outdoor exposure, store electrical materials off the ground and under cover to prevent corrosion, contamination, or deterioration.
- C. Handle materials and equipment in accordance with manufacturer's recommendations. Lift large or heavy items only at points designated by the manufacturer. Use padded slings and hooks for lifting as necessary to prevent damage.
- D. Protect electrical materials and equipment until Final Acceptance. Protect factory painted surfaces from impact, abrasion, discoloration, and other damage. Keep electrical equipment, materials, and insulation dry at all times. Maintain heaters in equipment connected and operating until equipment is placed in operation. If partial dismantling of equipment is required for installation, box or wrap the removed parts until reinstalled. Repair or replace damaged Work as directed, at no additional cost to the County.

BASIC ELECTRICAL REQUIREMENTS

- E. Notify County in writing if any equipment or material is damaged. Do not repair damaged products without prior written approval from the County.
- F. All equipment handled by the Contractor shall be delivered, staged, and installed so as to avoid interference with the landfill's daily operation.

1.07 JOB CONDITIONS

- A. Project Drawings are diagrammatic and indicate the general layout of the complete Work. Locations of equipment, inserts, anchors, motors, panels, pull boxes, conduits, stub-ups, fittings, and outlets are approximate. Exercise care to secure approved headroom and clearances, and to overcome structural interference. Verify scaled dimensions, field dimensions, and conditions of the jobsite.
- B. Underground electrical lines shown on the Project Drawings are, to a degree, symbolic. When the lines are installed, they shall follow as close as possible the locations shown on the Project Drawings; however, they shall be relocated if necessary to avoid interference with other underground utilities either existing or new. The difference between the actual location and the location shown on the Project Drawings shall be kept to a minimum. All deviations from the alignments shown on the Project Drawings must be approved in writing by the County.
- C. When performing underground work, the Contractor shall call Underground Service Alert of Southern California (USA/SC) at 811, the one-call underground facility locating service two (2) Working Days prior to making an excavation. Contractor shall be responsible for such notification of Subcontractor's work or shall require Subcontractor to assume this responsibility.
- D. Before proceeding with trenching, the Contractor shall investigate the proposed location to determine subsurface conditions or the existence of foreign pipes or ducts. If foreign substructures are found in or along the trenching path, trenching will be stopped until their purpose and ownership is investigated for proper installation of underground conduits. It may be necessary to utilize an electronic locating device or dig test holes to locate any underground obstacles.
- E. Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Excavation made with power-driven equipment is not permitted within five (5) feet of any known utility or subsurface construction. For Work immediately adjacent to or for excavations exposing a utility or other buried obstruction, the Contractor shall use hand labor or light equipment excavation. The Contractor shall start hand labor or light equipment excavation on each side of the encountered obstruction and continue until the obstruction is uncovered or until adequate clearance for the new proposed conduits are assured. The Contractor shall support uncovered substructures or other existing elements affected by the excavation until approval for backfill is granted by the County or its representative. The Contractor shall report damage to utility lines or subsurface construction immediately to the County.
- F. The Contractor shall provide temporary steel plating and shoring support for the plates, to completely cover the excavation created across roadways. Temporary steel plating

must be provided by the Contractor for areas which will remain open overnight. The temporary plating shall be a minimum of 0.75-inch thickness steel, but in no case shall the thickness be less than that required to support AASHTO-H20 traffic loading. Provide a visible barrier along the excavation path on each side of the roadway with a combination of highly visible "Caution Tape" and construction cones.

- G. The Contractor shall protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion, settlement, or any other damage. The Contractor shall repair and re-establish damaged or eroded grades and slopes and restore surface conditions prior to final acceptance by the County.
- H. Coordinate electrical work with all trades, code authorities, public utilities, and County. Where two (2) or more trades interface in an area, verify that no electrical work is omitted.
- I. Keep power shutdown periods to the minimum time feasible, and only for such times and durations as approved by the County. Submit written request for outage approval at least ten (10) Working Days in advance of need, stating date, time and probable duration of the outage. Contractor shall bear all overtime costs for outages required to be performed during non-working hours.
- J. Installation areas for electrical equipment, materials, and wiring are classified as "Non-Hazardous" unless otherwise indicated or specified.

1.08 GUARANTEE AND WARRANTY

- A. Contractor shall guarantee all Work indicated in the Contract Documents. With respect to equipment, condition guarantee to cover:
 - 1. Faulty or inadequate design;
 - 2. Improper assembly or erection;
 - 3. Defective workmanship or materials; and
 - 4. Incorrect or inadequate operation or other failure.

For materials and equipment bearing a manufacturer's warranty in excess of two (2) years, furnish a copy of the warranty to the County, who shall be named as beneficiary. Warranties shall provide for timely repair and/or replacement of any components or systems found to not be functioning within their intended parameters as specified in the Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Provide new materials and equipment as required to complete all indicated and specified electrical work, including incidental items inferable from the Contract Documents that are necessary to complete the Work. Provide materials and equipment of latest design, standard products or established manufacturers. For uniformity, only one (1) manufacturer is acceptable for each type of product. Manufacture individual

parts to standard sizes and gages so repair parts can be installed in the field. Make like parts of duplicate units interchangeable. Do not place equipment in service at any time prior to delivery except as required for factory or shop tests. Notify County in writing if any equipment or material is damaged. Do not repair damaged products without written approval from the County.

- B. All electrical materials and equipment shall be listed by UL and bear their label, or listed and certified by a nationally recognized testing authority where UL does not have an approval. Custom-made equipment must have complete test data submitted by the manufacturer attesting to its safety.
- C. All switchboards, distribution boards, panel boards and circuit breakers shall be of the same manufacturer.
- D. All wiring devices such as switches and receptacles shall be of the same manufacturer.
- E. Outdoor electrical equipment shall be weatherproof, NEMA 3R unless indicated or specified otherwise.
- F. Unless specified otherwise, the sheet metal surfaces of equipment enclosures shall be phosphatized and coated with a rust resisting primer. Over the primer, apply a corrosion resistant baked enamel finish on the interior and exterior metal surfaces. The exterior color shall be ASA No. 49 medium light gray. The interior color shall be white. Hardware shall have a corrosion resistant finish.
- G. Aluminum conductors are not acceptable unless approved by the County for each use and location.

PART 3 EXECUTION

3.01 GENERAL

A. Install electrical work in accordance with the codes and standards specified, except where more stringent requirements are indicated or specified. Verify that materials and equipment properly fit the installation space with clearances conforming to the codes and standards specified except where greater clearance is indicated. Perform Work as required to correct improper installations, at no additional cost to the County.

B. Location of Openings

1. Locate chases, shafts and openings required for the installation of the electrical work during framing of the structure. Do any additional cutting and patching required. Wherever conduit extends through roof, install flashings. Cutting or drilling in any structural member is prohibited without County approval. Furnish all access panels to make all boxes, connections and devices accessible as required by County.

C. Location of Sleeves

1. Where conduits pass through concrete walls, slabs or metal deck floors, install sleeves of adequate size to permit installation of conduit. Sleeves shall be installed prior to pouring of concrete and shall have ends flush with wall or extend 2-inches

above floor surfaces.

3.02 SUPERVISION

A. Assign a competent representative to supervise the electrical construction work from beginning to completion and Final Acceptance.

3.03 WORKMANSHIP

A. Employ skilled craftsmen experienced in installation of the types of electrical materials and equipment specified. Use specialized installation tools and equipment as applicable. Produce acceptable installations free of defects.

3.04 PREPARATION AND CLEAN UP

- A. Prior to installing electrical work, ensure the installation areas are clean. Maintain areas in a broom-clean condition during installation operations. Clean, condition, and service equipment in accordance with the manufacturer's instructions, approved submittals, and other requirements indicated or specified.
- B. Upon completion of the Work and at various times during the progress of the Work, remove from the building all surplus materials, rubbish and debris.
- C. Thoroughly clean switchgear including busses, apparatus, exposed conduit, metal work including exterior and interior, and accessories for the Work of this Division, of cement, plaster and other deleterious materials; remove grease and oil spots with cleaning solvent; carefully wipe surfaces and scrape cracks and clean corners. Thoroughly polish chromium or plated work.

3.05 PROTECTIVE DEVICE ADJUSTMENTS

A. Adjust all protective devices in accordance with tabulated settings listed in the approved coordination study. Adjustments shall conform to the serving utilities requirements 81 IEEE Standard 242. No equipment shall be operated prior to said adjustments being properly completed and verified/tested.

3.06 INSPECTION AND TESTING

- A. Inspect each item of material and equipment for damage, defects, completeness, and correct operation before installing. Inspect previously installed related Work and verify that it is ready for installation of electrical work.
- B. Where specified, electrical equipment manufacturer shall furnish the services of an authorized representative especially trained and experienced in the installation of their equipment to:
 - 1. Supervise the equipment installation in accordance with the approved submittals and manufacturer's instructions;
 - 2. Be present when the equipment is first put into operation;

BASIC ELECTRICAL REQUIREMENTS

- 3. Inspect, check, adjust as necessary, and approve the installation;
- 4. Repeat the inspection, checking, and adjusting until, all troubles or defects are corrected and the equipment installation and operation, are acceptable; and
- 5. Prepare and submit the specified Manufacturer's Certified Report.

C. Operational Demonstration

1. Demonstrate that performance of installed electrical materials and equipment complies with requirements specified in Division 26. Operate equipment through entire no-load to full-load range for not less than twenty-four (24) hours unless a larger period is specified elsewhere. Immediately correct defects and malfunctions with approved methods and materials in each case, and repeat the demonstration.

D. Final Operation Tests

1. Test all electrical systems for not less than eighty (80) hours, with no interruptions except for normal maintenance or corrective work.

E. Testing Materials

1. Furnish labor, instruments, recorders, gages, materials, and power for tests as required.

F. Testing Methods

1. Operate systems continuously twenty-four (24) hours a day under constant inspection of trained operators. Cause variable speed equipment to cycle through the applicable speed range at a steady rate of change. Induce simulated alarm and distressed operating conditions, and test controls and protective devices for correct operation in adjusting system functions or causing system shutdown. Perform other final operation tests as may be required under other Sections of Division 26, and under the Special Conditions.

G. Defects

1. Immediately correct all defects and malfunctions disclosed by tests. Use new parts and materials as required and approved. Add the interruption time for corrective work to the specified total test period.

3.07 COMPLETION

- A. Work will not be reviewed for Final Acceptance until operating and maintenance data, manufacturer's literature, panel directories and nameplates specified herein have been approved and properly posted or installed and final cleaning of equipment and premises has been completed.
- B. Prior to Final Completion of operating electrical systems, the Contractor shall:
 - 1. Provide the required manufacturer's certified reports, instructions, Shop Drawings, and replacement parts lists.
 - 2. Satisfactorily completed required inspections and testing
 - 3. Provide Operations and Maintenance (O&M) Manuals

- 4. Provide the necessary training programs and instructions to County staff. Number of hours shall be a minimum of four (4) hours for each system or days as required under separate Sections of these Detailed Provisions. Complete O&M manuals shall be provided at least two (2) weeks priors to scheduled training.
- 5. Submitted warranties and guarantees.
- 6. All deficiencies and adjustments have been completed.
- 7. Jobsite has been cleaned up to the satisfaction of the County.

END OF SECTION 26 0500



SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0519: WIRE AND CABLE: 600 VOLT AND BELOW CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
1.02	QUALITY ASSURANCE AND REFERENCE STANDARDS	
1.03	DEFINITIONS	
1.04	SUBMITTALS	
1.05	PRODUCT DELIVERY, STORAGE, AND HANDLING	3
PART 2	PRODUCTS	3
2.01	APPLICATIONS	3
2.02	ACCEPTABLE MANUFACTURERS	
2.03	GENERAL REQUIREMENTS	
2.04	SINGLE CONDUCTOR BUILDING WIRE, POWER CABLE, AND	
CON	TROL CABLE (600 VOLTS OR LESS)	6
2.05	SHIELDED VFD CABLE	7
2.06	INSTRUMENTATION CABLE	7
2.07	FIBER OPTIC CABLE	
2.08	WIRING CONNECTORS	9
PART 3	S EXECUTION	10
3.01	GENERAL	10
3.02	PREPARATION	10
3.03	INSTALLATION	
3.04	INSPECTIONS AND TESTING	13





SECTION 26 0519 WIRE AND CABLE: 600 VOLT AND BELOW

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Single conductor building wire.
 - b. Power cable for 600 volts and less.
 - c. Control cable.
 - d. Instrumentation cable.
 - e. Fiber optic cable.
 - f. Wiring connectors.
 - g. Insulating tape.
 - h. Pulling lubricant.
- B. Related Detailed Provisions Sections include but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Section 26 0500 Electrical: Basic Requirements.
 - 3. Section 26 0533 Raceways and Boxes.
 - 4. Section 26 0553 Identification for Electrical Systems.

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM B3 Standard Specification for Soft or Annealed Copper Wire
 - 2. ASTM B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 3. ASTM B33 Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
 - 4. ASTM B787/B787M Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation
- B. National Electrical Contractors Association (NECA):
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- C. National Electrical Manufacturers Association (NEMA):
 - 1. ICS 4 Industrial Control and Systems

WIRE AND CABLE: 600 VOLT AND BELOW

- 2. NEMA WC 57 Control Cables
- 3. NEMA WC 70 Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy
- D. International Electrical Testing Association (NETA):
 - 1. NETA ATS Acceptance Testing Specifications for Electrical Power Equipment and Systems
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code
 - 2. NFPA 262 Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- F. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
 - TIA/EIA/ANSI 568 SET Commercial Building Telecommunications Cabling Standard SET
 - 2. TIA/EIA/ANSI 598 Optical Fiber Cable Color Coding
- G. Underwriters Laboratories (UL):
 - 1. UL 13 Power-Limited Circuit Cables
 - 2. UL 44 Thermoset-Insulated Wires and Cables
 - 3. UL 83 Thermoplastic-Insulated Wires and Cables
 - 4. UL 486A-486B Wire Connectors
 - 5. UL 486C Splicing Wire Connectors
 - 6. UL 486D Sealed Wire Connector Systems
 - 7. UL 510 Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
 - 8. UL 1277 Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
 - 9. UL 1581 Electrical Wires, Cables, and Flexible Cords.
 - 10. UL 1666 Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts.
 - 11. UL 2250 Instrumentation Tray Cable.

1.03 **DEFINITIONS**

- A. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
- B. Instrumentation Cable:
 - 1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.

- 2. The following are specific types of instrumentation cables:
 - a. Analog signal cable:
 - 1) Used for the transmission of low current (e.g., 4-20mA DC) or low voltage (e.g., 0-10 Vdc) signals, using No. 16 AWG and smaller conductors.
 - 2) Commonly used types are defined in the following:
 - (a) TSP: Twisted shielded pair.
 - (b) TST: Twisted shielded triad.
 - b. Digital signal cable: Used for the transmission of digital signals between computers, PLC's, RTU's, etc.
- C. Power Cable: Multi-conductor, insulated, with outer sheath containing building wire, No. 8 AWG and larger.
- D. Shielded VFD Cable: Multi-conductor, insulated, with shield, drain wire and building wires, No. 12 and larger.
- E. Control Cable: Multi-conductor, insulated, with outer sheath containing building wires, No. 14, No. 12 or No. 10 AWG.
- F. Building Wire: Single conductor, insulated, with or without outer jacket depending upon type.

1.04 SUBMITTALS

- A. Submittal Procedures: Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Product Data:
 - 1. Provide manufacturer's standard catalog pages and data sheets for conductors and cables, wire connectors, insulating tape, cable lubricant, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Quality Assurance Submittals:
 - 1. Field test reports for NETA ATS testing.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.
- H. Aluminum conductors are not permitted.

2.02 ACCEPTABLE MANUFACTURERS

- A. Conductors and cables shall be manufactured by one of the following or approved equal:
 - 1. Building Wire, Power, and Control cable:
 - a. Cerro Wire LLC.; www.cerrowire.com
 - b. Encore Wire Corporation; <u>www.encorewire.com</u>
 - c. General Cable Technologies Corporation; www.generalcable.com
 - d. Okonite Company; www.okonite.com
 - e. Southwire Company, LLC.; www.southwire.com
 - 2. Shielded VFD Cable:
 - a. Belden, Inc.; www.belden.com
 - b. Encore Wire Corporation; www.encorewire.com
 - c. General Cable Technologies Corporation; www.generalcable.com
 - d. Okonite Company; www.okonite.com
 - e. Priority Wire and Cable, Inc.; www.prioritywire.com
 - f. Rockbestos-Surprenant Cable Corporation; www.r-scc.com
 - g. Southwire Company, LLC.; www.southwire.com
 - 3. Instrumentation Cable (analog):
 - a. Alpha Wire Corporation
 - b. Belden, Inc.; www.belden.com
 - c. Encore Wire Corporation; www.encorewire.com
 - d. General Cable Technologies Corporation; www.generalcable.com
 - e. Okonite Company; <u>www.okonite.com</u>
 - f. Southwire Company, LLC.; www.southwire.com

4. Wire Connectors:

- a. Burndy a part of Hubbell, Inc.; www.burndy.com
- b. Ideal Industries, Inc.; www.idealind.com
- c. Ilsco; www.ilsco.com
- d. Penn Union Corporation; www.penn-union.com
- e. Phoenix Contact; www.phoenixcontact.com
- f. 3M Company; www.3m.com/3M/en US/company-us
- g. Thomas and Betts a part of ABB Group; www.tnb.com
- 5. Insulating and Color Coding Tape:
 - a. 3M Company; www.3m.com/3M/en US/company-us
 - b. Red Seal Electric Company; www.redseal.com

2.03 GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70 and NEMA WC 70.
- B. Provide products listed and classified by UL as suitable for the purpose indicated.
- C. Provide new conductors and cables manufactured not more than one (1) year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors and other appurtenances necessary to complete operating system.
- E. Thermoplastic-Insulated Conductors and Cables Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables Listed and labeled as complying with UL 44.
- G. Conductor Material
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for the Project. Conductors sizes indicated are based on copper material.
 - 2. Copper Conductors: Soft drawn annealed, ninety-eight percent (98%) conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M, unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- H. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG
 - c. Exceptions for Voltage Drop:
 - 3) 20A, 120V circuits longer than 75 feet: 10 AWG minimum
 - 4) 20A, 120V circuits longer than 120 feet: 8 AWG minimum

5) 20A, 277V circuits longer than 150 feet: 10 AWG minimum

2. Control Circuits: 14 AWG

I. Conductor Color Coding:

- 1. Color code conductors as indicated and maintain consistent color coding throughout the Project.
- 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.

3. Color Code:

a. Color code conductors as follows:

20	8/120 V	480/277 V	
Phase A	Black	Phase A	Brown
Phase B	Red	Phase B	Orange
Phase C	Blue	Phase C	Yellow
Ground	Green	Ground	Green
Neutral	White	Neutral	Gray

- b. Equipment Ground (All Systems): Green.
- c. Isolated Ground (All Systems): Green with Yellow Stripe.
- d. Travelers for 3-Way and 4-Way Switching: Pink.

2.04 SINGLE CONDUCTOR BUILDING WIRE, POWER CABLE, AND CONTROL CABLE (600 VOLTS OR LESS)

A. Description:

- 1. Building Wire: Single conductor insulated wire
- 2. Power Cable: Multi-conductor, insulated, with outer sheath containing building wire, No. 8 AWG and larger.

B. Conductor Stranding:

- 1. Feeders and Branch Circuits
 - a. Size 10 AWG and Smaller: Solid; except shall be stranded for final connections to motors, transformers, and vibrating equipment.
 - b. Size 8 AWG and Larger: Stranded
- C. Insulation Voltage Rating: 600V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below:
 - a. Size 4 AWG and Larger: Type XHHW-2

WIRE AND CABLE: 600 VOLT AND BELOW

- b. Installed Underground: Type XHHW-2
- c. Fixed Wiring within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.
- E. Type THWN for exterior or wet locations, in raceway.
- F. Control cables shall be color coded in conformance with NEMA/ICEA Method 1, Table E-2.
- G. Surface mark with manufacturer's name or trademark, conductor size, insulation type, and UL label.

2.05 SHIELDED VFD CABLE

- A. Description:
 - 1. Multi-conductor, insulated, with shield, drain wire and building wires, No. 12 and larger.
- B. Insulation Voltage Rating: 600V.
- C. Cables No. 1 AWG and smaller:
 - 1. Type RHW-2 or XHHW-2 insulation with an overall PVC jacket.
 - 2. Shielding: eighty-five percent (85%) tinned copper braid, full size tinned copper drain wire and one hundred percent (100%) foil shield.
 - 3. Number of Conductors: 3 PH and one (1) full size ground.
- D. Surface mark with manufacturer's name or trademark, conductor size, insulation type, and UL label.

2.06 INSTRUMENTATION CABLE

- A. Surface mark with manufacturer's name or trademark, conductor size, insulation type, and UL label.
- B. Analog Cable:
 - 1. Tinned copper conductors.
 - 2. 300V or 600V PVC insulation with PVC jacket.
 - 3. Twisted with one hundred percent (100%) foil shield coverage with drain wire.
 - 4. Six (6) twists per foot minimum.
 - 5. Individual conductor color coding: ICEA Method 1, Table K-2.
 - 6. Conform to UL 2250, UL 1581 and NFPA 70 Type ITC.
- C. Digital Cable:
 - 1. As recommended by equipment (e.g. PLC, RTU) manufacturer.

- 2. Horizontal voice and data cable:
 - a. Category 6 per TIA/EIA/ANSI 568.
 - b. Cable shall be label-verified.
 - c. Cable jacket shall be factory marked at regular intervals indicating verifying organization and performance level.
 - d. Conductors: No. 24 AWG solid untinned copper or as indicated on the Project Drawings.
 - e. Rated CMP per NFPA 70.
 - f. Conform to NFPA 262 and NFPA 70 Type ITC.

2.07 FIBER OPTIC CABLE

- A. Design and Fabrication Multi-Mode:
 - 1. Type:
 - a. Indoor: Tight buffered or loose tube with a dry gel water blocking system.
 - b. Outdoor: Loose tube with a wet or dry gel water blocking system.
 - 2. Number of Fibers: As indicated on the Project Drawings.
 - 3. Fiber Size: 62.5/125 micrometer (core diameter/cladding diameter).
 - 4. Glass fiber core.
 - 5. Step index.
 - 6. Maximum attenuation:
 - a. At 850 nm: 3.75 dB/km.
 - b. At 1300 nm: 1.5 dB/km.
 - 7. Minimum bandwidth:
 - a. At 850 nm: 160 Mhz/km.
 - b. At 1300 nm: 500 Mhz/km.
 - 8. Maximum tensile load:
 - a. Installation: 225 lbs.
 - b. Long term: 67 lbs.
 - 9. Cable jacket material:
 - a. In rigid steel conduit: PVC or polyethylene.
 - b. In plenum or riser: Flame retardant material, PVC not allowed.
 - 1) Plenum applications: Cable materials shall pass NFPA 262 requirements.
 - 2) Riser applications: Cable materials shall pass UL 1666 requirements.

- c. In cable tray: Polyethylene or equivalent; PVC not allowed. Meet vertical flame tray test requirements of NFPA 262.
- 10. Cables shall be listed and marked in accordance with the requirements of NFPA 70.
- 11. Optical fiber cable type utilized shall be in accordance with NFPA 70.
- 12. Utilize ST type connectors:
 - a. Tip material: Ceramic or ceramic/glass composite.
 - b. Utilize connectors which do not require adhesive, epoxy, or polish.

2.08 WIRING CONNECTORS

A. Description:

- 1. Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors or compression connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use split bolt mechanical connectors.
- C. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting connectors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
 - 6. Stranded Conductors Size 10 AWG and Smaller: Use crimpled terminals for connections to terminal screws.
 - 7. Conductors for Control Circuits: Use crimpled terminals for all connections.
- D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

- F. Twist-On Insulated Spring Connectors: Rated 600V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations. Connectors shall be Buchanan Type B2, Scotchlok Type B, Thomas and Betts Type PT, or approved equal.
- G. Mechanical Connectors: Provide bolted type.
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration. Connectors and crimping tool shall be Square D-Anderson, Thomas and Betts, Buchanan, or approved equal.
- I. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
- J. Electrical tape shall be rated to splice and insulate wires up to 600V, resistant to abrasion, alkalis, acids, corrosion, moisture, low and high temperatures. The tape shall be as manufactured by 3M or approved equal.
- K. Wire lubricant shall be used per manufacturer's recommendations where necessary. The lubricant shall be Burndy "Slikon", Holub "Hi-Green", Ideal "Yellow 77", or approved equal.
- L. Wire markers shall be provided to identify conductors and cables at equipment terminals, and in boxes and handholes. The markers shall be adhesive and manufactured by Thomas and Betts, Brady, or approved equal.

PART 3 EXECUTION

3.01 GENERAL

- A. Provide the wiring installations and equipment installations, including connections and interconnections as indicated, specified, and required.
- B. Verify that interior of building has been protected from weather and that Work likely to damage conductors and cable has been completed.
- C. Verify that raceway installation is complete and supported.
- D. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- E. Assure proper fits for all equipment and materials in the spaces shown on the Project Drawings.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:

- 1. Unless dimensioned, circuit routing indicated is diagrammatic.
- 2. When circuit destination is indicated and routing is not shown, determine exact routing required.
- 3. Arrange circuiting to minimize splices.
- 4. Include circuit lengths required to install connected devices within ten (10) feet of location shown.
- 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
- 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
- 7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted.
- 8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three (3) single phase branch circuits of different phases installed in the same raceway is permitted where not otherwise prohibited, except for the following:
 - a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable securely in a neat and workmanlike manner in accordance with NECA 1.
- D. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into a raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the manufacturer. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G. Install conductors with a minimum of 12-inches of slack at each outlet.

- H. Where conductors are installed in enclosures for future termination by others, provide a minimum of five (5) feet of slack.
- I. Neatly train and bundle conductors inside boxes, raceways, panel boards and other equipment enclosures.
- J. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking, or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to remove corrosion, oxides, and other contaminants. Do not use wire brush or plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations, but apply outer covering of moisture sealing electrical tape.
 - 3. Wet/Damp Locations: Use heat shrink tubing.
- L. Insulate ends of spare conductors using vinyl insulating electrical tape.
- M. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation (conductors 4 AWG and larger), apply half overlapping turns of tape at each termination and at each location conductors are accessible.

- N. Wire Marking: All wire shall be marked with wire markers at each end and at each intermediate j-box, pull box, or enclosure except for short "jumper" wires. Wire markers shall indicate the designation/destination of the wiring in the conduit. Example, LPCB1 REC1 to indicate lighting panel circuit breaker No. 1 to receptacle No. 1; MCCCB4 MTR4 indicating motor control center circuit breaker No. 4 to Motor No. 4. Conduit numbers shall be imprinted on brass tags with the numbers as indicated on the "conduit and wire schedule" or as designated by the County.
- O. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- P. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise. Keep splices in underground junction boxes, handholes, and manholes to an absolute minimum. Where splices are necessary, use resin pressure splices and resin splicing kits manufactured by 3M or approved equal.

3.04 INSPECTIONS AND TESTING

- A. Contractor to inspect and test in accordance with NETA ATS, except Section 4.
- B. Contractor to perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. Insulation tests shall be made with a hand crack test instrument. The resistance test for parallel conductors listed as optional is not required.
- C. Power feeders branch conductors and motors shall be tested phase-to-phase, and phase-to-ground. A copy of the test results for feeders and motors shall be submitted to the County when completed and after any deficiencies have been corrected.
- D. Contractor to prepare and submit field test reports.
- E. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 0519





SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0526: GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
1.02	QUALITY ASSURANCE AND REFERENCE STANDARDS	1
1.03	SUBMITTALS	2
PART 2	PRODUCTS	2
2.01	ACCEPTABLE MANUFACTURERS	2
2.02	REQUIREMENTS	3
2.03	COMPONENTS	3
	CONDUCTORS	
2.05	CONNECTORS AND ACCESSORIES	5
PART 3	EXECUTION	5
3.01	INSTALLATION	5
3.02	INSPECTIONS AND TESTING	8





SECTION 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Grounding and bonding requirements.
 - 2. Conductors for grounding and bonding.
 - 3. Connectors for grounding and bonding.
 - 4. Grounding and bonding components.
 - 5. Grounding test wells.
- B. Related Detailed Provisions Sections include but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Section 26 0500 Electrical: Basic Requirements.
 - 3. Section 26 0519 Wire and Cable: 600 Volts and Below.
 - 4. Section 26 0543 Electrical: Exterior Underground.
 - 5. Section 26 0533 Raceways and Boxes.
 - 6. Section 26 0553 Identification for Electrical Systems.

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM B8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- B. National Electrical Contractors Association (NECA)
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- C. International Electrical Testing Association (NETA)
 - 1. NETA ATS Acceptance Testing Specifications for Electrical Power Equipment and Systems
- D. National Fire Protection Association (NFPA)
 - 1. NFPA 70 National Electrical Code
- E. Underwriters Laboratories
 - 1. UL 467 Grounding and Bonding Equipment

1.03 SUBMITTALS

- A. Submittal Procedures: Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Product Data
 - 1. Provide manufacturer's standard catalog pages and data sheets for grounding electrodes, clamps, terminals, connectors, and exothermic welding system.
- C. Quality Assurance Submittals:
 - 1. Prepare and submit field test reports for all NETA ATS testing.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers or an approved equal are acceptable:
 - 1. Ground rods and bars and grounding clamps, connectors and terminals:
 - a. Burndy a part of Hubbell, Inc.; www.burndy.com
 - b. Harger Lighting and Grounding; www.harger.com
 - c. Heary Brothers Lighting Protection; www.hearybros.com
 - d. National Lighting Protection Corporation; www.theprotectionsource.com
 - e. Robbins Lighting Company; www.robbinslightning.com
 - f. Thomas and Betts a part of ABB Group; www.tnb.com
 - g. Thompson Lighting Protection, Inc.; www.tlpinc.com
 - 2. Exothermic weld connections:
 - a. ERICO a part of Pentair Company(CADWELD); www.erico.com
 - b. Harger Lighting and Grounding; www.harger.com
 - c. Burndy a part of Hubbell, Inc. (Thermoweld); www.burndy.com
 - 3. Precast or prefabricated handholes for test wells:
 - a. Prefabricated composite handholes:
 - 1) Armoreast Products Company; www.armoreastprod.com
 - 2) Quazite, Hubbel Power Systems, Inc.; https://www.hubbell.com/hubbellpowersystems/en/hps-brands/quazite
 - b. Precast, polymer concrete or steel reinforced cement concrete, handholes:
 - 1) Armoreast Products Company; www.armoreastprod.com
 - 2) Christy Concrete, Oldcaste Prescast, Inc.; www.oldcastleprecast.com/plants/Enclosures/brands/Pages/Christy.aspx

- 3) Jensen Precast; <u>www.jensenprecast.com</u>
- 4) Oldcastle Precast, Inc.; www.oldcastleprecast.com/plants/Enclosures/Pages/default.aspx
- c. Cast iron AASHTO H-20 traffic rated covers:
 - 1) Alhambra Foundry Company; <u>www.alhambrafoundry.com/</u>
 - 2) Long Beach Iron Works; <u>www.lbiw.com/</u>

2.02 REQUIREMENTS

- A. Grounding System Resistance: 25 ohms
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit boxes, fittings, supports, accessories, and any other necessary appurtenances required for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Separately Derived System Grounding
 - 1. Separately derived systems include, but are not limited to:
 - d. Transformers (except autotransformers such as buck-boost transformers).
 - 2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 - 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 - 4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
 - 5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

2.03 COMPONENTS

A. Provide products listed, classified, and labeled as complying with UL 467 where applicable.

- B. Conductors for Grounding and Bonding, in addition to requirements of Detailed Provisions Section 26 0519 Wire and Cable: 600 Volt and Below:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 3) Use bare copper conductors where installed underground in direct contact with earth.
 - 4) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 - 1. Connectors shall be appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

2.04 CONDUCTORS

- A. Insulated Conductors
 - 1. Copper wire or cable insulated for 600V unless otherwise required by Applicable Code or standard.
- B. Bare Copper Conductors
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, ¼ inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrule; $1^{5}/_{8}$ -inch (41mm) wide and $1/_{16}$ -inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrule; 15/8-inch (41mm) wide and 1/16-inch (1.6 mm) thick.
 - 8. Rod Electrodes: Copper-clad steel.

2.05 CONNECTORS AND ACCESSORIES

- A. Mechanical Connectors: Bronze.
- B. Exothermic Connections:
 - 1. Cadweld or approved equal.
- C. Wire: Stranded copper
- D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.
- E. Grounding Well:
 - 1. Well Pipe: 8-inch diameter x 18-inch long precast cement concrete or polymer concrete valve box.
 - 2. Well Cover: Cast iron (H-20 traffic rated) or polymer concrete (SCTE Tier 15 traffic rated) lid with marking "GROUND" embossed on cover.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Install ground rods and grounding conductors in undisturbed, firm soil.
 - 1. Provide excavation required for installation of ground rods and ground conductors.
 - 2. Use driving studs or other suitable means to prevent damage to threaded ends of sectional rods.
 - 3. Unless otherwise specified, connect conductors to ground rods with compressor type connectors or exothermic weld.

- 4. Provide sufficient slack in grounding conductor to prevent conductor breakage during backfill or due to ground movement.
- 5. Backfill excavation completely, thoroughly tamping to provide good contact between backfill materials and ground rods and conductors.

E. Ground Ring Grounding System:

- 1. Ground ring consists of ground rods and a grounding conductor looped around the structure.
- 2. Placed at a minimum of ten (10) feet from the structure foundation and two and a half (2.5) feet below grade.
- 3. Provide a minimum of four (4) ground rods placed at the corners of the structure and additional rods so that the maximum distance between ground rods does not exceed fifty (50) feet.
- 4. Building/Structure grounding:
 - a. Bond building/structure metal support columns to the ground ring at all corners of the structure.
- 5. Grounding conductor: Bare conductor, size as indicated on the Project Drawings.

F. Triad Grounding System:

- 1. Triad consists of three ground rods arranged in a triangle separated by ten (10) feet and a grounding conductor interconnecting each ground rod.
- 2. Place first ground rod a minimum of ten (10) feet from the structure foundation and two and a half (2.5) feet below grade.
- 3. Grounding conductor: Bare conductor, size as indicated on the Project Drawings.

G. Grounding Conductors

1. Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

H. Conductor Terminations and Connections

- 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
- 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
- 3. Connections to Ground Rods at Test Wells: Bolted connectors.
- 4. Connections to Structural Steel: Welded connectors.

I. Raceway Bonding/Grounding:

- 1. All metallic conduit shall be installed so that it is electrically continuous.
- 2. All conduits to contain a grounding conductor with insulation identical to the phase conductors, unless otherwise indicated on the Project Drawings.

- 3. NFPA 70 required grounding bushings shall be of the insulating type.
- 4. Provide double locknuts at all panels.
- 5. Bond all conduit, at entrance and exit of equipment, to the equipment ground bus or lug.
- 6. Provide bonding jumpers if conduits are installed in concentric knockouts.
- 7. Make all metallic raceway fittings and grounding clamps tight to ensure equipment grounding system will operate continuously at ground potential to provide low impedance current path for proper operation of overcurrent devices during possible ground fault conditions.

J. Handhole, Pull Box, and Vault Grounding:

1. Provide a ground rod and ground bar, when indicated or as needed, in each handhole, pull box, or vault with exposed metal parts. Expose a minimum of 4-inches of the rod above the floor for field connections to the rod. Connect all exposed metal parts (e.g., conduits and cable racks) to the ground rod.

K. Equipment Grounding:

1. All utilization equipment shall be grounded with an equipment ground conductor.

L. Crane and Hoists Grounding:

1. Ground cranes and hoists in accordance with NFPA 70, Article 610.

M. Telecommunications Grounding System:

- 1. Coil five (5) feet of insulated #6 AWG conductor at each telephone terminal board and mechanically connected to the ground bar.
- 2. Grounding bar: Mounted on or adjacent to telephone terminal board.
- 3. Interconnect all telecommunication ground bars in a daisy chain or radial fashion to the main ground bar.
 - a. Grounding conductor: Bare conductor, size as indicated on the Project Drawings.

N. Cable Tray Grounding:

- 1. Make metal cable tray electrically continuous by one (1) of the following methods:
 - a. Tray sections and fittings suitable for grounding purposes.
 - b. Provide bonding jumpers at discontinuous joints.
 - c. Lay a grounding conductor within the tray for bonding of each individual tray section.
 - 1) Provide a minimum of one (1) ground lug per tray section.
 - 2) Grounding conductor: Bare #4 AWG minimum.

- 3) Securely tie the grounding conductor to cable tray every ten (10) feet. Bond the grounding conductor to the cable tray run a minimum of every fifty (50) feet with a UL listed connector.
- 2. Bond the tray or tray grounding conductor to every electrical equipment ground bus or telecomm backboard ground bus where conductors terminate.
- 3. Bond all conduits to the tray that extend the conductors to field equipment.
- O. Metal Light Poles:
 - 1. Connect metal pole to a grounding rod.
 - 2. Grounding conductor: Bare No. 6 AWG minimum.

3.02 INSPECTIONS AND TESTING

- A. Contractor to inspect and test in accordance with NETA ATS, Section 7.13.
- B. Contractor to prepare and submit field test reports.
- C. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 26 0526



SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0529: HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS CONTENTS

PART 1 GENERAL 1

	SUMMARYQUALITY ASSURANCE AND REFERENCE STANDARDSSUBMITTALS	1
PART 2	PRODUCTS	2
2.01 2.02	SUPPORT AND ATTACHMENT COMPONENTSSUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS	
PART 3	B EXECUTION	5
3.01	SUPPORT INSTALLATION	5
3.02	INSTALLATION OF FABRICATED METAL SUPPORTS	6
3.03	INSTALLATION	6
3.04	INSPECTIONS AND TESTING	6



SECTION 26 0529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0526 Grounding and Bonding for Electrical Systems
 - 4. Section 26 0533 Raceways and Boxes

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 2. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 3. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - 4. ASTM E488/E488M Strength of Anchors in Concrete Elements
- B. Manufacturers Standardization Society (MSS):
 - 1. MSS SP-58 Pipe Hangers and Supports Material, Design, and Manufacture
- C. Metal Framing Manufacturers Association (MFMA):
 - 1. MFMA-4 Metal Framing Standards
- D. National Electrical Contractors Association (NECA):
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code

1.03 SUBMITTALS

A. Submittal Procedures: Detailed Provisions Section 01 3300 – Submittal Procedures for requirements for the mechanics and administration of the submittal process.

B. Product Data:

1. Provide manufacturer's standard catalog pages and data sheets for all products specified in PART 2 of this Detailed Provisions Section.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

- 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
- 2. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 1.5. Include consideration for vibration, equipment operation, earthquake and shock loads where applicable.
- 3. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- 4. Steel Components:
 - a. Use corrosion resistant materials suitable for the environment where installed.
 - 1) Zinc-Plated Steel: Electroplated in accordance with ASTM B633
 - 2) Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports:

- 1. Straps, clamps, and all other appurtenances needed to support conduit or cable.
 - a. Conduit Straps: One-hole or two-hole type, steel or malleable iron.
 - b. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports:

- 1. Hangers, brackets, and all other appurtenances needed to support boxes.
- D. Metal Channel (Strut) Framing Systems:
 - 1. Factory-fabricated continuous-slot metal channel and associated fittings, accessories, and hardware required for field assembly of supports in compliance with MFMA-4.

E. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

2.02 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory fabricated components for field assembly.
 - 1. Shall be manufactured by one of the following or approved equal:
 - a. Allied Tube and Conduit a part of Atkore International; www.alliedeg.us
 - b. Cooper B-Line by Eaton Corporation; www.eaton.com
 - c. Power-Strut a part of Atkore International; <u>www.power-strut.com</u>
 - d. Thomas and Betts a part of ABB Group; www.tnb.com
 - e. Unistrut a part of Atkore International; www.unistrut.us

2. Coatings:

- a. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- b. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
- c. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
- 3. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with ${}^{9}/_{16}$ -inch (14 mm) diameter holes at a maximum of 8-inches (200 mm) on-center, in at least one surface.
 - 1. Shall be manufactured by the following or approved equal:
 - a. Allied Tube and Conduit a part of Atkore International; www.alliedeg.us
 - b. Cooper B-Line by Eaton Corporation; www.eaton.com
 - c. Fabco Plastics Wholesale Limited; <u>www.fabcoplastics.com</u>
 - d. Seasafe, Inc.; www.seasafe.com
 - 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items. Same material as channels and angles, except metal items may be stainless steel.
 - 3. Channel Dimensions: Selected for applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cable supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Shall be manufactured by the following or approved equal:
 - 1) Hilti Inc.; www.us.hilti.com
 - 2) ITW Ramset/Red Head, a division of Illinois Tool Works, Inc.; www.itwredhead.com
 - 3) MKT Fastening, LLC.; www.mktfastening.com
 - 4) Simpson Strong-Tie, Inc.; Masterset Fastening Systems Unit.; www.strongtie.com
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Shall be manufactured by the following or approved equal:
 - 1) Hilti Inc.; www.us.hilti.com
 - 2) ITW Ramset/Red Head, a division of Illinois Tool Works, Inc.; www.itwredhead.com
 - 3) MKT Fastening, LLC.; www.mktfastening.com
 - 4) Simpson Strong-Tie, Inc.; Masterset Fastening Systems Unit.; www.strongtie.com
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18, complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

PART 3 EXECUTION

3.01 SUPPORT INSTALLATION

- A. Raceway Support Methods: In addition to methods described in NECA 1, electrical metallic tubing (EMT), intermediate metallic conduit (IMC), and rigid metallic conduit (RMC) may be supported by openings through structure members, as permitted in NFPA 70. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum hanger rod size shall be ¼-inch diameter. For multiple raceways or cables, install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least twenty-five percent (25%) in the future without exceeding specified design load limits. Secure raceways and cables to these supports with two-bolt conduit clamps.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus two hundred pounds (200 lbs (90kg)).
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components:
 - 1. Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated:
 - a. To Wood: Fasten with lag screws of through bolts.
 - b. To New Concrete: Bolt to concrete inserts.
 - c. To Existing Concrete: Expansion anchor fasteners.
 - d. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete, 4-inches thick or greater. Do not use anchorage to lightweight-aggregate concrete of for slabs lees than 4-inches thick.
 - e. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - f. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-58.
 - g. To Light Steel: Sheet metal screws.
 - h. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.02 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M

3.03 INSTALLATION

- A. Install products in accordance with manufacturer's instructions
- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by County, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by County, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval from the County's Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to study to support equipment surface-mounted on hollow stud walls when strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. Remove temporary supports.

3.04 INSPECTIONS AND TESTING

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 0529



SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0533: RACEWAYS AND BOXES CONTENTS

r	AKII	GENERAL	I		
	1.01	SUMMARY OUT A TOTAL AND DEFENENCE STANDARDS	1		
	1.02	QUALITY ASSURANCE AND REFERENCE STANDARDS	1		
	1.03	SUBMITTALS DEFINITIONS	3		
		DELIVERY, STORAGE, AND HANDLING	<i>3</i>		
D		PRODUCTS			
	2.01	ACCEPTABLE MANUFACTURERS	4		
		CONDUIT APPLICATIONS	6		
	2.03	CONDUIT REQUIREMENTS	8		
		GALVANIZED STEEL RIGID METALLIC CONDUIT (RMC)	8		
		PVC-COATED GALVANIZED STEEL RIGID METALLIC CONDUIT (RMC)	9		
	2.06	ALUMINUM RIGID METALLIC CONDUIT (RMC)	9		
	2.07	INTERMEDIATE METALLIC CONDUIT (IMC)	10		
	2.08	ELECTRICAL METALLIC TUBING (EMT)	10		
	2.09	FLEXIBLE METALLIC CONDUIT (FMC)	11		
	2.10	LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)	11		
	2.11	RIGID POLYVINYL CHLORIDE (PVC) CONDUIT CONDUIT ACCESSORIES	11		
	2.12 2.13	SURFACE METALLIC RACEWAY	11 12		
	2.13		12		
	2.14	WIREWAY	12		
	2.16	OUTLET AND DEVICE, JUNCTION AND PULL BOXES (UP TO 100 CUBIC	12		
	2.10	INCHES) APPLICATIONS	12		
	2.17	OUTLET AND DEVICE, JUNCTION AND PULL BOXES (UP TO 100 CUBIC	12		
	2.1 /	INCHES) REQUIREMENTS	13		
	2 18	OUTLET BOXES	13		
		PULL AND JUNCTION BOXES	13		
_					
PART 3 EXECUTION14					
	3.01	GENERAL – RACEWAY INSTALLATION	14		
	3.02	RACEWAY INSTALLATION	14		
	3.03	OUTLET AND DEVICE, JUNCTION AND PULL BOXES (UP TO 100 CUBIC			
		INCHES) INSTALLATION	19		
	3.04	INSPECTIONS AND TESTING	22		





SECTION 26 0533 RACEWAYS AND BOXES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

- 1. Material and installation requirements for:
 - a. Galvanized steel rigid metal conduit (RMC)
 - b. Aluminum rigid metal conduit (RMC)
 - c. Intermediate metal conduit (IMC)
 - d. PVC-coated galvanized steel rigid metal conduit (RMC)
 - e. Flexible metal conduit (FMC)
 - f. Liquidtight flexible metal conduit (LFMC)
 - g. Electrical metallic tubing (EMT)
 - h. Rigid polyvinyl chloride (PVC) conduit
 - i. Conduit fittings and accessories
 - j. Surface raceways (metallic and non-metallic)
 - k. Wireways
 - 1. Outlet and device boxes up to 100 cubic inches in volume, including those used as junction and pull boxes.
 - m. Poke-thru devices
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Division 03 Concrete
 - 3. Section 26 0500 Basic Electrical Requirements
 - 4. Section 26 0526 Grounding and Bonding for Electrical Systems
 - 5. Section 26 0529 Hangers and Supports for Electrical Systems
 - 6. Section 26 0543 Electrical: Exterior Underground
 - 7. Section 26 0553 Identification for Electrical Systems

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. American National Standards Institute (ANSI):
 - 1. ANSI C80.1 Electrical Rigid Steel Conduit (ERSC)
 - 2. ANSI C80.3 Steel Electrical Metallic Tubing (EMT)

RACEWAYS AND BOXES

- 3. ANSI C80.5 Electrical Rigid Aluminum Conduit (ERAC)
- 4. ANSI C80.6 Electrical Intermediate Metal Conduit (EIMC)
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A123/A123M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A153/A153M Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Hardware.
 - ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Piping Systems.
- C. National Electrical Contractors Association (NECA):
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
 - 2. NECA 101 Standard for Installing Steel Conduits (Rigid, IMC, EMT)
 - 3. NECA 102 Standard for Installing Aluminum Rigid Metal Conduit
 - 4. NECA 111 Standard for Installing Nonmetallic Raceways
 - 5. NECA 130 Standard for Installing and Maintaining Wiring Devices
- D. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
 - 2. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
 - 3. NEMA OS 1 Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports
 - 4. NEMA OS 2 Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports
 - 5. NEMA RN 1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
 - 6. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Conduit
 - 7. NEMA TC 3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code (NEC).
- F. Underwriters Laboratories, Inc.:
 - 1. UL 1 Flexible Metal Conduit.
 - 2. UL 5 Surface Metal Raceways and Fittings
 - 3. UL 5A Nonmetallic Surface Raceways and Fittings
 - 4. UL 6 Electrical Rigid Metal Conduit.
 - 5. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations.

- 6. UL 50E Enclosures for Electrical Equipment, Environmental Considerations.
- 7. UL 360 Liquid-Tight Flexible Steel Conduit.
- 8. UL 467 Grounding and Bonding Equipment.
- 9. UL 514A Metallic Outlet Boxes.
- 10. UL 514B Conduit, Tubing, and Cable Fittings.
- 11. UL 651 Schedule 40 and 80 Rigid PVC Conduit and Fittings.
- 12. UL 797 Electrical Metallic Tubing Steel.
- 13. UL 870 Wireways, Auxiliary Gutters, and Associated Fittings.
- 14. UL 1203 Safety Explosion Proof and Dust-Ignition Proof Electrical Equipment for Use in Hazardous (Classified) Locations

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Product Data:
 - 1. Provide manufacturer's standard catalog pages and data sheets for conduit, boxes, wireways, fittings, and accessories.
- C. Shop Drawings:
 - 1. Provide Drawings showing routing of buried raceways.
 - 2. Identify conduit by tag number of equipment served or by circuit schedule number.
 - 3. Identify dimensional size of pull and junction boxes to be used.

1.04 **DEFINITIONS**

- A. EMT: Electrical Metallic Tubing
- B. ENT: Electrical Nonmetallic Tubing
- C. EPDM: Ethylene-Propylene-Diene Terpolymer Rubber
- D. FMC: Flexible Metallic Conduit
- E. IMC: Intermediate Metallic Conduit
- F. LFMC: Liquidtight Flexible Metallic Conduit
- G. LFNC: Liquidtight Flexible Nonmetallic Conduit
- H. NBR: Acrylonitrile-Butadiene Rubber
- I. PVC: Poly-Vinyl-Chloride
- J. RMC: Rigid Metallic Conduit
- K. RNC: Rigid Nonmetallic Conduit

- L. Raceway: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires, cables, or busbars, with additional functions as permitted in the NEC. Raceways include, but are not limited to, rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquid-tight flexible conduit, flexible metallic tubing, flexible metal conduit, electrical nonmetallic tubing, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface raceways, wireways, and busways.
- M. Wireway: A trough with hinged or removable covers for housing and protecting electric wires and cable. Conductors are laid into the wireway after the wireway has been installed as a complete system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Detailed Provisions Section 26 0500 – Basic Electrical Requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers or an approved equal, are acceptable:
 - 1. Galvanized Steel and Aluminum Rigid Metallic Conduit (RMC), Intermediate Metallic Conduit (IMC), and Electrical Metallic Tubing (EMT):
 - a. Allied Tube and Conduit a part of Atkore International; www.alliedeg.us
 - b. Calpipe Industries, Inc.; www.calpipe.com
 - c. Republic Conduit; www.republicconduit.com
 - d. Western Tube and Conduit Corporation; westerntube.com
 - e. Wheatland Tube Company a part of JMC Steel Group; www.wheatland.com
 - 2. PVC-Coated Galvanized Steel Rigid Metallic Conduit (RMC) and Repair Kits:
 - a. Calpipe Industries, Inc.; www.calpipe.com
 - b. Robroy Industries; www.robroy.com
 - c. Thomas and Betts a part of ABB Group; www.tnb.com
 - 3. Rigid Nonmetallic Conduit (RNC):
 - a. Cantex, Inc.; www.cantexinc.com
 - b. JM Eagle a part of J-M Manufacturing Company, Inc.; www.jmeagle.com
 - c. National Pipe and Plastics, Inc.; www.nationalpipe.com
 - d. Southern Pipe, Inc.; www.southern-pipe.com

- 4. Flexible Metallic Conduit (FMC) and Liquidtight Flexible Metallic Conduit (LFMC):
 - a. AFC Cable Systems a part of Atkore International; www.afcweb.com
 - b. Anamet Electrical, Inc.; www.anacondasealtite.com
 - c. Electri-Flex Company; www.electriflex.com
 - d. Encore Wire Corporation; www.encorewire.com
 - e. International Metal Hose Company; <u>www.metalhose.com</u>
 - f. Southwire Company, LLC.; www.southwire.com
- 5. Conduit Fittings and Accessories:
 - a. Same as manufacturer of conduit body fitting is to be installed on.
 - b. Appleton Group a part of Emerson Electric Company; <u>www.appletonelec.com</u>
 - c. Arlington Industries, Inc.; www.aifittings.com
 - d. Bridgeport Fittings, Inc.; www.bptfittings.com
 - e. Crouse-Hinds by Eaton Corporation; www.eaton.com
 - f. Killark a part of Hubbell Inc.; www.hubbell-killark.com
 - g. O-Z/Gedney a part of Emerson Electric Company; www.emersonindustrial.com
 - h. RACO a part of Hubbell Inc.; www.hubbell-rtb.com
 - i. Thomas and Betts a part of ABB Group; www.tnb.com
- 6. Surface Raceway (Metallic and Nonmetallic):
 - a. Hubbell Inc. Wiring Device-Kellems; www.hubbell-wiring.com
 - b. Thomas and Betts a part of ABB Group; www.tnb.com
 - c. Wiremold by Legrand, Inc.; www.legrand.us/wiremold.aspx
- 7. Wireway:
 - a. Cooper Industries by Eaton Corporation; www.eaton.com
 - b. Milbank Manufacturing Company; www.milbankmfg.com
 - c. Wiegmann a part of Hubbell Inc.; www.hubbell-wiegmann.com
- 8. Outlet, Device, Pull and Junction Boxes up to 100 Cubic Inches
 - a. Appleton Group a part of Emerson Electric Company; www.appletonelec.com
 - b. Arlington Industries, Inc.; www.aifittings.com
 - c. Bell a part of Hubbell Inc.; www.hubbell-rtb.com
 - d. Crouse-Hinds by Eaton Corporation; www.eaton.com
 - e. Hubbell Inc.; www.hubbell.com

- f. Hubbell Inc. Wiring Device-Kellems; www.hubbell-wiring.com
- g. Legrand, Inc. www.legrand.us
- h. Pass and Seymour by Legrand, Inc.; www.legrand.us/passandseymour.aspx
- i. RACO a part of Hubbell Inc.; www.hubbell-rtb.com
- j. Thomas and Betts a part of ABB Group; www.tnb.com
- k. Wiremold by Legrand, Inc.; www.legrand.us/wiremold.aspx
- 9. Poke-Thru Devices:
 - a. Hubbell Inc. Wiring Device-Kellems; www.hubbell-wiring.com
 - b. Wiremold by Legrand, Inc.; www.legrand.us/wiremold.aspx

2.02 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one (1) listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit Schedule 40.
 - 2. Exterior, Direct-Buried: Use PVC-coated galvanized steel rigid metal conduit or rigid PVC conduit Schedule 80.
 - 3. Where rigid PVC conduit is provided, transition to PVC coated steel rigid metal conduit where emerging from underground.
 - 4. Where rigid PVC conduit larger than 2-inch trade size is provided, use PVC-coated galvanized steel rigid metal conduit elbows for bends.
 - 5. Concrete Encased Ductbanks: Use rigid PVC schedule 40 or PVC coated steel rigid metal conduit. Use PVC-coated galvanized steel fittings for transitions to above grade. Use PVC-coated galvanized steel rigid long sweeping bends for conduits 2-inch and larger, and for bends greater than fifteen (15) degrees.
- D. Concealed Within Concrete or Masonry Walls:
 - 1. Use rigid PVC Schedule 40.
- E. Concealed Within Hollow Stud Walls:
 - 1. Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings:

- 1. Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT), or NEMA 1 rated wireway.
- G. Interior, Damp or Wet Locations:
 - 1. Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- H. Exposed, Interior, Not Subject to Physical Damage:
 - 1. Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- I. Exposed, Interior, Subject to Physical Damage:
 - 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below eight (8) feet, except within electrical and communication rooms or closets.
 - b. Where exposed below twenty (20) feet in warehouse, operations, and maintenance areas.
- J. Exposed, Exterior:
 - 1. Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- K. Concealed, Exterior, Not Embedded in Concrete or in Contact with Earth:
 - 1. Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- L. Embedded Within Poured Concrete Footings, Walls and Floors:
 - 1. Use rigid PVC Schedule 40 within concrete and PVC-coated galvanized steel when emerging from concrete.
- M. Corrosive Locations above Ground:
 - 1. Use PVC-coated galvanized steel rigid metal conduit or aluminum rigid metal conduit. Corrosive locations include, but are not limited to:
 - a. High-Pressure Wash System bay of Fleet Maintenance Facility.
- N. Hazardous (Classified) Locations:
 - 1. Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), aluminum rigid metal conduit, or PVC-coated galvanized steel rigid metal conduit.
- O. Connections to Luminaires above Accessible Ceilings:
 - 1. Use flexible metal conduit (FMC) with maximum length of six (6) feet.
- P. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use liquidtight flexible metal conduit (LFMC).
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
 - 3. Maximum Length: six (6) feet unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:

- a. Transformers
- b. Motors

2.03 CONDUIT REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled by UL.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4-inch trade size
 - 2. Branch Circuit Homeruns: 3/4-inch trade size
 - 3. Control Circuits: ½-inch trade size
 - 4. Flexible Connections to Luminaires: ½-inch trade size
 - 5. Underground, Interior: 1-inch trade size
 - 6. Underground, Exterior: 1-inch trade size
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.04 GALVANIZED STEEL RIGID METALLIC CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing. Threads shall be galvanized after cutting. Inside of conduit shall be coated with baked lacquer, varnish or enamel for a smooth surface.

B. Fittings:

- 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
- 3. Material: Use steel or malleable iron. Die cast zinc fittings are not permitted.
- 4. Bushings: Threaded, insulated metallic. Grounding or non-grounding type.
- 5. Connectors and Couplings: Use threaded or compression type fittings only. Threadless set screw type fittings are not permitted.
- 6. Hubs: Threaded, insulated and gasketed metallic for raintight connection.
- 7. Unions: Threaded galvanized steel or zinc plated malleable iron.

- 8. Sealing Fittings: Body shall be cast copper free aluminum with threaded hubs. Fiber and sealing compound UL listed for use with the sealing fitting.
- 9. Expansion Couplings: 2-inch nominal straight-line conduit movement in either direction. Galvanized steel with insulated bushing and gasketed for damp/wet locations. Internally or externally grounded.
- 10. Deflection Couplings: ³/₄-inch nominal straight-line conduit movement in either direction and 30-degree nominal deflection from the normal in all directions. Metallic hubs, neoprene outer jacket and stainless steel jacket clamps. Liquidtight and internally or externally grounded.

2.05 PVC-COATED GALVANIZED STEEL RIGID METALLIC CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed as complying with UL 6.
- B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil and bonded to hot-dipped galvanized rigid steel conduit conforming to ANSI C80.1.
- C. Interior Coating: Urethane coating with a nominal thickness of 2 mil minimum.
- D. Conduit shall be primed with epoxy prior to application of PVC and urethane coatings. Conduit threads shall be coated with urethane.
- E. Female Ends: Have a plastic sleeve extending a minimum of one (1) pipe diameter or 2-inches, whichever is less beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit to be used with it.
- F. PVC-Coated Fittings:
 - 1. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 - 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 - 3. Same material and construction as those fittings listed under Section 2.04 Galvanized Steel Rigid Metallic Conduit (RMC) and coated as defined under this section.
- G. PVC-Coated Supports: Furnish with exterior coating of PVC, minimum thickness of 15 mil.

2.06 ALUMINUM RIGID METALLIC CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
- B. Fittings:

- 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
- 3. Material: Use aluminum.
- 4. Connectors and Couplings: Use threaded or compression type fittings only. Threadless set screw type fittings are not permitted.

2.07 INTERMEDIATE METALLIC CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing. Inside of conduit shall be coated with baked lacquer, varnish or enamel for a smooth surface.

B. Fittings:

- 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 2. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
- 3. Material: Use steel or malleable iron. Die cast zinc fittings are not permitted.
- 4. Connectors and Couplings: Use threaded or compression type fittings only. Threadless set screw type fittings are not permitted.

2.08 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 listed and labeled as complying with UL 797. Metallic zinc applied by hot-dip galvanizing or electro-galvanizing. Inside of conduit shall be coated with baked lacquer, varnish or enamel for a smooth surface.

B. Fittings:

- 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 2. Material: Use steel or malleable iron. Die cast zinc fittings are not permitted.
- 3. Connectors and Couplings: Use compression (gland) type
 - a. Do not use indenter type connectors and couplings.
 - b. Do not use set-screw type connectors and couplings.
- 4. Damp or Wet Locations (where permitted): Use fittings for use in wet locations.
- 5. Embedded within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.09 FLEXIBLE METALLIC CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:

- 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 2. Material: Use steel or malleable iron. Die cast zinc fittings are not permitted.

2.10 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:

- 1. Description: Sealtight compression type fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 2. Material: Use steel or malleable iron. Die cast zinc fittings are not permitted.

2.11 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C and shall be marked "maximum 90 Deg C". PVC plastic compound shall include inert modifiers to improve weatherability and heat distribution. Conduit shall be rated for direct sunlight exposure.

B. Fittings:

1. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.12 CONDUIT ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- C. Pull Strings: Use nylon cord with average breaking strength of not less than two hundred (200) pound-force.
- D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

E. Weather and Corrosion Protection Tape: PVC based tape with a minimum nominal thickness of 10 mils to protect against moisture, acids, alkalis, salts, and suitable for direct bury. Shall be used with appropriate pipe primer.

2.13 SURFACE METALLIC RACEWAY

A. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway and conforms to UL 5. Raceways fittings shall be as recommended by raceway manufacturer.

2.14 SURFACE NONMETALLIC RACEWAY

A. Description: Plastic channel with fitted cover, suitable for use as surface metal raceway and conforms to UL 5A. Raceways fittings shall be as recommended by raceway manufacturer.

2.15 WIREWAY

- A. Suitable for lay-in conductors and designed for continuous grounding.
- B. Covers: Hinged or removable in accessible areas. Non-removable when passing through partitions.
- C. Finish: Rust inhibiting primer and manufacturer's standard paint inside and out except for stainless steel type.

2.16 OUTLET AND DEVICE, JUNCTION AND PULL BOXES (UP TO 100 CUBIC INCHES) APPLICATIONS

- A. Use sheet-steel boxes for dry locations unless otherwise indicated or required. Sheet-steel boxes shall comply with NEMA OS 1, listed and labeled as complying with UL 514A.
- B. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required, furnish with compatible waterproof gasketed covers. Cast metal boxes shall comply with NEMA FB 1, listed and labeled as complying with UL514A; furnish with threaded hubs.
- C. Use suitable concrete type boxes where flush-mounted in concrete.
- D. Use suitable masonry type boxes where flush-mounted in masonry walls.
- E. Used raised covers suitable for the type of wall construction and device configuration where required.
- F. Use shallow boxes where required by the type of wall construction.
- G. Do not use "through-wall" boxes designed for access from both sides of wall.
- H. Boxes for Supporting Luminaires and Ceiling Fans Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

I. Boxes for Ganged Devices – Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.

2.17 OUTLET AND DEVICE, JUNCTION AND PULL BOXES (UP TO 100 CUBIC INCHES) REQUIREMENTS

- A. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
- B. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements.
- C. Provide grounding terminals within boxes where equipment grounding conductors terminate.

2.18 OUTLET BOXES

- A. Metallic Outlet Boxes:
 - 1. In conformance with NEMA OS 1.
 - 2. Hot-dip galvanized steel and include conduit knockouts and grounding pigtail.
 - 3. Minimum size: 4-inch square x 1½-inch deep.
 - 4. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include ½-inch male fixture studs where required.
 - 5. Concrete Ceiling Boxes: Concrete type.
- B. Nonmetallic Outlet Boxes:
 - 1. In conformance with NEMA OS 2.
- C. Cast Outlet Boxes:
 - 1. In conformance with NEMA FB 1, cast ferroalloy. Gasketed cover, threaded hubs and grounding screw.
 - 2. Styles:
 - a. "FS" or "FD".
 - b. "Bell".
 - c. Single or multiple gang and tandem.
 - d. "EDS" or "EFS" for hazardous locations.

2.19 PULL AND JUNCTION BOXES

- A. Interior Sheet Metal Boxes: NEMA OS 1, galvanized steel. Finished with rush inhibiting primer and manufacturers standard paint inside and out. Interior boxes larger than 12-inches in any dimension shall have a hinged cover.
- B. Exterior Boxes and Wet/Damp Location Installations: NEMA 250, Type 4 and Type 6; flat-flanged, surface mounted junction box, UL listed as rain-tight:

RACEWAYS AND BOXES

- 1. Material: Galvanized cast iron or copper-free aluminum.
- 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- C. In-Ground Cast Metal Box: NEMA 250, Type 6; outside flanged, recessed cover box for flush mounting:
 - 1. Material: Copper-free cast aluminum
 - 2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws. Legend shall be "POWER" or "SIGNAL", or as otherwise noted on Project Drawings.
- D. Box extensions and adjacent boxes within 48-inches of each other are not allowed for the purpose of creating more wire capacity.
- E. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.

PART 3 EXECUTION

3.01 GENERAL – RACEWAY INSTALLATION

- A. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction, and splicing points.
- B. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop. Unless specifically indicated otherwise, the minimum raceway size shall be:
 - 1. Conduit: ³/₄-inch.
 - 2. Wireway: $2\frac{1}{2}$ x $2\frac{1}{2}$ inches.
- C. Coordinate the Work with other trades to avoid placement of structural members, ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
- D. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed by other trades.
- E. Coordinate the Work with other trades to provide roof penetrations that preserve the integrity of the roofing system.
- F. All exposed conduit runs, fittings and supports located within structure exterior and interior finished areas shall be painted to match the finish.
- G. Do not install aluminum conduits in contact with concrete.

3.02 RACEWAY INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

- C. Install galvanized steel RMC and IMC in accordance with NECA 101.
- D. Install aluminum RMC in accordance with NECA 102.
- E. Install PVC-coated galvanized steel RMC using only tools approved by the manufacturer.
- F. Install rigid PVC conduit in accordance with NECA 111.
- G. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms
 - b. Mechanical equipment rooms
 - c. Within joists and framing with structures that have no interior finished walls and/or ceilings.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors
 - b. Across roofs
 - c. Across top of parapet walls
 - d. Across building exterior surfaces
 - 6. Only where approved, route exposed conduit parallel and perpendicular to walls.
 - 7. Conduits installed underground and/or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 8. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 9. Arrange conduit to provide no more than the equivalent of three 90-degree bends between pull points.
 - 10. Route conduits above water and drain piping where possible.
 - 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 12. Maintain minimum clearance of 6-inches between conduits and piping for other systems.
 - 13. Maintain minimum clearance of 12-inches between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters

- b. Hot water piping
- c. Flues
- 14. Group parallel conduits in the same area together on a common rack.
- 15. Conduits Embedded in Above-Grade Reinforced Concrete:
 - a. Conduit shall not be run in beams.
 - b. Place conduit after reinforcing steel has been laid. The reinforcement steel shall not be displaced by the conduit.
 - c. Provide a minimum of 1½-inch of cover over conduit, excluding surface finish.
 - d. Conduits parallel to main reinforcement shall be run near the center of the wall.
 - e. Conduits perpendicular to main reinforcement shall be run midway between wall or slab supports.

H. Field Bending and Cutting of Conduits:

- 1. Utilize tools and equipment recommended by the manufacturer of the conduit, designed for the purpose and the conduit material to make all filed bends and cuts.
- 2. Do not reduce the internal diameter of the conduit when making conduit bends.
- 3. Degrease threads after threading and apply a zinc rich paint.
- 4. Debur interior and exterior after cutting.
- I. Conduit Seals: Installed in conduit systems located in hazardous areas as required by the NFPA 70.
- J. The protective coating integrity of conduits, fittings, outlet, pull and junction boxes and accessories shall be maintained.
 - 1. Repair galvanized components utilizing a zinc rich paint provided by or approved by the manufacturer.
 - 2. Repair painted components utilizing touch up paint provided by or approved by the manufacturer.
 - 3. Repair PVC coated components utilizing a patching compound, of the same material as the coating, provided by the manufacturer of the conduit.

K. Underground Installations

1. Provide the required rigid steel and PVC conduits with watertight connections and completely encased with concrete. Provide at least 3-inches of concrete between the conduits and the outside of the encasement, and 2-inches of concrete between conduits unless otherwise indicated. Install spacers and adapters to support and terminate nonmetallic conduits. Connect the adapters to rigid steel conduit risers that terminate at above-grade equipment. The steel conduit riser shall be completely concrete encased to finish grade. The top of the concrete encasement shall be a minimum of 30-inches below finish grade. Concrete shall be red-dye in accordance with Detailed Provisions Section 26 0543 – Electrical: Exterior Underground. Trench and backfilling shall be done in accordance with Detailed Provisions

Section 31 2133 – Trenching, Backfilling, and Compacting for Utilities. Restore the finish grade surface to match existing. Repave the trench to match existing pavement if trench passes through a paved area. Install warning tape in accordance with Detailed Provisions Section 26 0553 – Identification for Electrical Systems. Comply with Detailed Provisions Section 03 1113 – Formwork-Structural Cast-in-Place Concrete, Detailed Provisions Section 03 2100 – Concrete Reinforcement, Detailed Provisions Section 03 3100 – Cast-in-Place Structural Concrete, Detailed Provisions Section 03 3131 – Concrete Mixing, Placing, Jointing, and Curing, and Detailed Provisions Section 03 3132 – Concrete Finishing and Repair of Surface Defects.

L. Conduit Support:

- 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods. See Detailed Provisions Section 26 0529 Hangers and Supports for Electrical Systems.
- 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

M. Connections and Terminations:

- 1. Male threads of conduit systems shall be coated with an electrically conductive anti-seize compound as recommended by the conduit manufacturer. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
- 2. Where two (2) threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
- 3. Use suitable adapters where required to transition from one type of conduit to another.
- 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
- 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for damp and wet locations.
- 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
- 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
- 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- 9. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum twenty (20) minutes.

N. Penetrations:

- 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of the County's Structural Engineer.
- 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
- 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
- 4. Conceal bends for conduit risers emerging above ground.
- 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
- 6. Make penetrations of roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
- 7. Provide metal escutcheon plates for conduit penetrations exposed to public view.
- 8. Install firestop to preserve fire resistance rating of partitions and other elements.
- O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 - 2. Where conduits are subject to earth movement by settlement or frost.
- P. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
 - 1. Where conduits pass from outdoors into conditioned interior spaces.
 - 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 - 3. Where conduits penetrate coolers or freezers.
- Q. Provide nylon or polyethylene pull rope in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12-inches at each end.
- R. Provide grounding and bonding.
- S. Remove moisture and debris from conduit before wire is pulled into place.
 - 1. Pull mandrel with diameter approximately ½-inch less than the inside diameter of the conduit, to remove obstructions.

- 2. Swab conduit by pulling a heavy duty wire brush mandrel followed by a rubber duct swab through each conduit.
- 3. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

3.03 OUTLET AND DEVICE, JUNCTION AND PULL BOXES (UP TO 100 CUBIC INCHES) INSTALLATION

A. General:

- 1. Install products in accordance with manufacturer's instructions.
- 2. See Detailed Provisions Section 26 0500 Basic Electrical Requirements and Project Drawings for area classifications.
- 3. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
- 4. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
- 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, and any other potential conflict items. Electrical boxes are shown on Project Drawings in approximate locations unless otherwise dimensioned. Adjust box locations up to ten (10) feet if required to accommodate intended purpose.
- 6. Perform Work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 120, including mounting heights specified in those standards where mounting heights are not indicated. Unless otherwise indicated in the Contract Documents, the Contractor shall mount center of outlets or boxes at the following heights above finish floor:
 - a. Distribution Panels -6'-0" to top
 - b. Outlets 14"
 - c. Switches -3'-6"
- 7. Close unused box openings. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- 8. Provide grounding and bonding in accordance with Detailed Provisions Section 26 0526 Grounding and Bonding for Electrical Systems.

B. Outlet and Device Boxes:

- 1. Permitted use of metallic boxes:
 - a. Housing of wiring devices:
 - 1) Recessed in all stud framed walls and ceilings.

2) Recessed in poured concrete, concrete block and brick walls or architecturally finished areas and exterior building walls.

b. Pull or junction box:

- 1) Above gypsum wall board or acoustical tile ceilings. Inaccessible ceiling area, install box no more than 6-inches from ceiling access panel or from removable recessed luminaire.
- 2) Above ten (10) feet in an architecturally finished area where there is no ceiling.
- 3) Above ten (10) feet in dry non-architecturally finished areas.
- 4) Provide NEMA 4 pull or junction box mounted in damp/wet areas.
- 5) Provide NEMA 4X pull or junction box mounted in areas designated as wet and/or corrosive.
- 6) Provide NEMA 7 pull or junction box mounted in areas designated as Class I hazardous. Provide PVC coating in corrosive and highly corrosive areas when PVC coated conduit is used.

2. Permitted use of cast outlet boxes:

- a. Housing of wiring devices surface mounted in non-architecturally finished dry, damp, wet, corrosive, highly corrosive and hazardous areas.
- b. Pull and junction box surface mounted in non-architecturally finished dry, damp, wet, corrosive, highly corrosive and hazardous areas.
- 3. Install boxes plumb and vertical to the floor.

C. Box Supports:

- 1. Secure and support boxes in accordance with NFPA 70 and Detailed Provisions Section 26 0529 Hangers and Supports for Electrical Systems using suitable supports and methods.
- 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

D. Flush-Mounted Boxes:

- 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than ½-inch or does not project beyond finished surface.
- 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
- 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than ¹/₈-inch at the edge of the box.

- E. Install boxes as required to preserve insulation integrity, where applicable.
- F. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300V.
- G. Provide grounding and bonding in accordance with Detailed Provisions Section 26 0526 Grounding and Bonding for Electrical Systems.
- H. Install in locations as shown on Project Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- I. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- J. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- K. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- L. Use flush mounting outlet box in finished areas. Locate flush mounting box in masonry wall to require cutting off masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- M. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- N. Locate outlet boxes so that wall plates do not span different building finishes.
- O. Locate outlet boxes so that wall plates do not cross masonry joints.
- P. Do not install flush mounting box back-to-back in walls, provide minimum 6-inches separation.
 - 1. Provide minimum 24-inches separation in acoustic rated walls.
 - 2. Provide minimum 24-inches separation in fire rated walls.
- Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Use adjustable steel channel fasteners for hung ceiling outlet box.
- T. Do not fasten boxes to ceiling support wires.
- U. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12-inches of box.
- V. Use gang box where more than one device is mounted together. Do not use sectional box.
- W. Use gang box with plaster ring for single device outlets.
- X. Use cast outlet box in exterior locations exposed to weather and wet locations. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

3.04 INSPECTIONS AND TESTING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign matter.
- B. Contractor to test and clean interior of conduits using test mandrel, heavy-duty wire brush mandrel followed by a rubber duct swab.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Where coating of PVC-coated galvanized steel RMC contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- E. Correct deficiencies and replace damaged or defective conduit, boxes, fittings, and accessories.

END OF SECTION 26 0533



SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0543: ELECTRICAL: EXTERIOR UNDERGROUND CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	
1.02	QUALITY ASSURANCE AND REFERENCE STANDARDS	1
	DEFINITIONS	
1.04	SUBMITTALS	3
PART 2	PRODUCTS	3
2.01	ACCEPTABLE MANUFACTURERS	3
2.02	HANDHOLES, PULL BOXES, AND VAULTS	4
	ACCESSORIES	
2.04	UNDERGROUND CONDUIT AND ACCESSORIES	5
PART 3	S EXECUTION	6
3.01	GENERAL	6
3.02	HANDHOLES, PULL BOXES, AND VAULTS	6
3.03	UNDERGROUND CONDUITS	7
	INSPECTIONS AND TESTING	





SECTION 26 0543 ELECTRICAL: EXTERIOR UNDERGROUND

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Hand Holes.
 - b. Pull Boxes.
 - c. Vaults
 - d. Concrete encased underground nonmetallic conduits and ductbanks.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Division 03 Concrete
 - 3. Section 26 0500 Basic Electrical Requirements
 - 4. Section 26 0519 Wire and Cable: 600 Volt and Below
 - 5. Section 26 0526 Grounding and Bonding for Electrical Systems
 - 6. Section 26 0533 Raceways and Boxes
 - 7. Section 26 0553 Identification for Electrical Systems
 - 8. Section 31 2133 Trenching, Backfilling and Compacting for Utilities

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO HB Standard Specification for Highway Bridges
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A48/A48M Standard Specification for Grey Iron Castings
 - 2. ASTM F512 Standard Specification for Smooth-Wall PVC Conduit and Fittings for Underground Installation
 - 3. ASTM A536 Standard Specification for Ductile Iron Castings
 - 4. ASTM C857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
 - 5. ASTM C858 Standard Specification for Underground Precast Concrete Utility Structures

ELECTRICAL: EXTERIOR UNDERGROUND

- 6. ASTM C891 Standard Practice for Installation of Underground Precast Concrete Utility Structures
- 7. ASTM C 1037 Standard Practice for Inspection of Underground Precast Concrete Utility Structures
- C. California Public Utilities Commission (CalPUC):
 - 1. CalPUC GO 128 Rules for Construction of Underground Electrical Supply and Communications Systems.
- D. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Conduit
 - 2. NEMA TC 3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
 - 3. NEMA TC 6&8 PVC Plastic Utilities Duct for Underground Installations
 - 4. NEMA TC 9 Fittings for PVC Plastic Utilities Duct for Underground Installations.
- E. Society of Cable Telecommunications Engineers (SCTE):
 - 1. SCTE 77 Specification for Underground Enclosure Integrity.
- F. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code (NEC)
- G. Underwriters Laboratories, Inc. (UL):
 - 1. UL 514B Conduit, Tubing, and Cable Fittings
 - 2. UL 651 Schedule 40 and 80 Rigid PVC Conduit and Fittings

1.03 **DEFINITIONS**

- A. Concrete Encased Ductbank: An individual (single) or multiple conduits, arranged in one or more planes, encased in a common concrete envelope.
- B. Direct-Buried Conduit(s): Individual (single) or multiple underground conduits, arranged in one (1) or more planes, in a common trench.
- C. Duct: Interchangeable term for conduit.
- D. Duct Bank: An assembly of conduits that may either be directly buried in earth or encased in concrete.
- E. Hand Hole: Small underground structure (15"x20"x10") used for a maximum of two (2) 1¹/₄ -inch conduits. Used for distribution to a single end point.
- F. Pull Box: Small underground structure (15"x26"x18") used for a maximum of two 2-inch conduits. .
- G. Vault: Large underground structure of varying size used for 4-inch conduits.
 - 1. Up to six (6) 4-inch conduits minimum vault size is 5'x7'x7'.

- 2. Up to twelve (12) 4-inch conduits minimum vault size is 6'x10'x7'.
- 3. Thirteen (13) to eighteen (18) 4-inch conduits minimum vault size is 6'x12'x7'.
- 4. Nineteen (19) to twenty-four (24) 4-inch conduits minimum vault size is 8'x15'x7'.

1.04 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Shop Drawings:
 - 1. Provide dimensional drawings of each hand hole, pull box, and vault indicating all specified accessories and conduit entry locations.
 - 2. Provide cross-sectional sketch of each concrete encased ductbank. Dimension spacing between conduits. Dimension concrete envelope and reinforcing, if applicable. Provide dimensions from top of encasement to finish grade. Show and dimension placement of warning tape.

C. Product Data:

- 1. Provide manufacturer's standard catalog pages and data sheets for conduit, hand holes, pull boxes, vaults, spacers, fittings, and accessories.
- 2. Provide specifications for red-dye concrete mix to be used for encasement.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers or an approved equal are acceptable:
 - 1. Prefabricated Composite Handholes:
 - a. Armorcast Products Company; www.armorcastprod.com
 - b. Quazite, Hubbel Power Systems, Inc.; www.hubbellpowersystems.com/about/quazite/
 - 2. Precast Handholes, Pull Boxes, and Vaults:
 - a. Armoreast Products Company; www.armoreastprod.com
 - b. Christy Concrete, Oldcaste Prescast, Inc.; https://oldcastleinfrastructure.com/brands/christy/
 - c. Jensen Precast; www.jensenprecast.com
 - d. Oldcastle Precast, Inc.; https://oldcastleinfrastructure.com/products/energy/substations/
 - 3. Accessories:
 - a. Alhambra Foundry Company; www.alhambrafoundry.com/

- b. Condux International, Inc.; www.condux.com/
- c. Long Beach Iron Works; www.lbiw.com/
- d. Underground Devices, Inc.; www.udevices.com/
- e. Unistrut, a part of Atkore International; www.unistrut.us/
- 4. Concrete Encasement Red Dye:
 - a. L.M. Scofield Company, Integral Color "Utility Red"; www.scofield.com

2.02 HANDHOLES, PULL BOXES, AND VAULTS

- A. Prefabricated Composite Material Handholes:
 - 1. Handhole Body and Cover: Fiberglass reinforced polymer concrete conforming to all tests provision of SCTE 77.
 - 2. Minimum Load Ratings: In compliance with SCTE 77 Tier 15.
 - 3. Open bottom, stackable design as required for specified depth.
 - 4. Cover:
 - a. Engraved legend "ELECTRIC" or "COMMUNICATIONS".
 - b. Non-gasketed bolt down with stainless steel penta head bolts.
 - c. Lay-in non-bolt down, when cover is over one hundred pounds (100 lbs).
 - d. One or multiple sections so the maximum weight of section is one hundred twenty-five pounds (125 lbs).
 - 5. Cover Lifting Hook: 24-inch minimum length.
- B. Precast Handholes, Pullboxes, and Vaults:
 - 1. Fiberglass reinforced polymer concrete or steel reinforced cement concrete
 - 2. AASHTO Live Load Rating: H-20 for full deliberate vehicle traffic.
 - 3. Mating Edges: Tongue and groove type.
 - 4. Solid bottom with a 12"x12" sump or 12-inch diameter french drain in the bottom of each vault.
 - 5. Gasketed removable top slab with lifting eyes and cast in frame for cover.
 - 6. Cable pulling eyes opposite all conduit entrances.

2.03 ACCESSORIES

- A. Concrete Handhole, Pull Boxes, and Vaults:
 - 1. Cover and Frame:
 - a. Cast Ductile Iron: ASTM A536.
 - b. AASHTO Live Load Rating: H-20.

c. Cast legend "ELECTRICAL" or "COMMUNICATIONS" into covers.

B. Cable Racks and Hooks:

- 1. Material: Heavy-duty, non-metallic (glass reinforced nylon).
- 2. Hook Loading Capacity: four hundred pounds (400 lbs.) minimum.
- 3. Rack Loading Capacity: Four (4) hooks maximum.
- 4. Hook Deflection: 1/4-inch maximum.
- 5. Hooks: Length, as required, with positive locking device to prevent upward movement.
- 6. Mounting Hardware: Stainless Steel.
- 7. Cable Pulling Irons:
 - a. ⁷/₈-inch diameter hot-dipped galvanized steel.
 - b. Six thousand pound (6,000 lb.) minimum pulling load.
- 8. Grounding Rods and Grounding Equipment: See Detailed Provisions Section 26 0526 Grounding and Bonding for Electrical Systems.

2.04 UNDERGROUND CONDUIT AND ACCESSORIES

A. Concrete Encasement:

- Comply with Detailed Provisions Section 03 1113 Formwork Structural Castin-Place Concrete, Detailed Provisions Section 03 2100 Concrete Reinforcement, Detailed Provisions Section 03 3100 Cast-in Place Structural Concrete, Detailed Provisions Section 03 3131 Concrete Mixing, Placing, Jointing, and Curing, and Detailed Provisions Section 03 3132 Concrete Finishing and Repair of Surface Defects.
- 2. Concrete shall be red dyed utilizing red dye mixed into the concrete for a minimum of five (5) minutes prior to pouring. Minimum of twelve pounds (12 lbs.) of dye per one (1) cubic yard of concrete.
- 3. Compressive Strength: Unless noted otherwise, minimum 3,000 psi.
- 4. Graded as specified in ASTM C33, size number 8.
- B. Conduit: Comply with Detailed Provisions Section 26 0533 Raceways and Boxes.
- C. Duct Terminators: ABS plastic, window type and provided for conduit entrance. Designed for installation into handholes, pull boxes, and vaults for a watertight seal. Sufficient space between terminator walls to allow for placement of rebar and concrete.
- D. Duct Spacers/Supports: Interlocking, high density polyethylene or high impact polystyrene. Provide 3-inch minimum spacing between conduits. Provide accessories as required, including, but not limited to: hold down bars and ductbank strapping.
- E. Warning Tape See Detailed Provisions Section 26 0553 Identification for Electrical Systems.

PART 3 EXECUTION

3.01 GENERAL

- A. Project Drawings indicate the intended location of handholes, pull boxes, vaults and routing of ductbanks and direct buried conduit. Field conditions may affect actual routing. Proposed deviations from locations and routing shown on the Project Drawings must be approved by the County in writing.
- B. Handhole, pull box, and vault locations:
 - 1. Approximately as shown on the Project Drawings. Determine exact locations after careful consideration has been given to the location of other utilities, grading, and paving. Shall not be located in a swale or drainage ditch.
 - 2. As required for pulling distances, for number of bends in ductbank routing, and to keep pulling tension under allowable cable tensions.
 - 3. Locations are to be approved by the County prior to excavation and placement of all handholes, pull boxes, and vaults.
- C. Install products in accordance with manufacturer's instructions.
- D. Comply with Detailed Provisions Section 31 2133 Trenching, Backfilling, and Compacting for Utilities.

3.02 HANDHOLES, PULL BOXES, AND VAULTS

- A. Prefabricated Composite Material Handholes:
 - 1. Only for use in areas subjected to occasional non-deliberate vehicular traffic.
 - 2. Place handhole on a foundation of compacted ¼-inch to ½-inch crushed rock, a minimum 8-inches thick and extended a minimum 6-inches past the handholes footprint on all sides.
 - 3. Provide concrete encasement ring around handhole per manufacturer's installation instructions.
 - 4. Install so that the surrounding grade is 1-inch lower than the top of the handhole.
 - 5. Size: As indicated on Project Drawings or as required for the number and size of conduits.
 - 6. Provide cable rails and pulling eyes as needed.
- B. Precast Handholes, Pull Boxes, and Vaults:
 - 1. For use in vehicular and non-vehicular traffic areas.
 - 2. Construction:
 - a. Grout or seal all joints, per manufacturer's instructions.

- b. Support cables on wall by cable racks:
 - 1) Provide a minimum of two (2) racks, install symmetrically on each wall of handholes, pull boxes, and vaults. Provide additional cable racks, as required, so that both ends of cable splices will be supported horizontally.
 - 2) Equip cable racks with adjustable hooks in quantity as required by the number of conductors to be supported.
- c. In each handhole, pull box, and vault, drive a ¾-inch diameter by 10-foot long copper clad ground rod into the earth with approximately 6-inches exposed above finished floor.
 - 1) Drill opening in floor for ground rod.
 - 2) Connect all metallic components to ground rod by means of #8 AWG minimum copper wire and approved grounding clamps.
 - 3) Utilize a ground bar in the handhole, pull box, or vault if the quantity of ground wires exceeds three (3). Connect ground bar to ground rod with a #2/0 AWG minimum cooper wire.
- 3. Place handhole, pull box, or vault on a foundation of compacted ¼-inch to ½-inch crushed rock, a minimum 8-inches thick and extended a minimum 6-inches past the handhole, pull box, or vault footprint on all sides.
- 4. Install so that the top of cover is 1-inch above finished grade. Where existing grades are higher than finished grades, install sufficient number of courses of curved segmented concrete block between top of structure and cover frame to temporarily elevate cover to existing grade level.
- 5. After installation is complete, backfill and compact soil around handholes, pull boxes, and vaults.
- 6. Size: As indicated on Project Drawings or as required for the number and size of conduits entering. See paragraph 1.03 of this Detailed Provisions Section for minimum required sizes.

3.03 UNDERGROUND CONDUITS

- A. General Installation Requirements:
 - 1. Ductbank types per location:
 - a. Concrete encased ductbank:
 - 1) As indicated in the Ductbank Schedule and/or Project Drawings.
 - b. Direct-buried conduit(s):
 - 1) Area/Roadway lighting
 - 2) As indicated in the Ductbank Schedule and/or Project Drawings.
 - 2. Do not place concrete encasement or backfill with soil until conduits have been observed and surveyed by the County.

- 3. Ductbanks shall be sloped a minimum of 4-inches per one hundred (100) feet. Low points shall be at handholes, pull boxes, or vaults.
- 4. During construction and after conduit installation is complete, plug the ends of all conduits.
- 5. Provide conduit supports and spacers.
 - a. Place supports and spacers for rigid nonmetallic conduit on maximum centers as indicated for the following trade sizes:
 - 1) 1-inch and less: 3 feet.
 - 2) 1¹/₄-inch to 3-inches: 5 feet.
 - 3) 3-inch and larger: 20 feet.
 - b. Place supports and spacers for rigid steel conduit on maximum centers as indicated for the following trade sizes:
 - 1) 1-inch and less: 10 feet.
 - 2) 1¹/₄-inch to 2¹/₂-inch: 14 feet.
 - 3) 3-inch and larger: 20 feet.
 - c. Securely anchor conduits to supports and spacers to prevent movement during placement of concrete or soil.
- 6. Stagger conduit joints at intervals of 6-inches vertically.
- 7. Make conduit joints watertight and in accordance with manufacturer's recommendations.
- 8. Accomplish changes in direction of runs exceeding a total of fifteen (15) degrees by long sweep bends having a minimum radius of twenty-five (25) feet. Sweep bends may be made up of one or more curved or straight sections or combinations thereof.
- 9. Furnish manufactured bends at end of runs. Minimum radius of 18-inches for conduits less than 3-inch trade size and 36-inches for conduits 3-inch trade size and larger.
- 10. Field cuts requiring tapers shall be made with the proper tools and shall match factory tapers.
- 11. After the conduit run has been completed:
 - a. Prove joint integrity and test for out-of-round duct by pulling a test mandrel through each conduit.
 - 1) Test Mandrel:
 - (a) Length: Not less than 12-inches.
 - (b) Diameter: Approximately 1/4-inch less than the inside diameter of the conduit.
 - b. Clean the conduit by pulling a heavy duty wire brush mandrel followed by a rubber duct swab through each conduit.

- 12. Pneumatic rodding may be used to draw in lead wire.
 - a. Install a heavy nylon cord free of kinks and splices in all unused new ducts.
 - b. Extend cord three (3) feet beyond ends of conduit.
- 13. Transition from rigid non-metallic conduit to rigid metallic conduit, per Detailed Provisions Section 26 0533 Raceways and Boxes, prior to entering a structure or going above ground.
 - a. Except rigid non-metallic conduit may be extended directly to handholes, pull boxes, vaults, pad mounted transformer boxes and other exterior pad mounted electrical equipment where the conduit is concealed within the enclosure.
 - b. Terminate rigid PVC conduits with end bells.
 - c. Terminate rigid steel conduits with insulated bushings.
- 14. Place warning tape in trench over ductbanks, direct-buried conduit, and direct-buried wire and cable in accordance with Detailed Provisions Section 26 0553 Electrical Devices Identification.
- 15. Placement of conduits stubbing into handholes, pull boxes, and vaults shall be located to allow for proper bending radiuses of the cables.

B. Concrete Encased Ductbank:

- 1. Provide the required rigid steel and PVC conduits with watertight connections and completely encased with concrete.
- 2. Provide at least 3-inches of concrete between the conduits and the outside of the encasement, and 2-inches of concrete between conduits unless otherwise indicated.
- 3. Install spacers and adapters to support and terminate nonmetallic conduits. Connect the adapters to rigid steel conduit risers that terminate at above-grade equipment.
- 4. The steel conduit riser shall be completely concrete encased to finish grade. The top of the concrete encasement shall be a minimum of 30-inches below finish grade.
- 5. Trench backfilling shall be done in accordance with Detailed Provisions Section 31 2133 Trenching, Backfilling, and Compacting for Utilities. Restore the finish grade surface to match existing. Repave the trench to match existing pavement if trench passes through a paved area.
- 6. Install warning tape in accordance with Detailed Provisions Section 26 0553 Identification for Electrical Systems.
- 7. Comply with Detailed Provisions Section 03 1113 Formwork-Structural Cast-in-Place Concrete, Detailed Provisions Section 03 2100 Concrete Reinforcement, Detailed Provisions Section 03 3100 Cast-in-Place Structural Concrete, Detailed Provisions Section 03 3131 Concrete Mixing, Placing, Jointing, and Curing, and Detailed Provisions Section 03 3132 Concrete Finishing and Repair of Surface Defects.

C. Direct-Buried Conduit(s):

- 1. Install so that the top of the uppermost conduit, at any point:
 - a. Is not less than 30-inches below grade.
 - b. Is below pavement sub-grading.
- 2. Provide a uniform minimum clearance of 3-inches between conduits or as required in Detailed Provisions Section 26 0533 Raceways and Boxes for different cabling types.
 - a. Maintain the separation of multiple planes of conduits by one of the following methods:
 - 1) Install multilevel conduits with the use of conduit supports and spacers to maintain the required separations, and backfill with flowable fill (100 psi) or concrete per Detailed Provisions Section 31 2133 Trenching, Backfilling, and Compacting for Utilities.
 - 2) Install the multilevel conduits one level at a time. Each level is backfilled with the appropriate amount of soil and compaction, per Detailed Provisions Section 31 2133 Trenching, Backfilling, and Compacting for Utilities, to maintain the required separations.

3.04 INSPECTIONS AND TESTING

- A. Inspect handholes, pull boxes, vaults, conduits, fittings, and accessories for damage and defects.
- B. Contractor to test and clean interior of conduits using test mandrel, heavy —duty wire brush mandrel followed by a rubber duct swab.
- C. Correct deficiencies and replace damaged or defective conduit, fittings, and accessories.

END OF SECTION 26 0543



SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0553: IDENTIFICATION FOR ELECTRICAL SYSTEMS CONTENTS

PART 1	GENERAL	1
1.01	SECTION INCLUDES	1
1.02	REFERENCE STANDARDS	1
1.03	SUBMITTALS	1
1.04	QUALITY ASSURANCE	2
PART 2	PRODUCTS	2
2.01	IDENTIFICATION REQUIREMENTS	2
	IDENTIFICATION NAMEPLATES AND LABELS	
2.03	WIRE AND CABLE MARKERS	6
PART 3	S EXECUTION	6
	INSTALLATION	
3.02	INSPECTIONS AND TESTING	1





SECTION 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Electrical identification, material and installation requirements for:
 - a. Identification nameplates and labels
 - b. Wire and cable markers
 - c. Warning Signs and Labels
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0519 Wire and Cable: 600 Volt and Below
 - 4. Section 26 0533 Raceways and Boxes
 - 5. Section 26 2717 Equipment Wiring

1.02 REFERENCE STANDARDS

- A. American National Standards Institute (ANSI):
 - 1. ANSI Z535.2 Environmental and Facility Safety Signs
 - 2. ASNI Z535.4 Product Safety Signs and Labels
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D 709 Standard Specification for Laminated Thermosetting Materials
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code (NEC)
- D. Underwriters Laboratories, Inc. (UL):
 - 1. UL 969 Marking and Labeling Systems

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Showing nameplate data including material, heights of letters and proposed inscriptions.

B. Product Data:

1. Provide manufacturer's standard catalog pages and data sheets for nameplates, wire and cable markers, and labels.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchboards/Panelboards
 - 1) Identify ampere rating
 - 2) Identify voltage and phase
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Mini-Power Zone
 - 1) Identify ampere rating
 - 2) Identify voltage and phase
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 6) For panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - c. Transformers
 - 1) Identify KVA rating
 - 2) Identify voltage and phase for primary and secondary
 - 3) Identify power source and circuit number. Include location when not within sight of equipment.

- 4) Identify load(s) served. Include location when not within sight of equipment.
- d. Enclosed Switches, Circuit Breakers, and Motor Control Centers (MCCs)
 - 1) Identify voltage and phase
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
- 2. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized. Warning labels shall be in accordance with Detailed Provisions Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, And Field Testing of Electrical Equipment.

B. Identification for Conductors and Cables:

- 1. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- 2. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

C. Identification for Raceways:

- 1. Use identification labels or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not with sight.
- 2. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
- 3. Use underground traceable warning tape to identify underground raceways.

D. Identification for Boxes:

- 1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:

- 1. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by the County, provide identification on inside surface of wallplate.
- F. Buried Electrical, Telephone, and Communication Lines:
 - 1. Use polyethylene plastic and metallic core, acid and alkali resistant, waring tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3-inch minimum width, color coded as stated below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil. Minimum thickness of the tape shall be 0.004 inches. Tape shall have a minimum strength of 1,500 psi lengthwise and 1,250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when the tape is buried up to three (3) feet deep below finished grades. Warning tape color coded as follows:
 - a. Electric Red
 - b. Telephone and Other Communications Orange
 - c. Water Lines Blue
- G. Communication Cabinets Use identification nameplates.
- H. Electrical Distribution and Control Equipment Enclosures Use identification nameplates.
- I. Junction Box Load Connections Use wire markers.
- J. Outlet Box Load Connections Use wire markers.
- K. Panel Gutter Load Connections Use wire markers.
- L. Pull Box Load Connections Use wire markers.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

- 2. Plastic Nameplates: Two-layer of three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of ¹/₁₆-inch; engraved text. Provide minimum thickness of ¹/₈-inch when any dimension is greater than 4 inches.
- 3. Stainless Steel Nameplates: Minimum thickness of ¹/₃₂-inch, engrave or laser-etched text.
- 4. Aluminum Nameplates: Anodized; minimum thickness of ¹/₃₂-inch; engraved or laser-etched text.
- 5. Mounting Holes for Mechanical Fasteners: Two (2), centered on sides for sizes up to 1-inch high; four (4), located at corners for larger sizes.

B. Identification Labels:

- 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
- 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

- 1. Minimum Size: 1-inch by $2\frac{1}{2}$ -inches.
- 2. Legend: Equipment designation or other approved description.
- 3. Text: All capitalized unless otherwise indicated.
- 4. Minimum Text Height:
 - a. Equipment Designation: ½-inch.
 - b. Other Information: 1/4-inch.
- 5. Color:
 - a. Nominal Power System: White text on black background.

D. Format for Receptacle Identification:

- 1. Minimum Size: $\frac{3}{8}$ -inch by $\frac{1}{2}$ -inches.
- 2. Legend: Power source and circuit number or other designation indicated.
- 3. Text: All capitalized unless otherwise indicated.
- 4. Minimum Text Height: 3/16-inch
- 5. Color: Black text on clear background.

E. Format for Control Device Identification:

- 1. Minimum Size: $\frac{3}{8}$ -inch by $\frac{1}{2}$ -inches.
- 2. Legend: Load controlled or other designation indicated.
- 3. Text: All capitalized unless otherwise indicated.
- 4. Minimum Text Height: ³/₁₆-inch

5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8-inch
- F. Color: Black text on white background unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front, also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Conduits: Legible from the floor.
 - 8. Boxes: Outside face of cover.
 - 9. Conductors and Cables: Legible from the point of access.
 - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing of epoxy cement.

- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Mark all handwritten text, where permitted, to be neat and legible.

3.02 INSPECTIONS AND TESTING

- A. Inspect nameplates, labels, and markers for damage and defects.
- B. Correct deficiencies and replace damaged or defective nameplates, labels, and markers. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling, or other signs of improper adhesion.

END OF SECTION 26 0553





SPECIFICATIONS – DETAILED PROVISIONS

SECTION 26 0573: ELECTRICAL SHORT CIRCUIT/COORDINATION STUDY, ARC FLASH HAZARD STUDY, AND FIELD TESTING OF ELECTRICAL EQUIPMENT

CONTENTS

PART 1	GENERAL	1
1.01	GENERAL	1
1.02	SCOPE – SHORT CIRCUIT/COORDINATION STUDY	1
1.03	SCOPE – ARC FLASH HAZARD STUDY	1
1.04	SCOPE – FIELD TESTING AND VERIFICATION	2
PART 2	PRODUCTS	2
2.01	SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION AND	
	COORDINATION STUDY	2
2.02	ARC FLASH HAZARD STUDY	4
PART 3	EXECUTION	6
	FIELD SETTINGS AND TESTING	
3.02	FIELD TESTING REPORT	7
3.03	UTILITY COMPANY APPROVAL	7





SECTION 26 0573

ELECTRICAL SHORT CIRCUIT/COORDINATION STUDY, ARC FLASH HAZARD STUDY, AND FIELD TESTING OF ELECTRICAL EQUIPMENT

PART 1 GENERAL

1.01 GENERAL

A. The proposed electrical distribution equipment shall be designed, manufactured, and supplied to limit the Arc Flash Hazard/Risk Categories of the equipment to Level 3 or less. The engineer(s) performing the studies shall coordinate with Contractor, the County, and the electrical equipment manufacturer to assist in achieving this requirement.

1.02 SCOPE – SHORT CIRCUIT/COORDINATION STUDY

- A. The Contractor shall provide short circuit and protective device evaluation and coordination study to verify electrical protective devices selected and selective tripping coordination for proposed facilities.
- B. Unless otherwise noted, the evaluations and study shall include all portions of the existing and proposed electrical distribution system from the normal power source or sources down to and including the smallest adjustable trip circuit breaker in the distribution system. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- C. The study shall be performed, stamped and signed by a registered electrical engineer in the State of California. Credentials of the individual(s) performing the study and background of the firm shall be submitted to the County for approval prior to start of the Work. A minimum of five (5) years experience in power system analysis is required for the individual in charge of the Project. The firm performing the study shall provide assistance during start up as required.
- D. The Engineer performing the system studies shall furnish the Contractor with a listing of the required data immediately following award of the Contract, and Contractor shall expedite collection of the data to assure completion of the study prior to final approval of the electrical equipment shop drawings and/or release of the equipment for manufacture.

1.03 SCOPE – ARC FLASH HAZARD STUDY

- A. Contractor shall provide an Arc Flash Hazard Study to determine potential arc flash incident energies, arc flash boundaries, shock hazard boundaries and required personal protective equipment (PPE) for all energized electrical equipment, and arc flash and shock hazard warning labels.
- B. Unless otherwise noted, the study shall include all electrical equipment from the normal power source or sources to and including all electrical panels with voltage greater than 120 volts.

ELECTRICAL SHORT CIRCUIT/COORDINATION STUDY, ARC FLASH HAZARD STUDY, AND FIELD TESTING OF ELECTRICAL EQUIPMENT

- C. The study shall be performed, stamped, and signed by a registered electrical engineer in the State of California. Credentials of the individual(s) performing the study and background of the firm shall be submitted to the County for approval prior to start of Work. The study shall be performed using the latest revision of SKM Arc Flash Evaluation software by SKM Systems Analysis Software. The firm performing the study shall provide assistance during startup as required.
- D. The engineer performing the study shall furnish Contractor with a listing of the required data immediately following award of the Contract, and Contractor shall expedite collection of the data to assure completion of the study prior to final approval of the electrical equipment shop drawings and/or release of the equipment for manufacture.

1.04 SCOPE – FIELD TESTING AND VERIFICATION

A. Contractor shall provide the services of an independent testing consultant to field verify that all protective devices are set in accordance with the accepted short circuit/coordination study requirements and recommendations. In addition, the consultant shall perform resistance testing of ground systems to confirm compliance with National Fire Protection Association (NFPA) 70 (National Electric Code-NEC) and electric utility requirements and other testing as specified herein, and verify that arc flash and stock hazard warning labels have been installed.

PART 2 PRODUCTS

2.01 SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION AND COORDINATION STUDY

A. General:

- 1. The short circuit study shall be performed in accordance with the latest applicable NEC, NETA, IEEE, ANSI, and NFPA standards. Provide calculation methods and assumptions, the base per unit quantities selected, one-line diagrams, source impedance data including power company system characteristics, typical calculations, tabulations of calculation quantities and results, conclusions, and recommendations. Calculate short circuit interrupting and momentary (when applicable) duties for an assumed 3-phase bolted fault at each supply switchgear lineup, unit substation primary and secondary terminals, low-voltage switchgear lineup, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboard, and other significant locations throughout the system. Provide a ground fault current study for the same system areas, including the associated zero sequence impedance data. Include in tabulations fault impedance, X to R ratios, asymmetry factors, motor contribution, short circuit kVA, and symmetrical and asymmetrical fault currents.
- 2. In the protective device evaluation and coordination study include utility company device characteristics, system medium-voltage equipment relay and device characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, pertinent motor and generator characteristics, and characteristics of other system load protective devices. Include all devices,

ELECTRICAL SHORT CIRCUIT/COORDINATION STUDY, ARC FLASH HAZARD STUDY, AND FIELD TESTING OF ELECTRICAL EQUIPMENT

including branch circuits and feeder circuit breakers in each motor control center, and main breaker in branch panelboards.

Provide time-current curves graphically indicating the coordination proposed for the system. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.

Include all adjustable settings for ground fault protective devices. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Show transformer full load and 150, 400, or 600 percent currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and significant symmetrical and asymmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current to which the device is exposed.

- 3. When emergency generator is provided, include phase and ground coordination of the generator protective devices. Show the generator decrement curve and damage curve along with the operating characteristic of the protective devices. Obtain the information from the generator manufacturer and include the generator actual impedance value, time constants and current boost data in the study. Do not use typical values for the generator.
- 4. For motor control circuits, show the MCC full-load current plus symmetrical and asymmetrical of the largest motor starting current and time to ensure protective devices will not trip during major or group start operation.

B. Study Report:

- 1. The results of the power system study shall be summarized in a final report. Three (3) bound copies of the final report and two (2) CDs containing Adobe Acrobat PDF format of the report and the root data file (.drw) shall be submitted to the County.
- 2. The report shall include the following sections:
 - a. Descriptions, purpose, basis and scope of the study.
 - b. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
 - c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 - d. Fault current calculations including a definition of terms and guide for interpretation of computer printout.

C. Modifications Required by Study:

1. The Contractor shall coordinate the study results with the manufacturer and supplier of the electrical equipment to incorporate the recommendations and modifications therein, prior to fabrication.

2.02 ARC FLASH HAZARD STUDY

A. General:

- 1. The Arc Flash Hazard Study shall be performed in accordance with the latest applicable NFPA, IEEE, and ANSI Standards. Provide calculation methods and assumptions, typical calculations, tabulations of calculation quantities and results, conclusions, and recommendations.
- 2. Calculate equipment arc gap.
- 3. Calculate bolted and estimated arcing fault current at the fault point.
- 4. Calculate trip time, opening time, and total clearing time (total arc time) of the protective device.
- 5. Calculate worst-case arc flash boundary for each bus/panel.
- 6. Calculate worst-case arc flash hazard energy in cal/cm² for each bus/panel and establish the Arc Flash Hazard/Risk Categories.
- 7. Determine worst-case Personal Protective Equipment (PPE) for each bus/panel.
- 8. Calculate shock hazard approach boundaries (limited approach boundary, restricted approach boundary, and prohibited approach boundary).
- 9. Provide recommendations to reduce arc flash hazard energy and exposure.
- 10. Coordinate with the manufacturer/supplier of the electrical equipment.

B. Study Report:

- 1. The results of the Arc Flash Hazard Study shall be summarized in a final report. Three (3) bound copies of the final report and two (2) CDs containing Adobe Acrobat PDF format of the report and the root data file (.drw) shall be submitted to the County.
- 2. The report shall include the following sections:
 - a. Descriptions, purpose, basis, and scope of study.
 - b. Tabulations of equipment arc gap and bolted and estimated arcing fault current at the fault point.
 - c. Tabulations of trip time, opening time, and total clearing time (total arc time) for each protective device.
 - d. Tabulations of worst-case arc flash hazard incident energy and worst-case PPE for each bus/panel.

- e. Tabulations of shock hazard approach boundaries (limited approach boundary, restricted approach boundary, and prohibited approach boundary).
- f. Recommendations to reduce arc flash hazard energy and exposure.
- g. Listing of SKM Arc Flash Evaluation software computer file(s) prepared for the study and CD containing electronic file data.

C. Warning Labels

- 1. Warning labels shall be 4" x 6" UV resistant vinyl labels (white label with orange warning stripe and black letters). Sample warning label is presented at the end of this Detailed Provisions Section.
- 2. Firm performing the Study shall provide labels to Contractor.
- 3. For outdoor electrical panels (NEMA 1 MCC in NEMA 3R wrapper), warning labels shall be provided on both outer and inner doors.

Each outer door section shall be provided with a warning label stating "WARNING, ARC FLASH AND SHOCK HAZARD, APPROPRIATE PPE REQUIRED".

Each inner door, behind each set of outer doors, shall be provided with one (1) warning label every four (4) feet. Inner warning labels shall include the following information:

- a. "WARNING, ARC FLASH AND SHOCK HAZARD, APPROPRIATE PPE REQUIRED".
- b. Flash hazard boundary.
- c. Cal/cm² flash hazard for worst-case.
- d. Worst case PPE level and list required PPE.
- e. Shock hazard when cover is removed.
- f. Limited approach distance and list required PPE.
- g. Restricted approach distance and list required PPE.
- h. Prohibited approach distance and list required PPE.
- 4. For all electrical panels without a NEMA 3R wrapper (stand-alone panels), one (1) warning label shall be provided every four (4) feet. Warning labels shall include the following minimum information:
 - a. "WARNING, ARC FLASH AND SHOCK HAZARD, APPROPRIATE PPE REQUIRED".
 - b. Flash hazard boundary.
 - c. Cal/cm² flash hazard for worst-case.
 - d. Worst case PPE level and list required PPE.
 - e. Shock hazard when cover is removed.
 - f. Limited approach distance and list required PPE.

- g. Restricted approach distance and list required PPE.
- h. Prohibited approach distance and list required PPE.



WARNING

Arc Flash and Shock Hazard Appropriate PPE Required

24 inch Flash Hazard Boundary
3 cal/cm2 Flash Hazard at 18 inches
PPE Level, 1 Layer 6 oz Nomex®,
Leather Gloves, Faceshield

480 VAC Shock Hazard when Cover is removed

42 inch Limited Approach

12 inch Restricted Approach - 500 V Class 00 Gloves

1 inch Prohibited Approach - 500 V Class 00 Gloves

Equipment Name: Slurry Pump Starter

PART 3 EXECUTION

3.01 FIELD SETTINGS AND TESTING

- A. Prior to energizing facilities, final testing shall be performed by the Contractor and witnessed by the field testing consultant. Testing shall be performed to confirm compliance with Contract Documents, NEC, and to permit energizing the equipment including the "green tagging" of the electrical service.
- B. The Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short circuit study, protective device evaluation study, and protective device coordination study. The testing consultant shall witness the settings and confirm same.
- C. Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short circuit and protective device coordination study shall be carried out by the Contractor at no additional cost to the County.
- D. Field testing consultant shall measure and record the resistance of the ground systems.

ELECTRICAL SHORT CIRCUIT/COORDINATION STUDY, ARC FLASH HAZARD STUDY, AND FIELD TESTING OF ELECTRICAL EQUIPMENT

- E. Field testing consultant shall confirm proper torque of wire lug connections to the main switchgear, power distribution sections, MCC, lighting panels, and check for loose wiring connections.
- F. Field testing consultant shall megger test each motor at 500 volts and 1,000, and report results.
- G. The field testing consultant shall verify proper short circuit duty and amperage rating of all devices and bussing.
- H. The field testing consultant shall verify that arc flash and shock hazard warning labels shave been installed in accordance with the requirements of Part 2.02.C, herein.

3.02 FIELD TESTING REPORT

A. The field testing consultant shall provide a detailed report showing all test results and showing that settings of protective devices are in compliance with the coordination study. The report shall state adequacy of grounding systems and protective device settings and indicate the facilities are in compliance with NEC and ready to be energized. Report shall be submitted to the County for acceptance as a submittal document.

3.03 UTILITY COMPANY APPROVAL

A. Unless otherwise noted, copies of the final report shall be submitted to the County for submittal to the utility company for their review and approval. Report shall demonstrate that the service is ready to be energized and include suitable test results meeting the utility's requirements.

END OF SECTION 26 0573





SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0813: ELECTRICAL ACCEPTANCE TESTING CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
	QUALITY ASSURANCE AND REFERENCE STANDARDS	
1.03	SUBMITTALS	2
PART 2	PRODUCTS	2
2.01	FACTORY QUALITY CONTROL	2
PART 3	EXECUTION	3
3.01	FIELD QUALITY CONTROL	3
	SPECIFIC EQUIPMENT TESTING REQUIREMENTS	





SECTION 26 0813 ELECTRICAL ACCEPTANCE TESTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Basic requirements for electrical acceptance testing.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Division 26 Electrical.
 - 3. Division 33 Utilities

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

A. Reference Standards:

- 1. National Electrical Testing Association (NETA):
 - a. NETA ATS Standard for Acceptance Testing Specifications for Electric Power Equipment and Systems.
- 2. Nationally Recognized Testing Laboratory (NRTL).
- 3. Telecommunications Industry Association/Electronic Industries Alliance/American National Standards Institute (TIA/EIA/ANSI):
 - a. TIA/EIA/ANSI 455-78 Optical Fibers- Part 1-40: Measurement and Test Procedures Attenuation.

B. Qualifications:

- 1. Testing Firm Qualifications:
 - a. An independent firm performing, as the sole or principal part of its business for a minimum of 10 years, the inspection, testing, calibration, and adjusting of systems.
 - b. Must have an established monitoring and testing equipment calibration program with accuracy traceable in an unbroken chain, according to NIST.

2. Field Personnel:

- a. Minimum of one (1) year field experience covering all phases of electrical equipment inspection, testing, and calibration.
- b. Relay test technician having previous experience with testing and calibration of relays of the same manufacturer and type used on project and proficient in setting and testing the types of protection elements used.
- c. As an alternative, supervising technician may be certified by the equipment manufacturer.

ELECTRICAL ACCEPTANCE TESTING

3. Analysis Personnel:

- a. Minimum three (3) years combined field testing and data analysis experience.
- b. As an alternative, supervising technician may be certified by the equipment manufacturer.

C. Phasing Diagram:

- 1. Coordinate with Utility Company for phase rotations and Phase A, B and C markings.
 - a. Create a phasing diagram showing the coordinated phase rotations with generators and motors through the transformers.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. See Detailed Provisions Section 26 0500 Basic Electrical Requirements for electrical equipment and connection testing plan submittal requirements.
- C. Quality Assurance Submittals:
 - 1. Prior to energizing equipment:
 - a. Coordinated phasing diagram.
 - 2. Electrical Equipment and Connections Testing Program prepared by an independent electrical testing firm. Contractor shall procure the firm and bear all costs associated with preparation and implementation of the Electrical Equipment and Connections Testing Program.
 - 3. Within two (2) weeks after successful completion of testing:
 - a. Single report containing information including:
 - 1) Summary of Work.
 - 2) Information from pre-energization testing.
 - 3) See testing and monitoring reporting requirements in Detailed Provisions Section 26 0500 Basic Electrical Requirements.

PART 2 PRODUCTS

2.01 FACTORY QUALITY CONTROL

- A. Provide Division 26 and 33 equipment with all routing factory tests required by the applicable industry standards or NRTL.
- B. Factory testing will not be accepted in lieu of field acceptance testing requirements specified in this Detailed Provisions Section.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. General:

- 1. See Detailed Provisions Section 26 0500 Basic Electrical Requirements and individual electrical equipment and component sections for electrical testing requirements.
- 2. Contractor to procure services of an independent firm to prepare and implement Electrical Equipment and Connections Testing Program. Firm shall provide all required electrical testing and Contractor shall be responsible for all costs associated with testing.
- 3. Complete electrical testing in three (3) phases:
 - a. Pre-energization testing phase.
 - b. Equipment energized with no load.
 - c. Equipment energized under load.
- 4. Perform testing in accordance with this Detailed Provisions Section and NETA ATS.
- 5. Provide field setting and programming of all adjustable protective devices and meters to settings provided by the County.

B. Equipment Monitoring and Testing Plan:

- 1. Approved in accordance with Shop Drawing submittal schedule.
- 2. Included as a minimum:
 - a. Qualifications of firm, field personnel, and analysis personnel doing the Work.
 - b. List and description of testing and analysis equipment to be utilized.
 - c. List of all equipment to be testing, including:
 - 1) Name and tag numbers identified in the Contract Documents.
 - 2) Manufacturer's serial numbers.
 - 3) Other pertinent manufacturer identification.
- C. Instruments Used in Equipment and Connections Quality Control Testing:
 - 1. Minimum calibration frequency:
 - a. Field analog instruments: Not more than 6 months.
 - b. Field digital instruments: Not more than 12 months.
 - c. Laboratory instruments: Not more than 12 months.
 - d. If instrument manufacturer's calibration requirements are more stringent, those requirements shall govern.
 - 2. Carry current calibration status and labels on all testing instruments.

- 3. See individual testing programs for additional instrumentation compliance requirements.
- D. Testing and Monitoring Program Documentation:
 - 1. Provide reports with tabbed sections for each piece of equipment tested.
 - 2. Include all testing results associated with each piece of equipment under that equipment's tabbed section.
 - a. Include legible copies of all forms used to record field test information.
 - 3. Prior to start of testing, submit one (1) copy of preliminary report format for County review and comment.
 - a. Include data gathering and sample test report forms that will be utilized.
 - 4. In the final report, include as a minimum, the following information for all equipment tested:
 - a. Equipment identification, including:
 - 1) Name and tag numbers identified in the Contract Documents.
 - 2) Manufacturer's serial numbers.
 - 3) Other pertinent manufacturer identification.
 - a. Date and time of each test.
 - b. Ambient conditions including temperature, humidity, and precipitation.
 - c. Visual inspection report.
 - d. Description of test and referenced standards, if any, followed while conducting tests.
 - e. Results of initial and all retesting.
 - f. Acceptance criteria.
 - g. "As found" and "as left" conditions.
 - h. Corrective action, if required, taken to meet acceptance.
 - i. Verification of corrective action signed by the Contractor, equipment supplier, and County.
 - i. Instrument calibration dates of all instruments used in testing.
 - 5. Provide three (3) bound final reports prior to Project final completion.
- E. Electrical Equipment and Connections Testing Program:
 - 1. Perform testing on Division 26 and Division 33 equipment and connections in accordance with Division 26 requirements.
 - 2. Testing of motors:
 - a. After installation and prior to energizing the motor, perform inspections and tests per NETA ATS 7.15 for all motors 10 HP or above.

- b. Bump motor to check for correct rotation.
- 3. Repair or replace equipment shown to be out of range of the acceptable tolerance until the equipment meets or exceeds acceptability standards.

3.02 SPECIFIC EQUIPMENT TESTING REQUIREMENTS

- A. Cable Low Voltage:
 - 1. Perform inspections and tests per NETA ATS 7.3.2. See Detailed Provisions Section 26 0519 Wire and Cable: 600 Volt and Below.
- B. Cable Optical Fiber:
 - 1. Perform inspections on tests per TIA/EIA/ANSI 455-78, including:
 - a. Optional time domain reflectometer test.
 - b. Power attenuation test.
 - c. Gain margin test.
- C. Low Voltage Power Circuit Breakers:
 - 1. Perform inspections and tests per NETA ATS 7.6.1.2. See Detailed Provisions Section 26 2800 Overcurrent and Short Circuit Protective Devices:
 - a. Tests shall include primary current injection testing of all breakers at final settings.
 - b. Where short-time or instantaneous settings on large frame breakers are beyond the current capability of field testing, primary injection tests at reduced currents shall be permitted if combined with secondary injection calibration test of trip unit at final settings.
 - 2. Components: Test all components per applicable paragraphs of this Detailed Provisions Section and NETA ATS.
 - 3. Perform the following additional tests:
 - a. Shunt trip devices minimum tripping voltage.
 - 4. Record as-left settings.
- D. Low Voltage Molded Case Circuit Breakers:
 - 1. Perform inspections and tests per NETA ATS 7.6.1.1. See Detailed Provisions Section 26 2800 Overcurrent and Short Circuit Protective Devices.
 - 2. Components:
 - a. Test all components per applicable paragraphs of this Detailed Provisions Section and NETA ATS.
 - b. Thermal magnetic breakers: Visual and mechanical inspection per NETA ATS only.
 - c. Solid state trip type: Visual and mechanical inspection and electrical tests per NETA ATS.

3. Record as-left settings.

E. Metering:

- 1. Perform inspections and tests per NETA ATS 7.11.
- 2. Components: Test all components per applicable paragraphs of this Detailed Provisions Section and NETA ATS.

F. Grounding:

- 1. Perform inspections and tests per NETA ATS 7.13. See Detailed Provisions Section 26 0526 Grounding and Bonding for Electrical Systems.
- 2. Components: Test all components per applicable paragraphs of this Detailed Provisions Section and NETA ATS.

G. Ground Fault Protection:

- 1. Perform inspections and tests per NETA ATS 7.14. See Detailed Provisions Section 26 0573.
- 2. Components: Test all components per applicable paragraphs of this Detailed Provisions Section and NETA ATS.
- 3. Perform the following optional tests per NETA ATS:
 - a. Control wiring insulation resistance.
- 4. Perform the following additional tests for four-wire systems:
 - a. Primary current injection into switchgear bus with test set configured to simulate transformer source and high current jumper used to simulate unbalanced load and ground fault conditions.
 - b. Verify no tripping for unbalanced load on each feeder and each main breaker.
 - c. Verify no tripping for unbalanced load across tie breaker for dual-source schemes.
 - d. Verify tripping for ground fault on load side of feeder each feeder and on each main bus.
 - e. Verify tripping for ground fault on a single feeder and on each main bus through tie breaker(s) for multiple-source schemes.

H. Motors:

- 1. Perform inspections and tests per NETA ATS 7.15.
- 2. See Detailed Provisions Section 33 1136 Submersible Well Pumps.

I. Motor Controllers:

- 1. Perform inspections and tests per NETA ATS 7.16. See Detailed Provisions Section 26 2419 Motor Control Centers.
- 2. Components: Test all components per applicable paragraphs of this Detailed Provisions Section and NETA ATS.

J. Control System Functional Test:

- 1. Perform test upon completion of equipment acceptance tests.
- 2. The test is to prove the correct interaction of all sensing, processing and action devices.
- 3. Develop a test plan and parameters for the purpose of evaluating the performance of the system.
- 4. Perform the following tests:
 - a. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
 - b. Verify the correct operation of all sensing devices, alarms and indicating devices.
- 5. Systems to be tested:
 - a. Non-Potable Water Production Wells See Detailed Provisions Section 33 1114– Non-Potable Water Production Wells.
 - b. Submersible Well Pumps See Detailed Provisions Section 33 1136 Submersible Well Pumps.

END OF SECTION 26 0813





SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 0916: CONTROL EQUIPMENT ACCESSORIES CONTENTS

PART 1	GENERAL	1
	SUMMARYQUALITY ASSURANCE AND REFERENCE STANDARDSSUBMITTALS	1
PART 2	PRODUCTS	2
2.02 2.03 2.04	ACCEPTABLE MANUFACTURERS OPERATOR CONTROL/PILOT DEVICES RELAYS CONTACTORS TERMINATION EQUIPMENT	3 4
2.06 2.07	ENCLOSURESREPLACEMENT PARTS	6
	INSTALLATIONFIELD QUALITY CONTROL	





SECTION 26 0916 CONTROL EQUIPMENT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Operator control/pilot devices (selector switches, pushbuttons, indicator lights, etc.).
 - b. Control devices (timers, relays, contactors, etc.).
 - c. Control panels and operator stations.
 - d. Alarm devices.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0553 Identification for Electrical Systems
 - 4. Section 26 2419 Motor-Control Centers
 - 5. Section 33 1136 Submersible Well Pumps

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. National Electrical Contractors Association (NECA)
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- B. National Electrical Manufacturers Association (NEMA)
 - 1. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. ICS 2 Industrial Control and System Controllers, Contactors and Overload Relays Rated 600 Volts
- C. Underwriters Laboratories, Inc.
 - 1. UL 508 Industrial Control Equipment
 - 2. UL 508A Industrial Control Panels
- D. Supplier of Industrial Control Panels shall build control panel under the provisions of UL 508A.
 - 1. Entire assembly shall be affixed with a UL 508A label "Listed Enclosed Industrial Control Panel" prior to shipment to the jobsite.

CONTROL EQUIPMENT ACCESSORIES

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Product Data:
 - 1. Provide manufacturer's standard catalog pages and data sheets for all products specified in PART 2 of this Detailed Provisions Section.
- C. Shop Drawings:
 - 1. Control panel interior and exterior layout.
 - 2. Control panel wiring diagrams.
- D. Operation and Maintenance (O&M) Manual: Provide O&M documentation, including updated fabrication/shop drawings reflecting as-built condition.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers or an approved equal are acceptable:
 - 1. Operator control/pilot devices (pushbuttons, selector switches, indicator lamps, toggle switches, stacklights, etc.) and relays:
 - a. Allen-Bradley a division of Rockwell Automation, Inc.; www.ab.rockwellautomation.com
 - b. ATC Diversified Electronics a division of Marsh Bellofram Group; www.marshbellofram.com/diversified-electronics
 - c. Eaton Corporation; www.eaton.com
 - d. General Electric Company; www.geindustrial.com
 - e. Time Mark Corporation; www.time-mark.com

2. Contactors:

- a. Allen-Bradley a division of Rockwell Automation, Inc.; www.ab.rockwellautomation.com
- b. ASCO a part of Emerson Electric Company; www.ascoswitch.com
- c. Eaton Corporation; www.eaton.com
- d. General Electric Company; https://electrification.us.abb.com/
- 3. Terminal Blocks:
 - a. Allen-Bradley a division of Rockwell Automation, Inc.; www.ab.rockwellautomation.com
 - b. Phoenix Contact; www.phoenixcontact.com

CONTROL EQUIPMENT ACCESSORIES

4. Enclosures:

- a. Adalet a part of ScottFetzer Company; www.adalet.com
- b. Allen-Bradley a division of Rockwell Automation, Inc.; www.ab.rockwellautomation.com
- c. Eaton Corporation; www.eaton.com
- d. General Electric Company; https://electrification.us.abb.com/
- e. Hoffman a part of nVent; https://hoffman.nvent.com/hoffman
- f. Wiegmann a part of Hubbell Inc.; www.hubbell-wiegmann.com

2.02 OPERATOR CONTROL/PILOT DEVICES

A. General:

- 1. Standards: NEMA ICS 2, UL 508.
- 2. Heavy-duty NEMA 4/13 watertight/oiltight.
- 3. Heavy-duty NEMA 4/4X corrosion resistant.
- 4. Mounting hole: 30.5 mm.
- 5. Contact blocks: 10 amp, NEMA A600 rated, number as required to fulfill functions.
- 6. Legend plate marked as specified.

B. Selector Switches:

- 1. Two, three- or four-position rotary switch as required to fulfill functions.
- 2. Maintained contact type.
- 3. Knob or lever type operators.
 - a. Non-fused: 10,000A.
 - b. Fused: 200,000A.

C. Pushbuttons:

- 1. Non-illuminated type:
 - a. Protective boot.
 - b. Momentary contact.
 - c. Standard flush and mushroom operators.
 - d. Black colored buttons for START or ON and red color for STOP or OFF.
 - e. Emergency stop pushbuttons: Mushroom head operator and maintained contact.

D. Indicating Lights:

- 1. Allowing replacement of bulb without removal from control panel.
- 2. Lamp: LED, 120V or 24V as required.

- 3. Full voltage type.
- 4. Push-to-test indicating lights.
- 5. Glass lens.
- 6. Color code lights as follows:
 - a. Green: OFF or stopped, valve open.
 - b. Amber: Standby; auto mode; ready.
 - c. Red: ON or running; valve closed.

2.03 RELAYS

- A. General:
 - 1. Standards: NEMA ICS 2, UL 508.
- B. Control Relays:
 - 1. General purpose (ice cube) type:
 - a. Plug-in housing.
 - b. Clear polycarbonate dust cover with clip fastener.
 - c. Coil voltage: 120V or as required.
 - d. Contacts:
 - 1) 10 amp continuous.
 - 2) Silver-cadmium oxide.
 - 3) Minimum of three (3) SPDT contacts.
 - e. Sockets: DIN rail mounted.
 - f. Internal neon or LED indicator is lit when coil is energized.
 - g. Manual operator switch.
 - 2. Industrial type:
 - a. Coil voltage: 120V or as required.
 - b. Contacts:
 - 1) 10 amp, NEMA A600 rated.
 - 2) Double break, silver alloy.
 - 3) Convertible from normally open to normally closed or vice versa, without removing any wiring.
 - 4) Expandable from two (2) poles to twelve (12) poles.
 - c. Provide contacts for all required control plus two (2) spares.

2.04 CONTACTORS

A. General:

- 1. Standards: NEMA ICS 2, UL 508.
- B. Lighting and Remote Control Switches:
 - 1. Electrically operated, electrically held.
 - 2. Coil voltage: 120V or as required.
 - 3. Contacts: Totally enclosed, double-break, silver-cadmium oxide.
 - 4. Rated for ballasted lighting, tungsten and general use loads.
 - 5. Number of poles, continuous ampere rating and voltage, as indicated on drawings or as specified.
 - 6. Auxiliary control relays, as indicated on drawings or as specified.
 - 7. Auxiliary contacts, as indicated on drawings or as specified.

C. Definite Purpose:

- 1. Coil voltage: 120V or as required.
- 2. Contacts: Totally enclosed, double-break, silver-cadmium oxide.
- 3. Resistive load and horsepower rated.
- 4. Number of poles, continuous ampere rating and voltage, as indicated on drawings or as specified.
- 5. Auxiliary contacts, as indicated on drawings or as specified.

2.05 TERMINATION EQUIPMENT

A. General:

- 1. Modular type with screw compression clamp.
- 2. Screws: Stainless steel.
- 3. Current bar: Nickel-plated copper alloy.
- 4. Thermoplastic insulation rated for -40 to +90 Deg C.
- 5. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
- 6. End sections and end stops at each end of terminal strip.
- 7. Machine-printed terminal markers on both sides of block.
- 8. Spacing: 6mm.
- 9. Wire size: 22-12 AWG.
- 10. Rated voltage: 600V.
- 11. DIN rail mounting.

B. Standard-Type Block:

- 1. Rated current: 30A.
- 2. Color: Gray body.

C. Bladed-Type Disconnect Block:

- 1. Terminal block with knife blade disconnect which connects or isolates the two sides of the block.
- 2. Rated current: 10A.
- 3. Color:
 - a. Panel control voltage leaves enclosure normal: Gray body, orange switch.
 - b. Foreign voltage entering enclosure: Orange body, orange switch.

D. Grounded-Type Block:

- 1. Electrically grounded to mounting rail.
- 2. Terminal ground wires and analog cable shields.
- 3. Color: Green and yellow body.

E. Fuse Holders:

- 1. Blocks can be ganged for multi-pole operation.
- 2. Spacing: 9.1 mm.
- 3. Wire size: 30-12 AWG.
- 4. Rated voltage: 300V.
- 5. Rated current: 12A.
- 6. Fuse size: \(\frac{1}{4} \text{ x } \) 1\(\frac{1}{4} \text{.}
- 7. Blown fuse indication.
- 8. DIN rail mounting.

2.06 ENCLOSURES

A. Control Panels:

- 1. NEMA 4 rated:
 - a. Seams continuously welded and ground smooth.
 - b. No knockouts.
 - c. External mounting flanges.
 - d. Hinged or non-hinged cover held closed with stainless steel screws and clamps.
 - e. Cover with oil resistant gasket.

2. Control Panel Miscellaneous Accessories:

- a. Back-Plane Mounting Panels: Steel with white enamel finish or Type 304 stainless steel.
- b. Interiors shall be white or light gray in color.
- c. Wire management duct:
 - 1) Bodies: PVC with side holes.
 - 2) Cover: PVC snap-on.
 - 3) Size as required.
- d. Rigid handles for covers larger than nine (9) sq. ft. or heavier than twenty-five pounds (25 lbs.).
- e. Split covers when heavier than twenty-five pounds (25 lbs.).
- f. Floor stand kits made of same material as enclosure.
- g. Weldnuts for mounting optional panels and terminal kits.
- h. Ground bonding jumper from door, across hinge, to enclosure body.
- 3. Standards: NEMA 250, UL 508.
- 4. Identify panel in compliance with Detailed Provisions Section 26 0553 Identification for Electrical Systems.

B. Operator Control Stations:

- 1. NEMA 4/13 rated:
 - a. Die cast aluminum body with manufacturer's standard finish.
 - b. Gasketed die cast aluminum cover with manufacturer's standard finish.
 - c. Number of device mounting holes as required.
- 2. Identify panel in compliance with Detailed Provisions Section 26 0553 Identification for Electrical Systems.

2.07 REPLACEMENT PARTS

- A. Provide one hundred percent (100%) replacement lamps for indicating lights.
- B. Provide ten percent (10%) replacement caps for indicating lights.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install as indicated and in accordance with manufacturer's instructions and recommendations.
- B. Control Panels:
 - 1. Size as required to mount the equipment.
 - 2. Permitted uses of NEMA 4 enclosure:
 - a. Surface mounted in areas designated as damp and/or wet.
- C. Operator Control Stations:
 - 1. Permitted uses of NEMA 4/13 enclosure:
 - a. Surface mounted in areas designated as dry and/or dusty architecturally or non-architecturally finished areas and damp and/or wet.

3.02 FIELD QUALITY CONTROL

A. See Detailed Provisions Section 26 0500 – Basic Electrical Requirements for individual equipment sections.

END OF SECTION 26 0916



SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 2419: MOTOR-CONTROL CENTERS CONTENTS

PART 1	GENERAL	. 1
	SUMMARY	
	QUALITY ASSURANCE AND REFERENCE STANDARDS	
	SUBMITTALS	
1.04	DELIVERY, STORAGE, AND HANDLING	. 2
PART 2	PRODUCTS	. 2
	ACCEPTABLE MANUFACTURERS	
	SEPARATELY MOUNTED COMBINATION STARTERS	
	MOTOR STARTERS	
2.04	MANUAL MOTOR STARTERS	. 4
PART 3	S EXECUTION	. 4
3.01	INSTALLATION	. 4
	INSPECTIONS AND TESTING	





SECTION 26 2419 MOTOR-CONTROL CENTERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Separately mounted motor starters (including those supplied with equipment).
 - b. Manual motor starters.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0553 Identification for Electrical Systems
 - 4. Section 26 0916 Control Equipment Accessories
 - 5. Section 26 2800 Overcurrent and Short Circuit Protective Devices
 - 6. Section 33 1136 Submersible Well Pumps

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. National Electrical Testing Association (NETA):
 - 1. ATS Acceptance Testing Specification Electrical Power Distribution Equipment and Systems.
- B. International Electrotechnical Commission (IEC).
- C. National Electrical Contractors Association (NECA):
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- D. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
 - 2. ICS 2 Controllers, Contactors, and Overload Relays Rated 600 V.
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code (NEC).
- F. Underwriters Laboratories, Inc. (UL):
 - 1. UL 508 Industrial Control Equipment.

MOTOR-CONTROL CENTERS

1.03 SUBMITTALS

A. Submittal Procedures: See Detailed Provisions Section 01 3300 – Submittal Procedures for requirements for the mechanics and administration of the submittal process.

B. Product Data

1. Provide manufacturer's standard catalog pages and data sheets for all products specified in PART 2 of this Detailed Provisions Section.

C. Shop Drawings

- 1. Separately mounted combination starters:
 - a. Unit ladder logic wiring for each unit depicting electrical wiring and identification of terminals where field devices or remote control signals are to be terminated as indicated on the Project Drawings and/or loop descriptions.
 - b. Schematic and connection wiring diagrams.
- D. Operation and Maintenance (O&M) Manual: Provide O&M documentation, including updated fabrication/shop drawings reflecting as-built condition.

1.04 DELIVERY, STORAGE, AND HANDLING

A. See Detailed Provisions Section 26 0500 – Basic Electrical Requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Motor-control centers shall be manufactured by one of the following, or an approved equal:
 - 1. Allen-Bradley a division of Rockwell Automation, Inc.; www.ab.rockwellautomation.com
 - 2. Eaton Corporation; www.eaton.com
 - 3. General Electric Company; https://electrification.us.abb.com/geindustrialcom

2.02 SEPARATELY MOUNTED COMBINATION STARTERS

- A. Standards: NEMA 250, NEMA ICS 2, and UL 508.
- B. Enclosure:
 - 1. NEMA 4 rated:
 - a. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturer's standard paint inside and out.
 - b. No knockouts, external mounting flanges, hinged and gasketed door.

C. Operating Handle:

- 1. With the door closed the handle mechanism allows complete ON/OFF control of the unit disconnect and clear indication of the disconnect status.
- 2. Circuit breaker and MCP operators includes a separate TRIPPED position.
- 3. Mechanical interlock to prevent the opening of the door when the disconnect is in the ON position with a defeater mechanism for use by authorized personnel.
- 4. Mechanical interlock to prevent the placement of the disconnect in the ON position with the door open with a defeater mechanism for use by authorized personnel.
- D. External mounted overload relay pushbutton.
- E. Control Devices:
 - 1. Provide control devices per Detailed Provisions Sections 26 0916 Control Equipment Accessories and 33 1136 Submersible Well Pumps.
 - 2. The following devices are the minimum required unless otherwise indicated on the Project Drawings:
 - a. Three-position switch (HAND-OFF-AUTO).
 - b. Red ON indicator light.
 - c. Green OFF indicator light.
 - 3. Devices will be accessible with the door closed.
- F. Fault Current Withstand Rating: Equal to the rating of the electrical gear from which it is fed.
- G. Motor Starters: See requirements within this Detailed Provisions Section.
- H. Disconnect Switch, Overcurrent and Short Circuit Protective Devices:
 - 1. Motor circuit protector.
 - 2. See Detailed Provisions Section 26 2800 Overcurrent and Short Circuit Protective Devices for requirements.
 - 3. Factory installed.

2.03 MOTOR STARTERS

- A. Standards: NEMA ICS 2 and UL 508.
- B. Full Voltage Non-Reversing (FVNR) Magnetic Starters:
 - 1. NEMA full size rated contactor.
 - a. NEMA half sizes and IEC contactors are not permitted.
 - 2. Double-break silver alloy contacts.

3. Overload relays:

- a. Ambient compensated, bimetallic type with interchangeable heaters, twenty-four percent (24%) adjustability, single phase sensitivity, an isolated arm contact and manual reset.
- 4. Interlock and auxiliary contacts, wired to terminal blocks:
 - a. Holding circuit contact, normally open.
 - b. Overload alarm contact, normally open.
 - c. Normally open auxiliary contact, for remote run status.
 - d. Additional field replaceable auxiliary contacts as required per the Sequence of Operation.
 - e. Two (2) additional normally open spare field replaceable auxiliary contacts.

2.04 MANUAL MOTOR STARTERS

- A. Standards: NEMA 250, NEMA ICS 2 and UL 508.
- B. Quick-make, quick-break toggle mechanism that is lockable in the OFF position.
- C. Types:
 - 1. Horsepower rated, for ON/OFF control.
 - 2. Horsepower rated, for ON/OFF control and thermal overload protection.
 - a. Switch to clearly indicate ON, OFF, and TRIPPED position.
- D. Voltage and current ratings and number of poles as required for the connected motor.
- E. Enclosures:
 - 1. NEMA 4 rated:
 - a. Sheet steel finished with rust inhibiting primer and manufacturer's standard paint inside and out or cast gray iron alloy or copper-free aluminum with manufacturer's standard finish.
 - b. No knockouts, external mounting flanges.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install as indicated on the Project Drawings, in accordance with the NFPA 70, and in accordance with manufacturer's instructions and in a neat and workmanlike manner in accordance with NECA 1.
- B. Mounting height for surface mounted equipment: See Detailed Provisions Section 26 0500 Basic Electrical Requirements.

MOTOR-CONTROL CENTERS

- C. Overload Heaters:
 - 1. Size for actual motor full load current of the connected motor.
- D. Combination and Manual Starter Enclosures:
 - 1. Permitted uses of NEMA 4 enclosure:
 - a. Surface mounted in areas designated as damp/wet.
- E. Install MCC identification nameplate in accordance with Detailed Provisions Section 26 0553 Identification for Electrical Systems.

3.02 INSPECTIONS AND TESTING

- A. Inspect motor-control centers and accessories for damage and defects.
- B. Correct deficiencies and replace damaged motor-control centers and accessories.

END OF SECTION 26 2419





SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 2717: EQUIPMENT WIRING CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
	QUALITY ASSURANCE AND REFERENCE STANDARDS	
	ADMINISTRATIVE REQUIREMENTS	
1.04	SUBMITTALS	2
1.05	DELIVERY, STORAGE, AND HANDLING	2
PART 2	PRODUCTS	2
2.01	MATERIALS	2
PART 3	EXECUTION	2
3.01	PREPARATION	2
	ELECTRICAL CONNECTIONS	





SECTION 26 2717 EQUIPMENT WIRING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Electrical connections to equipment.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0519 Wire and Cable: 600 Volt and Below
 - 4. Section 26 0533 Raceways and Boxes
 - 5. Section 26 0916 Control Equipment Accessories
 - 6. Section 26 2419 Motor-Control Centers
 - 7. Section 26 2800 Overcurrent and Short Circuit Protective Devices
 - 8. Section 26 4313 Low Voltage Surge Protection Devices (SPD)
 - 9. Section 33 1136 Submersible Well Pumps

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA WD 1 General Color Requirements for Wiring Devices
 - 2. NEMA WD 6 Wiring Devices: Dimensional Requirements
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review Shop Drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for electrical equipment furnished as part of the Project.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

EQUIPMENT WIRING

1.04 SUBMITTALS

A. Submittal Procedures: See Detailed Provisions Section 01 3300 – Submittal Procedures for requirements for the mechanics and administration of the submittal process.

B. Product Data:

1. Provide manufacturer's standard catalog pages and data sheets for all products specified in PART 2 of this Detailed Provisions Section.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide any additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction, debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose of lifting. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.
- C. Ambient Temperature: Do not exceed 86 degrees F average or 104 degrees F maximum measured during any twenty-four (24) hour period during and after installation of transformers.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
 - 1. Colors: Conform to NEMA WD 1.
 - 2. Cord Construction: NFPA 70, Type SO, multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
 - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: In individual equipment Detailed Provisions Sections.
- C. Flexible Conduit: As specified in Detailed Provisions Section 26 0533 Raceways and Boxes.
- D. Wire and Cable: As specified in Detailed Provisions Section 26 0519 Wire and Cable: 600 Volt and Below.
- E. Boxes: As specified in Detailed Provisions Section 26 0533 Raceways and Boxes.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

EQUIPMENT WIRING

3.02 ELECTRICAL CONNECTIONS

- A. Perform Work in a neat and workmanlike manner in accordance with NECA 1.
- B. Make electrical connections in accordance with equipment manufacturer's instructions.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

END OF SECTION 26 2717





SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 2800: OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES CONTENTS

PART 1	[GENERAL	1
1.01	SUMMARY	1
	QUALITY ASSURANCE AND REFERENCE STANDARDS	
	SUBMITTALS	
	ARC FLASH STUDY REPORT	
PART 2	PRODUCTS	2
2.01	ACCEPTABLE MANUFACTURERS	2
2.02	CIRCUIT BREAKERS	3
2.03	FUSES	4
	ARC FLASH HAZARD LABELS	
PART 3	B EXECUTION	5
3.01	INSTALLATION	5
	SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION AND	2
	RDINATION STUDY	6
3.03	ARC FLASH HAZARD STUDY	6
3.04	FIELD TESTING AND VERIFICATION	6
3.05	INSPECTIONS AND TESTING	6



SECTION 26 2800 OVERCURRENT AND SHORT CIRCUIT PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Low voltage circuit breakers.
 - b. Low voltage fuses.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0553 Identification for Electrical Systems
 - 4. Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.
 - 5. Section 26 0813 Electrical Acceptance Testing
 - 6. Section 33 1136 Submersible Well Pumps

1.02 **QUALITY ASSURANCE AND REFERENCE STANDARDS**

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE C37.13 Low-Voltage AC Power Circuit Breakers Used in Enclosures.
 - 2. IEEE C37.16 Low-Voltage Power Circuit Breakers and AC Power Circuit Protectors Preferred Ratings, Related Requirements, and Application Recommendations.
- B. National Electrical Testing Association (NETA):
 - 1. ATS Acceptance Testing Specification Electrical Power Distribution Equipment and Systems.
- C. National Electrical Contractors Association (NECA):
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code (NEC).
- E. Underwriters Laboratories, Inc. (UL):
 - 1. UL 248-1 Low-Voltage Fuses Part 1: General Requirements
 - 2. UL 248-4 Low-Voltage Fuses Part 4: Class CC Fuses

- 3. UL 248-8 Low-Voltage Fuses Part 8: Class J Fuses.
- 4. UL 489 Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
- 5. UL 943 Ground-Fault Circuit-Interrupters.
- 6. UL 1053 Ground-Fault Sensing and Relaying Equipment.
- 7. UL 1066 Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Product Data:
 - 1. Provide manufacturer's standard catalog pages and data sheets for all products specified in PART 2 of this Detailed Provisions Section.
- C. Quality Assurance Submittals
- D. Ground fault protection system test reports signed by the supervising electrical foreman.
- E. Short circuit study report.
- F. Protective coordination study report.
- G. Operation and Maintenance Manual:
 - 1. Operation and Maintenance (O&M) Manual Content: Provide O&M manual documentation as required by Detailed Provisions Section 01 7823 Operation and Maintenance Manuals.

1.04 ARC FLASH STUDY REPORT

A. Perform arc flash hazard study after the short circuit and protective device coordination study has been completed. See Detailed Provisions Section 26 0573 – Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers or an approved equal are acceptable:
 - 1. Circuit Breakers:
 - a. Eaton Corporation; www.eaton.com
 - b. General Electric Company; https://electrification.us.abb.com/geindustrialcom

2. Fuses:

- a. Bussmann a part of Eaton Corporation; www.eaton.com
- b. Littelfuse, Inc.; www.littelfuse.com

2.02 CIRCUIT BREAKERS

A. Molded Cast Type:

- 1. General:
 - a. Standards: NEMA AB1, UL 489.
 - b. Unit construction.
 - c. Over-center, toggle handle operated.
 - d. Quick-make, quick-break, independent of toggle handle operation.
 - e. Manual and automatic operation.
 - f. All poles open and close simultaneously.
 - g. Three (3) position handle: On, off and tripped.
 - h. Molded-in ON and OFF markings on breaker cover.
 - i. One-, two- or three-pole as indicated on the Project Drawings.
 - j. Current and interrupting ratings as indicated on the Project Drawings.
 - k. Bolt-on type.

2. Thermal Magnetic Type:

- a. Inverse time overload and instantaneous short circuit protection by means of a thermal magnetic element.
- b. Frame size 150 amp and below:
 - 1) Non-interchangeable, non-adjustable thermal magnetic trip units.
- c. Frame sizes 225 to 400 amp (trip settings less than 400A):
 - 1) Interchangeable and adjustable instantaneous thermal magnetic trip units.
- d. Ground Fault Circuit Interrupter (GFCI) Listed:
 - 1) Standard: UL 943.
 - 2) One- or two-pole as indicated on the Project Drawings.
 - 3) Class A ground fault circuit.
 - 4) Trip on 5mA ground fault (4-6mA range).
- e. Ground Fault Equipment Protective Circuit Interrupter (GFEPCI) Listed:
 - 1) Standard: UL 1053.
 - 2) Trip on 30 mA ground fault (6-50 mA range).

f. HACR listed: Heating, air conditioning and refrigeration applications.

3. Solid State Trip Type:

- a. Inverse time overload, instantaneous short circuit and ground fault protection by means of a solid state trip element, associated current monitors and flux shunt trip mechanism.
- b. Frame size 400 amp to 1200 amp (trip settings between 400 and 1200 A):
 - 1) Standard rating.
 - 2) Interchangeable current sensor or rating plug.
 - 3) Adjustable long time pick-up setting.
 - (a) Adjustable from fifty to one hundred percent (50% to 100%) of the current sensor or rating plug.
 - 4) Adjustable short time pick-up setting.
 - 5) Adjustable instantaneous pick-up.
 - 6) Fixed ground fault pick-up, when indicated on the Project Drawings.
- c. Frame size 1600 amp and above:
 - 1) One hundred percent (100%) rated.
 - 2) Interchangeable current sensor or rating plug.
 - 3) Adjustable long time pick-up setting.
 - (a) Adjustable from fifty to one hundred percent (50% to 100%) of the current sensor or rating plug.
 - 4) Adjustable long time delay setting.
 - 5) Adjustable short time pick-up setting.
 - 6) Adjustable instantaneous pick-up setting.
 - 7) Adjustable ground fault pick-up setting, when indicated on the Project Drawings.
 - 8) Adjustable ground fault delay setting, when indicated on the Project Drawings.

4. Motor Circuit Protector:

- a. Adjustable instantaneous short circuit protection by means of a magnetic or solid state trip element.
- b. Sized for the connected motor.

2.03 FUSES

A. UL Class J Fuses:

- 1. Standard: UL 248-1 and 248-8.
- 2. Dual-element time-delay and current limiting rejection type.

- 3. Ratings: 600V, 0-600 amps and 200,000 RMS AIC symmetrical.
- B. UL Class RK-5 Fuses:
 - 1. Standard: UL 248-1 and UL 248-12.
 - 2. Dual-element time-delay and current limiting rejection type.
 - 3. Ratings: 250 and 600V, 1/10-600 amps and 200,000 RMS AIC symmetrical.
- C. UL Class CC Fuses:
 - 1. Standard: UL 248-1 and UL 248-4.
 - 2. Single-element fast-acting and current limiting rejection type.
 - 3. Ratings: 250 and 600V, 1/10-30 amps and 200,000 RMS AIC symmetrical.

2.04 ARC FLASH HAZARD LABELS

- A. Provide labels on all electrical equipment and weatherproof labels for equipment mounted outdoors.
- B. Information on each equipment Arc Flash Hazard warning label shall include:
 - 1. Flash Protection Boundary distance.
 - 2. Hazard/Risk Category level (0-4) defined by NFPA 70E.
 - 3. Required Protective Clothing and PPE.
 - 4. Shock Hazard when enclosed equipment is exposed.
 - 5. Equipment name and field marked location.
 - 6. See Detailed Provisions Section 26 0553 Identification for Electrical Systems and Detailed Provisions Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Current and interrupting ratings as indicated on the Project Drawings.
- B. Series rated systems not acceptable.
- C. Devices shall be ambient temperature compensated.
- D. Circuit Breakers:
 - 1. Molded case circuit breakers shall incorporate the following, unless indicated otherwise:
 - a. Frame sizes 250 amp and less with trip setting less than 250 amp shall be thermal magnetic type.
 - b. Frame sizes 400 amp and larger shall be solid state trip type.

- c. Frame sizes 400 amp and larger shall include integral ground fault protection.
- d. Motor circuit protectors sized for the connected motor.

E. Fuses:

- 1. UL Class J: Use for feeder devices 600 amps and smaller.
- 2. UL Class RK-5: Use for motor feeder and branch circuit devices.

3.02 SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION AND COORDINATION STUDY

- A. The Contractor shall provide short circuit and protective device evaluation and coordination study to verify electrical protective devices selected and selective tripping coordination for proposed facilities.
- B. See Detailed Provisions Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.

3.03 ARC FLASH HAZARD STUDY

- A. Contractor shall provide an Arc Flash Hazard Study to determine potential arc flash incident energies, arc flash boundaries, shock hazard boundaries and required personal protective equipment (PPE) for all energized electrical equipment, and arc flash and shock hazard warning labels.
- B. See Detailed Provisions Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.

3.04 FIELD TESTING AND VERIFICATION

- A. Contractor shall provide the services of an independent testing consultant to field verify that all protective devices are set in accordance with the accepted short circuit/coordination study requirements and recommendations. In addition, the consultant shall perform resistance testing of ground systems to confirm compliance with NEC and electric utility requirements and other testing as specified herein, and verify that arc flash and stock hazard warning labels have been installed.
- B. See Detailed Provisions Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.

3.05 INSPECTIONS AND TESTING

- A. See Detailed Provisions Section 26 0813 Electrical Acceptance Testing.
- B. Adjustable circuit breakers:
 - 1. Test and verify all circuit breaker trip functions using a test set provided by the manufacturer for that purpose for circuit breakers 1200A and above.

END OF SECTION 26 2800



SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 2816: SAFETY SWITCHES CONTENTS

PART 1	GENERAL	1
1.01 1.02	SUMMARYQUALITY ASSURANCE AND REFERENCE STANDARDS	1
	PRODUCTS	
-	ACCEPTABLE MANUFACTURERS	
PART 3	EXECUTION	3
3.01	INSTALLATION	3





SECTION 26 2816 SAFETY SWITCHES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Safety switches.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0553 Identification for Electrical Systems
 - 4. Section 26 0813 Electrical Acceptance Testing
 - 5. Section 26 2800 Overcurrent and Short Circuit Protective Devices
 - 6. Section 33 1136 Submersible Well Pumps

1.02 **QUALITY ASSURANCE AND REFERENCE STANDARDS**

- A. National Electrical Contractors Association (NECA):
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- B. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA KS1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- C. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code (NEC).
- D. Underwriters Laboratories, Inc. (UL):
 - 1. UL 98 Enclosed and Dead-Front Switches

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Product Data
 - 1. Provide manufacturer's standard catalog pages and data sheets for all products specified in PART 2 of this Detailed Provisions Section.
- C. Quality Assurance Submittals

SAFETY SWITCHES

- D. Provide a table that associates safety switch model number with connected equipment tag number.
- E. Operation and Maintenance Manual:
 - 1. Operation and Maintenance (O&M) Manual Content: Provide O&M manual documentation as required by Detailed Provisions Section 01 7823 Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following safety switch manufacturers or an approved equal are acceptable:
 - 1. Eaton Corporation; www.eaton.com
 - 2. General Electric Company; https://electrification.us.abb.com/geindustrialcom

2.02 SAFETY SWITCHES

A. General:

- 1. Standards: NEMA KS 1, UL 98.
- 2. Non-fusible or fusible as indicated on the Project Drawings.
- 3. Suitable for service entrance when required.
- 4. NEMA Type HD heavy-duty construction.
- 5. Switch blades will be fully visible in the OFF position with the enclosure door open.
- 6. Quick-make/quick-break operating mechanism.
- 7. Deionizating arc chutes.
- 8. Manufacture double-break rotary action shaft and switchblade as one (1) common component.
- 9. Clear line shields to prevent accidental contact with line terminals.

10. Operating handle:

- a. Red and easily recognizable.
- b. Padlockable in the OFF position
- c. Interlocked to prevent door from opening when the switch is in the ON position with a defeater mechanism.

B. Ratings:

- 1. Horsepower rated of connected motor.
- 2. Voltage and amperage: As indicated on the Project Drawings.
- 3. Short circuit withstand:

a. Non-fused: 10,000A.

b. Fused: 200,000A.

C. Enclosures:

- 1. NEMA 4 rated:
 - a. Body and cover: Sheet steel finished with rust inhibiting primer and manufacturers standard paint inside and out.
 - b. No knockouts, external mounting flanges, hinged, gasketed and lockable door.
- D. Overcurrent and Short Circuit Protective Devices:
 - 1. Fuses.
 - 2. See Detailed Provisions Section 26 2800 Overcurrent and Short Circuit Protective Devices.
- E. Accessories, when indicated in PART 3 of this Detailed Provisions Section or on the Project Drawings:
 - 1. Neutral kits.
 - 2. Ground lug kits.
 - 3. Auxiliary contact kits with 1 N.O. and 1 N.C. contact.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install as indicated and in accordance with manufacturer's instructions and recommendations.
- B. Install switches adjacent to the equipment they are intended to serve unless otherwise indicated.
- C. Permitted uses of NEMA 4 enclosure:
 - 1. Surface mounted in areas designated as damp/wet.

END OF SECTION 26 2816





SPECIFICATIONS – DETAILED PROVISIONS SECTION 26 4313: LOW VOLTAGE SURGE PROTECTION DEVICES CONTENTS

PART :	1 GENERAL	. 1
1.01	SUMMARY	. 1
1.02	QUALITY ASSURANCE AND REFERENCE STANDARDS	. 1
1.03	MANUFACTURER QUALIFICATIONS	. 2
	SUBMITTALS	
1.05	DEFINITIONS	. 3
PART 2	2 PRODUCTS	, 4
2.01	ACCEPTABLE MANUFACTURERS	. 4
2.02	SURGE PROTECTION DEVICE (SPD)	. 4
PART (3 EXECUTION	. 6
	INSTALLATIONFIELD TESTING AND VERIFICATION	





SECTION 26 4313 LOW VOLTAGE SURGE PROTECTION DEVICES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Material and installation requirements for:
 - a. Transient voltage surge protection devices (SPD) for installation in motor control center, integrally mounted.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Section 26 0500 Basic Electrical Requirements
 - 3. Section 26 0553 Identification for Electrical Systems
 - 4. Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment.
 - 5. Section 26 0813 Electrical Acceptance Testing
 - 6. Section 26 2419 Motor-Control Centers
 - 7. Section 33 1136 Submersible Well Pumps

1.02 QUALITY ASSURANCE AND REFERENCE STANDARDS

- A. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - 1. IEEE C62.41.1 Guide on the Surge Environment in Low-Voltage (1000V and Less) Power Circuits.
 - 2. IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000V and Less) AC Power Circuits.
 - 3. IEEE C62.45 Recommended on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
- B. Military Standard (MIL):
 - 1. MIL-STD-220B Method of Insertion-Loss Measurement.
- C. National Electrical Contractors Association (NECA)
 - 1. NECA 1 Standard for Good Workmanship in Electrical Construction
- D. National Electrical Manufacturers Association (NEMA)
 - 1. NEMA 250 Enclosures for Electrical Equipment.
- E. National Fire Protection Association (NFPA):
 - 1. NFPA 70 National Electrical Code (NEC).

LOW VOLTAGE SURGE PROTECTION DEVICES (SPD)

- F. Underwriters Laboratories, Inc. (UL):
 - 1. UL 1283 Electromagnetic Interference Filters.
 - 2. UL 1449 Transient Voltage Surge Suppressors.

1.03 MANUFACTURER QUALIFICATIONS

- A. Provide devices from a manufacturer who has been regularly engaged in the development, design, testing, listing and manufacturing of SPDs of the types and ratings required for a period ten (10) years or more and whose products have been in satisfactory use in similar service.
 - 1. Upon, request, suppliers or manufacturers shall provide a list of not less than three (3) customer references showing satisfactory operation.

1.04 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Product Data:
 - 1. Standard manufacturer catalog and data sheets.
 - 2. Drawings showing unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.
 - 3. Create a Product Data Sheet for each different model number of SPD provided (i.e., Model XYZ with disconnect and Model XYZ without disconnect, each require a Product Data Sheet).
 - a. Data in the Product Data Sheet heading:
 - 1) SPD Manufacturer's name and product model number.
 - b. Data in the Product Data Sheet body:
 - 1) Column One: Specified value/feature of every paragraph of Part 2 of this Detailed Provisions Section.
 - 2) Column Two: Manufacturer's certified value confirming the product meets the specified value/feature.
 - 3) Name of the nationally recognized testing laboratory that performed the tests.
 - c. Data in the Product Data Sheet closing:
 - 1) Signature of the manufacturer's official (printed and signed).
 - 2) Title of the official and date of signature.
- C. Quality Assurance Submittals:
 - 1. Manufacturer's qualifications

- 2. Testing procedures and testing equipment data. Testing shall include, but not limited to, the following:
 - a. Quality control checks.
 - b. MIL STD-220B.
 - c. ANSI/IEEE C62.41.1
 - 1) Category A.
 - 2) Category B.
 - 3) Category C.

D. Operation and Maintenance Manual:

1. Operation and Maintenance (O&M) Manual Content: Provide O&M manual documentation as required by Detailed Provisions Section 01 7823 – Operation and Maintenance Manuals.

1.05 DEFINITIONS

- A. Clamping Voltage:
 - 1. The applied surge shall be induced at the ninety (90) degree phase angle of the applied system frequency voltage.
 - 2. The voltage measured at the end of the 6-inch output leads of the SPD and from the zero voltage reference to the peak of the surge.
- B. Let-Through Voltage:
 - 1. The applied surge shall be induced at the ninety (90) degree phase angle of the applied system frequency voltage.
 - 2. The voltage measured at the end of the 6-inch output leads of the SPD and from the system peak voltage to the peak of the surge.
- C. Maximum Continuous Operating Voltage (MCOV): The maximum steady-state voltage at which the SPD device can operate and meet its specification within its rated temperature.
- D. Maximum Surge Current:
 - 1. The maximum 8 x 20 microsecond surge current pulse the SPD device is capable of surviving on a single-impulse basis without suffering either performance degradation or more than ten percent (10%) deviation of clamping voltage at a specified surge current.
 - 2. Listed by mode, since number and type of components in any SPD may vary by mode.
- E. MCC: Motor Control Center.
- F. MOV: Metal Oxide Varistor.

- G. Protection Modes: This parameter identifies the modes for which the SPD has directly connected protection elements, i.e., line-to-neutral (L-N), line-to line(L-L), line-to-ground (L-G), neutral-to-ground (N-G).
- H. Surge Current per Phase:
 - 1. The per phase rating is the total surge current capacity connected to a given phase conductor.
 - a. For example, a wye system surge current per phase would equal L-N plus L-G; a delta system surge current per phase would equal L-L plus L-G.
 - b. The N-G mode is not included in the per phase calculation.
- I. System Peak Voltage: The electrical equipment supply voltage sine wave peak (i.e., for a 480/277 V system the L-L peak voltage is 679V and the L-N peak voltage is 392 V).

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers of SPDs are acceptable:
 - 1. Eaton Corporation; <u>www.eaton.com</u>
 - 2. General Electric Company; https://electrification.us.abb.com/geindustrialcom
 - 3. Or approved equal.

2.02 SURGE PROTECTION DEVICE (SPD)

A. General:

- 1. The SPD shall be listed to UL 1449 as a SPD Type 1 or SPD Type 2.
- 2. The UL 1449 Nominal Discharge Current (In) for the SPD shall be 20 kA. A SPD with Nominal Discharge Current listing of 3 kA, 5 kA, or 10 kA will not be accepted.
- 3. MCOV shall be greater than one hundred fifteen (115%) of the nominal operating voltage.
- 4. The SPD shall have a stand-off voltage rating twice the nominal voltage. The SPD shall be able to withstand Temporary over Voltage Conditions twice the nominal voltage for an indefinite period of time, without damage, removing components from the circuit, or interrupting panel.
- 5. The SPD shall protect all modes via L-N, L-G and N-F modes of protection. For Delta power systems L-L and L-G protections modes shall be provided, with the ability to configure L-G to L-L for ungrounded systems.

- 6. Independent certification shall be provided proving that the SPD meets the required 8x20 micros per phase single shot surge rating, without failure of any fusing, disconnects or surge module. Bypassing of any fusing/disconnects for purpose of this test is not acceptable.
- 7. Each mode of the SPD shall be rated to exceed the life cycle testing of ANSI/IEEE C62.45 by withstanding at least two hundred (200) operations at 10kA 8x20 micros and at least one hundred (100) operations at 20 kA without failure.
- 8. SPD shall have a Short Circuit Current Rating (SCCR) of 200 kAIC, per UL 1449.
- 9. SPD shall be capable of withstanding multiple temporary over-voltage per UL 1449 Section 36 "Overvoltage Test" and Section 37 "Abnormal Overvoltage Tests" without failure or need to reset or replace modules/fuses.
- 10. Each MOV shall be protected with individual thermal disconnect devices bonded directly to the MOV substrate for rapid and automatic disconnection of any MOV exhibiting excessive temperature. The following are not acceptable:
 - a. SPDs without thermal fuses/disconnects.
 - b. SPDs with shared thermal devices that disconnect more than one MOV.
- 11. For safety, the SPD shall have a maximum continuous operating voltage (MCOV) of at least:

Power System	MCOV (L-N)
Single phase (2W+G) 220-240V	310V
Three phase (4W +G) 120/208 WYE	170V
Three phase (4W+G) 277/480 WYE	310V

12. Enclosure shall be:

- a. NEMA 4 enclosure suitable for outdoor usage.
- b. The SPD depth shall be less than 3.5-inches to allow mounting within wall cavity with optional flush mount kit.
- c. The SPD width shall be less than 5-inches to enable installation between adjacent electrical enclosures.
- B. Switchgear, Switchboard, Panelboard and Motor-Control Centers:
 - 1. Provide SPDs integrally mounted in all power distribution panels (switchgear, switchboard, panelboards, motor-control centers, etc.)
 - 2. The SPD shall incorporate 200 kA 8x20 micros MOV protection per phase.
 - 3. The SPD shall have the following status indications:
 - a. Each individual mode of protection shall be separately monitored and displayed via a mechanical flag status indication for each mode.
 - b. A LED status indication per phase.

- c. An overall status LED
- d. Form-C alarm contacts for remote alarming of faults
- e. Audible Alarm.
- f. A five (5) digit surge counter that cannot be rest.
- 4. The SPD shall have a built-in disconnect that allows fusing and surge components to be removed without interrupting power, or disconnecting hard wire connections.
- 5. The following Voltage Protection Ratings (VPR) shall not be exceeded by the SPD:

Voltage F		ection Rating
Impulse Standard	120/240V	277/480V
(no AC applied)	120/208V	
ANSI/IEEE C62.41	600V	1000V
Cat B3 3kA		
ANSI/UL 1449	1200V	1800V
20 kA Nominal Discharge		
Current Testing		

6. At least -40 dB @ 100 kHz EMI/RFI shall be provided L-N (L-L for Delta units). To avoid unsafe ground leakage current, not filtering shall connect to ground.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install SPDs in full accordance with manufacturer's written instructions and recognized industry practices to ensure that the SPDs comply with the requirements and serve the intended purposes. Comply with the requirements of NEMA and NEC standards and applicable portions of NECA's "Standard of Installation", for installation of electrical devices.
- B. SPDs with a UL 1449 listing as SPD Type 2 shall have a 30-amp circuit breaker or other size as recommended by the manufacturer's instructions. This independent circuit breaker will serve as a means of a disconnect for servicing the SPD with the protected panel remaining energized.
- C. SPDs with a UL 1449 listing as a SPD Type 1, an integrated disconnect can be connected directly to the buss without a designated circuit breaker.
- D. Install the SPD integrally mounted in the panel or adjacent to the equipment which it protects. Maximum cable length from the SPD to the protected device shall not exceed three (3) feet. The protector status alarm monitor shall be located in the face of the protector. Provide wiring connections and disconnect/overcurrent device as required for connection to the protected equipment bus.

3.02 FIELD TESTING AND VERIFICATION

- A. Prior to energization, check SPDs for continuity of circuits and for short circuits.
- B. Subsequent to wire and cable hookup, energize SPDs and demonstrate proper functioning.
- C. See Detailed Provisions Section 26 0573 Electrical Short Circuit/Coordination Study, Arc Flash Hazard Study, and Field Testing of Electrical Equipment and Detailed Provisions Section 26 0813 Electrical Acceptance Testing.

END OF SECTION 26 4313





3.05

3.06

SPECIFICATIONS – DETAILED PROVISIONS SECTION 31 2133: TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

CONTENTS

PART 1 GENERAL...... SUMMARY....... 1 1.01 1.02 OUALITY ASSURANCE...... 1 1.03 1.04 SAFETY PRECAUTIONS......4 1.05 1.06 1.07 SOILS TESTING......6 PART 2 PRODUCTS.......7 PART 3 EXECUTION9 GENERAL 9 3.02 PREPARATION OF FOUNDATION FOR PIPE LAYING 11 3.03 3.04





SECTION 31 2133 TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. This Work consists of excavating, backfilling and compacting for all underground utilities.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. General Requirements
 - 2. Division 03 Concrete
 - 3. Division 26 Electrical
 - 4. Section 31 2300 Earthwork

1.02 QUALITY ASSURANCE

A. Referenced Standards:

- 1. American Society for Testing and Materials (ASTM):
 - a. ASTM C33/C33M Standard Specification for Concrete Aggregates.
 - b. ASTM D75/D75M Standard Practice for Sampling Aggregates.
 - c. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - d. ASTM D1556/D1556M Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - e. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - f. ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
 - g. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - h. ASTM D2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - i. ASTM D2488 Standard Practice for Description and Identification of Soils.
 - j. ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - k. ASTM D4254 Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

- 1. ASTM D4643 Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating.
- m. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- 2. California Code of Regulations (CCR): CCR Title 8 Industrial Relations.
- 3. California Department of Industrial Relations Division of Occupational Safety and Health (Cal-OSHA).
- 4. California Labor Code Section 6705
- 5. State of California, Business and Transportation Agency, Department of Transportation (Caltrans):
 - a. Caltrans Standard Specifications Division III: Earthwork and Landscape
 - b. Caltrans Manual of Uniform Traffic Control Devices; http://www.dot.ca.gov/hq/traffops/engineering/mutcd/
- 6. Southern California Edison (SCE):
 - a. SCE Electrical Service Requirements, www.sce.com/nrc/aboutsce/regulatory/distributionmanuals/esr.pdf
 - b. SCE Underground Structures Standards, www.sce.com/nrc/aboutsce/regulatory/distributionmanuals/ugs.pdf

1.03 **DEFINITIONS**

- A. Backfill Material: Backfill for both trench backfill and pipe bedding (or pipe zone backfill).
- B. Pipe Bedding: Layer of material immediately below pipe or conduit and extending over the full trench width in which the pipe is bedded. Thickness of pipe bedding shall be a minimum of 6-inches compacted to ninety percent (90%) relative compaction. Bedding material may be specified as sand, rock, gravel, or concrete base, cradle, or encasement.
- C. Pipe Zone: The pipe zone shall include the full width of trench from the bottom of the pipe or conduit to a horizontal level 12-inches above the top of the pipe or conduit. Where multiple pipes are placed in the same trench, the pipe zone shall extend from the bottom of the lowest pipe or conduit to a horizontal level above the top of the highest or topmost pipe. Thickness of pipe zone above the highest top of pipe shall be a minimum of 12-inches.
- D. Relative Compaction: Ratio, expressed as a percentage of the in-place dry-density as compacted to a laboratory maximum dry-density of representative sample of the same material determined by ASTM D1557.
- E. Standard Specifications: Refers to the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (Caltrans), latest edition. In case of conflict between the Standard Specifications and these Specifications, the strictest specifications shall govern. Provisions for

- measurement and payment specified within the Standard Specifications shall be disregarded and the provisions of these Contract Documents shall govern.
- F. Subgrade: Previously undisturbed material prepared and compacted to required density and elevation to support a structure, pavement system, or to receive additional specified materials.
- G. Trench Zone: The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the pavement zone or to the existing surface in unpaved areas.
- H. Unsuitable Material: Shall consist of materials determined by the County and/or Testing/Inspection Provider to be:
 - 1. Soft, loose, unstable or yielding, or
 - 2. Previously placed uncontrolled fill, or
 - 3. Designated material to be over-excavated per geotechnical report requirements, or
 - 4. Unable to be compacted to specified density using ordinary methods at optimum moisture content, or
 - 5. Contains visible or excessive deleterious material as determined by the County or Testing/Inspection Provider, or
 - 6. Too wet to be properly compacted and circumstances prevent processing suitable in-place drying prior to being used as backfill, or
 - 7. Otherwise unsuitable for planned use.

Such material shall be removed to the limits directed by the County and the resulting excavation backfilled with engineered fill material.

I. Upper Zone: The upper zone includes the portion of the trench from the top of the pipe zone to the bottom of the pavement zone or to the existing surface in unpaved areas.

1.04 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - 2. Submit respective pipe or conduit manufacturer's data regarding bedding methods of installation and general recommendations.
 - 3. Deliver bulk samples of import backfill materials to County in quantities sufficient for testing. Deliver at least fifteen (15) Days prior to use.

4. Excavation Plan:

- a. In accordance with Section 5-5.2 Shoring Plan of the General Provisions, Contractor shall submit to the County a detailed plan showing the design of shoring, bracing, sloping of the sides of trenches, or other provisions to be made for the protection of personnel during earthwork operations.
- b. County acceptance of the Excavation Plan does not release the Contractor of liability in the event of an accident or injury, nor does it place any liability on the County or any County employees.
- 5. Trench shoring or shield (trench box) certification if employed:
 - a. Specific to Project Conditions.
 - b. Certified by Professional Structural Engineer, registered in California.
 - c. County is not responsible to, and will not, review and approve.
 - d. Cal-OSHA Contractor compliance information for trench safety. Submit an exemption letter or trenching permit from Cal-OSHA and comply with California Labor Code Section 6705, Excavation Plans for Worker Protection.
 - e. Submit a Confined Space Emergency Plan prior to any personnel entering trenches or excavations greater than four (4) feet in depth.
- 6. Testing laboratory reports verifying that imported material conforms to the specified gradations or characteristics.

C. Quality Assurance Submittals:

- 1. Submit sieve analysis reports on all granular materials.
- 2. Submit field quality control test results.

1.05 SAFETY PRECAUTIONS

- A. Observe safety precautions in all phases of the Work. Included shall be trench shoring, bracing, lighting, and barricades as dictated by reason and by Safety Orders of the Division of Industrial Safety, State of California (Cal-OSHA).
- B. Acquire an exemption letter or trenching permit from Cal-OSHA and comply with California Labor Code Section 6705, Excavation Plans for Worker Protection. Submit a copy of the exemption letter or trenching permit with excavation drawings to the County prior to excavation work.
- C. Install all necessary underpinning, shoring, lagging, cribbing, and bracing of ample strength to support adjoining soils, paving and structures.
- D. Barricade open depressions and holes occurring as part of this Work, and post warning lights on property adjacent to or with public access.
- E. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

- F. No trenches deeper than four (4) feet shall be left open during non-working hours, unless temporary steel plating and shoring support for the plates is provided to completely cover excavation. See Paragraph 1.06.I. herein for more information.
- G. Install fences and barricades to secure excavation areas.

1.06 PROJECT CONDITIONS

- A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent slides or caving.
 - 1. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to landfill operations.
- B. Provide full access to areas required for landfill operations and points as designated by the County to prevent serious interruption of travel.
- C. Protect and maintain benchmarks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of the County.
- D. Verify location of existing underground utilities.
- E. When performing underground work, the Contractor shall call Underground Service Alert of Southern California (USA/SC) at 811, the one-call underground facility locating service two (2) Working Days prior to making an excavation. Contractor shall be responsible for such notification of Subcontractor's Work or shall require Subcontractor to assume this responsibility.
- F. The Contractor's attention is directed to the possible existence of pipe, conduit and other underground improvements which may or may not be shown on the Project Drawings. Preserve and protect any such improvements whether shown on the Project Drawings or not. Expose such improvements in advance of the underground construction to allow for changes in alignment as necessary. Where it is necessary to remove and replace or to relocate such improvements in order to prosecute Work, they shall be removed, maintained, and permanently replaced by the Contractor at their expense. Relocation of said improvements shall not be performed without written permission of the County or the owner of the utility. Unless otherwise noted, existing underground utilities shall be protected in place.
- G. Excavation made with power driven equipment is not permitted within five (5) feet of any know utility or subsurface construction. For Work immediately adjacent to or for excavation exposing a utility or other buried obstruction, use hand or light equipment excavation. Start excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing Work as affected by the contract excavation until approval for backfill is granted by the County. The Contractor shall report damage of utility lines or subsurface construction immediately to the County and make repairs at no additional cost to the County.
- H. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods as required, to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to roadways and walks.

- I. Contractor shall provide temporary steel plating and shoring support for the plates, to completely cover the excavation created across roadways. Temporary steel plating must be provided by the Contractor for areas which will remain open overnight. The temporary plating shall be a minimum of 0.75-inch thickness steel, but in no case shall the thickness be less than that required to support AASHTO-H20 traffic loading. Provide a visible barrier along the excavation path on each side of the roadway with a combination of highly visible "Caution Tape" and construction cones.
- J. Protect existing streams, ditches and storm drain inlets using proper erosion control methodology.
- K. Do not use explosives unless approved otherwise in writing by the County.
- L. Provide dust alleviation and control measures continuously during the course of the Work to the satisfaction of the County.

1.07 SOILS TESTING

- A. A Testing/Inspection Provider will be procured by the County for testing and inspection as required by the Contract Documents.
- B. All materials, Work, methods and equipment shall be subject to inspection at the jobsite and import sources. Material or workmanship not complying with the Contract Documents will not be accepted. The Contractor shall give the Testing/Inspection Provider reasonable notice when ready for inspection and shall supply samples for inspection without extra charge.

C. Cost of Testing:

- 1. With the exceptions of retest due to material or Contractor workmanship, the County will assume the cost for all tests and inspections specified to be performed by the Testing/Inspection Provider. Additional costs of retesting incurred by the County shall be deducted from the Contract Final Payment.
- D. Tests performed by the Testing/Inspection Provider may include, but are not limited to:
 - 1. Determine the density of soil in place by the sand cone method, ASTM D1556 or by nuclear methods, ASTM D6938.
 - 2. Determine laboratory moisture-density relations of soils by ASTM D1557.
 - 3. Determine the relative density of cohesion-less soils by ASTM D4253 and D4254.
 - 4. Visual soil classification by ASTM D2488.
 - 5. Sample backfill materials in accordance with ASTM D75.
 - 6. Conduct in-place moisture-density tests for backfilling to assure that all work complies with this Detailed Provisions Section.
- E. Make excavation for compaction tests at the locations and to the depths designated by the Testing/Inspection Provider. Backfill and re-compact the excavation at completion of testing. When test indicate that the compaction is less than the specified relative compaction, rework and retest those areas until the specified relative compaction has been obtained.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe Bedding and Pipe Zone Materials:
 - 1. Imported sand consisting of natural or manufactured granular material, or a combination thereof, free of deleterious amounts of organic material, mica, loam, clay, and other substances. The material must have been tested to a minimum Sand Equivalent of 30 within two (2) weeks of its use. Imported sand shall have the following gradation or similar:

SIEVE SIZE	PERCENT PASSING
	BY WEIGHT
3/8"	100
#4	75-100
#30	12-50
#100	5-20
#200	0-15

- 2. Pipe bedding thickness = 1/2 pipe outside diameter or 6-inches, whichever is greater.
- 3. Special requirements for bedding may be described as part of the Special Conditions, pipe manufacturer's instructions or as shown on the Project Drawings shall supersede and take precedence over any and all other requirements found elsewhere in these Detailed Provisions.

B. Concrete Encasement:

- 1. Comply with Detailed Provisions Section 03 3100 Cast-in Place Structural Concrete and Section 26 0543 Electrical: Exterior Underground.
- 2. Concrete shall be red dyed utilizing red dye mixed into the concrete for a minimum of five (5) minutes prior to pouring. Minimum of twelve pounds (12 lbs.) of dye per one cubic yard (1 CY) of concrete.
- 3. Compressive Strength: Unless noted otherwise, minimum 3,000 psi.
- 4. Graded as specified in ASTM C33, size number 8.

C. Trench Zone Backfill Materials – General:

- 1. Backfill material shall consist of suitable material from excavation or imported when suitable material is not available from the excavated material. All excavated materials incorporated as part of trench backfill must be inspected and approved to be suitable by the County and/or Testing/Inspection Provider. Excavated material may need to be processed to meet specification requirements and shall be provided at the Contractor's expense.
- 2. Free of rock cobbles, roots, trash, vegetation or other organic matter.

- 3. Contains no lumps of rocks over 3-inches in greatest dimension, and with no more than fifteen percent (15%) of rocks over 2-inches in their greatest dimension.
- 4. Backfill materials that are obtained from trench excavated materials to the extent such material is available, shall be screened at the discretion of the County. Hand selecting of rocks from excavated material will not be permitted in lieu of screening. Under no circumstances will native earth materials be allowed or used in the pipe bedding, pipe zone, or directly under paved roads.
- 5. Special requirements for trench backfill materials may be described as part of the Special Conditions, pipe manufacturer's instructions or as shown on the Project Drawings shall supersede and take precedence over any and all other requirements found elsewhere in these Detailed Provisions.

D. Unsuitable Material:

1. Shall consist of materials too wet, soft, or loose to properly support the utility pipe, conduit or appurtenant structure. Such material shall be removed to the limits directed by the County or Testing/Inspection Provider and the resulting excavation backfilled with pipe bedding material compacted to a minimum of ninety percent (90%) relative compaction.

E. Controlled Density Fill (CDF)

- 1. As approved on a case-by-case basis by the County, controlled density fill (CDF) may be accepted in lieu of standard trench backfill materials. It shall be mandatory in trenches 8-inches wide or less where the prevention of subsequent settlement after placement of backfill is required. CDF shall conform to the following requirements:
 - a. CDF shall produce unconfined 28-day compressive strengths from 75 psi to a maximum of 175 psi. CDF material characteristics and approximate quantities for each component per cubic yard of mixed material shall be as follows:
 - 1) Cement (ASTM C150, Type I or II): 50 lbs.
 - 2) Fly ash (ASTM C618, for Class F pozzolans): 200 lbs.
 - 3) Fine sand: 2,700 lbs.
 - 4) Water: 420 lbs.
 - 5) Air content (air entraining agent- ASTM C260): 10%.
 - 6) Actual quantities shall be adjusted to provide a yield of one (1) cubic yard with the materials used.
 - b. Fine Sand: Fine sand shall be an evenly graded material having not less than ninety-five percent (95%) passing the No. 4 sieve and not more than five percent (5%) passing the No. 200 sieve.
 - c. Mix Design and Proportions:
 - 1) CDF shall be a mixture of cement, Class F pozzolan, fine sand, water and air having a consistency which will flow under a very low head. CDF shall

- be batched by a ready-mixed concrete plant and delivered to the site by means of transit mixing trucks.
- 2) Mix design shall be submitted for County approval.
- 3) Approximate compressive strength should be 85 psi to 175 psi.
- 4) Mixing and handling of the material shall be in accordance with Detailed Provisions Section 03 3131 Concrete Mixing, Placing, Jointing and Curing.
- F. Bedding and Backfill Materials for Southern California Edison (SCE) underground electrical utilities shall meet SCE specifications.
- G. Subgrade Stabilization Materials: Clean (less than five percent (5%) fines) compacted structural fill.

PART 3 EXECUTION

3.01 GENERAL

- A. Remove and dispose of unsuitable materials as directed by the County.
- B. Trenches shall be excavated in such a manner as to ensure that trench sidewalls will be stable under all working conditions.
- C. Trench walls shall be sloped and/or supported in conformance with Cal-OSHA standards.
- D. All excavations shall be barricaded in conformance with Cal-OSHA standards.
- E. Prior to excavation, Contractor shall acquire and submit an exemption letter or trenching permit from Cal-OSHA and comply with Labor Code Section 6705, Excavation Plans for Worker Protection.
- F. Sheeting and shoring for the Work and for the safety of personnel shall be in compliance with Cal-OSHA regulations. Shoring is required for all trench portions greater than 4-feet in depth. Trenches greater than 20-feet in depth require protection systems designed by Professional Structural Engineer licensed in California.

3.02 EXCAVATION

- A. Unclassified Excavation: Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and loose stone as directed by the County.
- B. Excavation for Appurtenances:
 - 1. 12-inch (minimum) clear distance between outer surface and embankment.
 - 2. See Detailed Provisions Section 31 2300 Earthwork for applicable requirements.
- C. Excavation shall be performed to the lines and grades indicated. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to one-half the depth of the excavation, but in no instance closer than 2-feet. At Contractor's expense, excavated material not

- required or not suitable for backfill shall be disposed of or if deemed suitable by the County, may be stockpiled on-site in a location as directed by the County.
- D. Grading shall be completed as necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed to maintain the stability of the bottom and sides of the excavation.

E. Trench Excavation:

- 1. The trench shall be excavated as recommended by the manufacturer of the pipe or conduit to be installed.
- 2. Open trench outside buildings, units, and structures:
 - a. No more than the distance between two vaults, structures, units or three hundred (300) linear feet, whichever is less.
 - b. Field adjust limitations as weather conditions dictate.
- 3. Trenching within buildings, units, or structures:
 - a. No more than one hundred (100) linear feet at any one time.
- 4. Any trench or portion of trench, which is opened and remains idle for seven (7) Calendar Days, or longer, as determined by the County, may be directed to be immediately refilled, without completion of Work, at no additional cost to the County.
 - a. Said trench may not be reopened until County is satisfied that Work associated with trench will be prosecuted.
- 5. Observe following trenching criteria:
 - a. Trench size:
 - 1) Excavate width to accommodate free working space.
 - 2) Unless otherwise specified in the Special Conditions, pipe manufacturer instructions, or on the Project Drawings, maximum trench width at top of pipe or conduit may not exceed outside diameter of utility service by more than the following dimensions:

OVERALL DIAMETER OF UTILITY SERVICE	EXCESS DIMENSION
33-inches and less	18-inches
More than 33-inches	24-inches

- 3) Cut trench walls vertically from bottom of trench to 1-foot above top of pipe, conduit, or utility service.
- 4) Keep trenches free of surface water runoff.
 - (a) No separate payment for surface water runoff pumping will be made by the County.
- 6. Where the pipe or conduit is in an existing paved area, the pavement shall be saw cut in a straight line parallel to the pipe on each side. Saw cutting operations shall

be performed prior to excavation to avoid excessive removal of pavement. Care shall also be taken during installation of pipe or conduit to avoid damage to adjoining surfaces.

F. Trench Excavation for Electrical Installations:

- 1. Observe Paragraph 3.02C.
- 2. Modify for electrical installations as follows:
 - a. Open no more than six hundred (600) linear feet of trench in exterior locations for trenches more than 12-inches but not more than 30-inches wide.
 - b. Any length of trench may be opened in exterior locations for trenches which are 12-inches wide or less.
 - c. Do not over-excavate trench.
 - d. Cut trenches for electrical runs with minimum 30-inches cover, unless otherwise specified or shown on Drawings.
 - e. See Division 26 for additional requirements.

G. Removal of Rock

1. Contractor shall notify County when rock is encountered at the bottom of a trench. Rock shall be removed to a depth and in a manner as directed by the County and replaced with select granular material.

H. Removal of Unsuitable Material

1. Contractor shall notify County when unsuitable material is encountered in the bottom of the trench. Such material shall be removed to the depth directed and replaced to proper grade with select granular material or compacted structural fill.

3.03 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Over-Excavation:

- 1. Excavate minimum of 6-inches below bottom exterior surface of the pipe or conduit.
- 2. Backfill and recompact to ninety percent (90%) of maximum dry density per ASTM D1557.
- 3. Backfill with granular bedding material as option.

B. Rock Excavation:

- 1. Excavate minimum of 6-inches below bottom exterior surface of the pipe or conduit.
- 2. Backfill to grade with suitable earth or granular material to ninety percent (90%) of maximum dry density per ASTM D1557.
- 3. Form bell holes in trench bottom.
- C. Subgrade Stabilization:

- 1. Stabilize the subgrade when directed by the County.
- 2. Observe the following requirements when unstable trench bottom materials are encountered.
 - a. Notify County when unstable materials are encountered.
 - 1) Define by drawing station locations and limits.
 - b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or Contractor operations.
 - 1) Replace with subgrade stabilization with no additional compensation.

D. Concrete Encasement:

- Comply with Detailed Provisions Section 03 1113 Formwork Structural Castin-Place Concrete, Section 03 2100 Concrete Reinforcement, Section 03 3100 Cast-in Place Structural Concrete, Section 03 3131 Concrete Mixing, Placing, Jointing, and Curing, and Section 03 3132 Concrete Finishing and Repair of Surface Defects.
- 2. See Detailed Provisions Section 26 0543 Electrical: Exterior Underground for conduit installation.

3.04 BACKFILLING METHODS

- A. Do not backfill until tests to be performed on system show system is in full compliance to specified requirements.
- B. Carefully Compacted Backfill:
 - 1. Furnish where indicated on Drawings, specified for trench embedment conditions and for compacted backfill conditions up to 12-inches above top of pipe or conduit.
 - 2. Comply with the following:
 - a. Place backfill in lifts not exceeding 8-inch (loose thickness).
 - b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
 - c. Observe specific manufacturer's recommendations regarding backfilling and compaction.
 - d. Compact each lift to specified requirements.

C. Common Trench Backfill:

- 1. Perform in accordance with the following:
 - a. Place backfill in lift thicknesses capable of being compacted to densities specified.
 - b. Observe specific manufacturer's recommendations regarding backfilling and compaction.

- c. Avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion.
- D. Water flushing (jetting) for consolidation is not permitted.
- E. Backfilling for Electrical Installations:
 - 1. Observe Paragraph 3.04.B. or C. or when approved by the County.
 - 2. Modify for electrical installation as follows:
 - a. Observe notes and details on electrical drawings for fill in immediate vicinity of direct burial cables.
 - b. Install warning tape in accordance with Detailed Provisions Section 26 0553 Identification for Electrical Systems.

3.05 COMPACTION

A. General:

- 1. Place and assure bedding, backfill, and fill materials achieve an equal or higher degree of compaction than undisturbed materials adjacent to the Work.
- 2. In no case shall degree of compaction below minimum compactions specified shall be accepted.

B. Compaction Requirements:

1. Unless noted otherwise on Drawings or more stringently by other Detailed Provisions Sections, comply with the following minimum trench compaction criteria.

a. Bedding material:

LOCATION	SOIL TYPE	COMPACTION DENSITY
All locations	Cohesionless soils	75% of relative density by ASTM D4253 and ASTM D4254.

b. Carefully compacted backfill:

LOCATION	SOIL TYPE	COMPACTION DENSITY
All applicable areas	Cohesive soils	95% of maximum dry density by ASTM D1557.
	Cohesionless soils	75% of relative density by ASTM D4253 and ASTM D4254.

c. Common trench backfill:

LOCATION	SOIL TYPE	COMPACTION DENSITY
Under pavements,	Cohesive soils	95% of maximum dry density by ASTM D1557.
roadways, surfaces	Cohesionless soils.	60% of relative density by ASTM D4253 and ASTM D4254.

TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES

within traffic areas.		
Under turfed, sodded, plant	Cohesive soils	85% of maximum dry density by ASTM D1557.
seeded, non- traffic areas.	Cohesionless soils	40% of relative density by ASTM D4253 and ASTM D4254.

3.06 FIELD QUALITY CONTROL

A. The County shall procure the services of a Testing/Inspection Provider and laboratory to conduct in-place moisture-density tests for backfilling to assure that all Work complies with this Detailed Provisions Section.

B. Testing:

- 1. Perform in-place moisture-density tests as directed by the County.
- 2. Perform tests through recognized testing laboratory approved by the County.
- 3. Perform additional tests as directed until compaction meets or exceeds requirements.
- 4. Assure County and Testing/Inspection Provider staff has immediate access for testing of all soils-related work.
- 5. Ensure excavations are safe for testing personnel.

END OF SECTION 31 2133



SPECIFICATIONS – DETAILED PROVISIONS SECTION 31 2300: EARTHWORK CONTENTS

PART 1	1 GENERAL	1
1.01	SUMMARY	1
1.02	QUALITY ASSURANCE	1
1.03	DEFINITIONS	3
1.04	SUBMITTALS	4
1.05	SAFETY PRECAUTIONS	
1.06	DELIVERY, STORAGE, AND HANDLING	5
1.07	PROJECT CONDITIONS	6
1.08	EXISTING CONDITIONS	7
1.09	SOILS TESTING	7
1.10	MAINTENANCE	7
PART 2	2 PRODUCTS	8
2.01	FILL MATERIALS	8
2.02	WATER	9
PART 3	3 EXECUTION	9
3.01	EXAMINATION	9
3.02	PROTECTION	
3.03	PREPARATION	11
3.04	EXCAVATION	11
3.05	PLACING AND COMPACTING FILL MATERIAL	12
3.06	GRADING	14
3.07	DUST ALLEVIATION AND CONTROL	15
3.08	FIELD QUALITY CONTROL	15





SECTION 31 2300 EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

A. Work includes:

- 1. Regardless of the nature or type of the materials encountered, includes excavating and grading for site grades, building preparation, roadways, driveways, parking areas, excavating below grade, excavating channels and ditches, removing slide material, and disposing of all excavated material. These activities may be performed in making cuts, embankments, slopes, fills, roadways, drainage features, parking areas, completing finished grade, and in completing related Work where shown on the Project Drawings or as designated by the County.
- 2. Finish grading shall consist of scarifying and establishing finish grade to conform to Project Drawings.
- 3. Removal of unsuitable materials.
- 4. Over-excavation and recompaction of suitable materials.
- 5. Subgrade preparation and engineered fill placement.
- 6. Aggregate base placement.
- 7. Dust alleviation and control.
- 8. Erosion control measures to prevent run-off of sediment and other unsuitable materials.
- 9. Location of Work: All areas within limits of grading and all areas outside limits of grading which are disturbed in the course of the Work.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Division 03 Concrete
 - 3. Section 31 2133 Trenching, Backfilling, and Compacting for Utilities.
 - 4. Division 32 Exterior Improvements
 - 5. Division 33 Utilities

1.02 **OUALITY ASSURANCE**

- A. Referenced Standards:
 - 1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. AASHTO T90 Determining the Plastic Limit and Plasticity of Index Soils.
 - b. AASHTO T180 Standard Specification for Moisture-Density Relations of

Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop.

- 2. American Society for Testing and Materials (ASTM):
 - a. ASTM C33/C33M Standard Specification for Concrete Aggregates.
 - b. ASTM D75/D75M Standard Practice for Sampling Aggregates.
 - c. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - d. ASTM D1556/D1556M Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - e. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - f. ASTM D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - g. ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
 - h. ASTM D2419 Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregates
 - i. ASTM D2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - j. ASTM D2488 Standard Practice for Description and Identification of Soils
 - k. ASTM D3786/D3786M Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.
 - 1. ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
 - m. ASTM D4254 Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
 - n. ASTM D4632/D4632M Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 - o. ASTM D4643 Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating
 - p. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- 3. California Code of Regulations (CCR): Title 8 Construction Safety Orders.
- 4. California Department of Industrial Relations Division of Occupational Safety and Health (Cal-OSHA).
- 5. State of California; Business, Transportation and Housing Agency; Department of Transportation (Caltrans):

- a. Caltrans Standard Specifications Division III: Earthwork and Landscape
- B. Testing and Inspection Service:
 - 1. County may procure Testing/Inspection Provider services, for quality assurance testing during earthwork operations.

1.03 **DEFINITIONS**

- A. Backfill: Refill of an excavation, previously removed.
- B. Earth Excavation: Earth excavation includes excavation of pavement and other obstructions visible on the ground surface, underground structures, utilities and other items to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
- C. Fill: Placement of material in an excavation or on prepared subgrade to final grade.
- D. Finish Grade: The establishment of grades to a plus or minus 0.05' of final grades as indicated on Project Drawings.
- E. Finished Grade Elevations: Indicated on Project Drawings.
- F. Grading Intent: Spot elevations (grades) and contours are indicated based on the best available data. Drawings are referenced to provide additional site grading data. The intent is to maintain constant slopes between spot elevations. If a spot elevation is determined to be in error, or the difference in elevation between points change, contact the County immediately for field adjustments of spot elevations.
- G. Relative Compaction: Ratio, expressed as a percentage of the in-place dry-density as compacted to a laboratory maximum dry-density of representative sample of the same material determined by ASTM D1557.
- H. Rough Grade: The establishment of grades to one-tenth (1/10) of a foot plus or minus tolerance of grades required to accomplish the Work described on Project Drawings or applicable Detailed Provisions Sections.
- I. Standard Specifications: Refers to the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation (Caltrans), latest edition. In case of conflict between the Standard Specifications and these Specifications, the strictest specifications shall govern. Provisions for measurement and payment specified within the Standard Specifications shall be disregarded and the provisions of these Contract Documents shall govern.
- J. Structural Fill: Any fill placed under structures and any backfill placed adjacent to buried walls.
- K. Sub-base: Compacted layer of approved material used between the subgrade and the pavement.
- L. Subgrade: Previously undisturbed material prepared and compacted to required density and elevation to support a structure, pavement system, or to receive additional specified materials.
- M. Subgrade Elevations: 4-inches below finish grade elevations indicated on Project

Drawings, unless otherwise indicated.

- N. Unauthorized Excavation: Includes removal and disposal of material beyond subgrade elevations, and dimensions indicated without prior approval of the County.
- O. Unsuitable Material: Shall consist of materials determined by the County and/or Testing/Inspection Provider to be:
 - 1. Soft, loose, unstable or yielding, or
 - 2. Previously placed uncontrolled fill, or
 - 3. Designated material to be overexcavated per geotechnical report requirements, or
 - 4. Unable to be compacted to specified density using ordinary methods at optimum moisture content, or
 - 5. Contains visible or excessive deleterious material as determined by the County or Testing/Inspection Provider, or
 - 6. Too wet to be properly compacted and circumstances prevent processing suitable in-place drying prior to being used as backfill, or
 - 7. Otherwise unsuitable for planned use.

Such material shall be removed to the limits directed by the County and the resulting excavation backfilled with engineered fill material.

1.04 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - 2. Certified supplier gradation results for import materials such as aggregate base, rock, and rip-rap.
 - 3. Deliver bulk samples of import fill materials to County in quantities sufficient for testing. Deliver at least fifteen (15) Days prior to use.
 - 4. Trench shoring or shield (trench box) certification if employed:
 - a. Specific to Project Conditions.
 - b. Certified by Professional Structural Engineer, registered in California.
 - c. County is not responsible to, and will not, review and approve.
 - d. Cal-OSHA Contractor compliance information for trench safety: Submit an exemption letter or trenching permit from Cal OSHA and comply with Labor Code Section 6705, Excavation Plans for Worker Protection.

e. Submit a Confined Space Emergency Plan prior to any personnel entering trenches or excavations greater than four (4) feet in depth.

5. Excavation Plan:

- a. In accordance with Section 5-5.2 Shoring Plan of the General Provisions, Contractor shall submit to the County a detailed plan showing the design of shoring, bracing, sloping of the sides of trenches, or other provisions to be made for the protection of personnel during earthwork operations.
- b. County acceptance of the Excavation Plan does not release the Contractor of liability in the event of an accident or injury, nor does it place any liability on the County or any County employees.
- 6. Testing laboratory reports verifying that imported material conforms to the specified gradations or characteristics.

C. Quality Assurance Submittals:

- 1. Submit sieve analysis reports on all imported granular materials.
- 2. Submit field quality control test results.

1.05 SAFETY PRECAUTIONS

- A. Observe safety precautions in all phases of the Work. Included shall be trench shoring, bracing, lighting, and barricades as dictated by reason and by Safety Orders of the Division of Industrial Safety, State of California (Cal-OSHA).
- B. Acquire an exemption letter or trenching permit from Cal-OSHA and comply with Labor Code Section 6705, Excavation Plans for Worker Protection. Submit a copy of the exemption letter or trenching permit with excavation drawings to the County prior to excavation work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stockpile satisfactory excavated materials in a location approved by the County, until required for backfill or fill. Place, grade, shape, and stabilize stockpiles for proper drainage and erosion control.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing. Segregate stockpiles for asphalt, concrete, rock and soil generated during construction. To the extent possible, separate saturated soil from unsaturated soil.
 - 2. Each stockpile will be placed on, at minimum, 6-mil plastic sheeting and, at a minimum, the sides and top will be covered by one layer of 6-mil plastic sheeting at all times except when the material is being handled. Contractor will cover each stockpile segment at the end of the workday.
 - 3. Provide berms around the stockpile area to contain precipitation runoff and to prevent run-on.

1.07 PROJECT CONDITIONS

- A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent slides or caving.
 - 1. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property owners.
- B. Protect and maintain benchmarks, monuments or other established points and reference points and if disturbed or destroyed, replace items to full satisfaction of the County and no additional cost to the County.
- C. Verify location of existing underground utilities.
- D. When performing underground work, the Contractor shall call Underground Service Alert of Southern California (USA/SC) at 811, the one-call underground facility locating service two (2) Working Days prior to making an excavation. Contractor shall be responsible for such notification of Subcontractor's Work or shall require Subcontractor to assume this responsibility.
- E. The Contractor's attention is directed to the possible existence of pipe, conduit and other underground improvements which may or may not be shown on the Project Drawings. Preserve and protect any such improvements whether shown on the Project Drawings or not. Expose such improvements in advance of the underground construction to allow for changes in alignment as necessary. Where it is necessary to remove and replace or to relocate such improvements in order to prosecute Work, they shall be removed, maintained, and permanently replaced by the Contractor at their expense. Relocation of said improvements shall not be performed without written permission of the County or the owner of the utility. Unless otherwise noted, existing underground utilities shall be protected in place.
- F. Excavation made with power driven equipment is not permitted within five (5) feet of any know utility or subsurface construction. For Work immediately adjacent to or for excavation exposing a utility or other buried obstruction, use hand or light equipment excavation. Start excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing Work as affected by the contract excavation until approval for backfill is granted by the County. The Contractor shall report damage of utility lines or subsurface construction immediately to the County and make repairs at no additional cost to the County.
- G. Protect excavations by shoring, bracing, sheeting, underpinning, or other methods as required, to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at Work adjacent to public streets and walks.
- H. Protect existing streams, ditches and storm drain inlets using proper erosion control methodology.
- I. Do not use explosives unless approved otherwise in writing by the County.
- J. Provide dust alleviation and control measures continuously during the course of the Work to the satisfaction of the County.

1.08 EXISTING CONDITIONS

A. A topographic survey of the property has been included in the Project Drawings, it is for reference only. Upon beginning the earthwork, the Contractor represents that they have inspected the project areas and are satisfied as to actual grades and levels and the true conditions under which the Work is to be performed.

1.09 SOILS TESTING

- A. A Testing/Inspection Provider may be procured by the County for testing and inspection as required by the Contract Documents.
- B. All materials, work, methods, and equipment shall be subject to inspection at the Project Location and import sources. Material or workmanship not complying with the Contract Documents will not be accepted. The Contractor shall give the Testing/Inspection Provider reasonable notice when ready for inspection and shall supply samples for inspection without extra charge.

C. Cost of Testing:

- 1. With the exceptions of retest due to material or Contractor workmanship, the County will assume the cost for all tests and inspections specified to be performed by the Testing/Inspection Provider. Additional costs of retesting incurred by the County shall be deducted from the Contract Final Payment.
- D. Tests performed by the Testing/Inspection Provider may include, but are not limited to:
 - 1. Determine the density of soil in place by the sand cone method, ASTM D1556 or by nuclear methods, ASTM D6938.
 - 2. Determine laboratory moisture-density relations of soils by ASTM D1557.
 - 3. Determine the relative density of cohesion-less soils by ASTM D4253 and D4254.
 - 4. Sample backfill materials in accordance with ASTM D75.
 - 5. Conduct in-place moisture-density tests for backfilling to assure that all work complies with this Detailed Provisions Section.
- E. Make excavation for compaction tests at the locations and to the depths designated by the Testing/Inspection Provider. Backfill and re-compact the excavation at completion of testing. When test indicate that the compaction is less than the specified relative compaction, rework and retest those areas until the specified relative compaction has been obtained.

1.10 MAINTENANCE

- A. Protect newly graded areas from traffic, erosion, and settlement. Repair and reestablish damaged or eroded slopes, elevations, or grades and restore surface construction prior to acceptance.
- B. Repair settlement at excavated areas for a period of one (1) year following Final Acceptance at no additional cost to the County. Remove surface (pavement, or other

finish), add backfill material, compact, and replace surface treatment; restore appearance, quality, and conditions of surface and finish to match adjacent work, and eliminate evidence of restoration.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General:

- 1. All fill material shall be approved by the County and conform to requirements of the Caltrans Standard Specifications Section 19 "Earthwork".
- 2. All earthwork is subject to inspection and verification by the County and/or Testing/Inspection Provider.
- 3. Representative samples of materials to be used for engineered fill shall be tested by the County's Testing/Inspection Provider to determine soil classification, potential contaminants (for imported soil materials), maximum dry density, optimum moisture content and particle size.
- 4. Materials shall be free of trash, lumber, debris, leaves, grass, roots, stumps, and other vegetable matter. Materials shall not be contaminated with hydrocarbons or other chemical contaminants.
- 5. Unless noted otherwise, materials derived from processing demolished or removed asphalt are not acceptable.
- 6. Fill required shall consist of suitable excavated material if available, and/or such approved imported borrow material as may be required for the Work to conform to the requirements of this Detailed Provisions Section. In either case, fill material shall be provided at the Contractor's expense, and shall be included in the Contractor's proposed costs. Excavated material may need to be processed to meet specification requirements and shall be provided at the Contractor's expense.

B. General Site Engineered Fill:

- 1. Sand and silty-sand soils derived from the jobsite are generally suitable for use in general engineered fill material under the following requirements:
 - a. Soil materials are at workable moisture content and free of organic materials, rubble, or debris.
 - b. Maximum particle size as follows:
 - 1) Fill Placed within Upper two (2) feet of Finished Grade material shall be free of lumps and/or cobbles larger than 3-inches in any dimension.
 - 2) Fill Placed below Upper two (2) feet of Finished Grade material shall be free of rock larger than 6-inches in any dimension.
 - c. On-site excavated clay and fine-grained soils are not considered suitable for use in engineered fill. Soil materials with an expansion index (EI) of less than 30 shall be used.

d. Moisture content at time of placement: between the optimum moisture content and three percent (3%) above optimum moisture content as specified in accordance with ASTM D1557.

C. Structural Fill:

- 1. Sand and silty-sand soils derived from the jobsite are generally suitable for use in structural fill material under the following requirements:
 - a. Soil materials are at workable moisture content and free of organic materials, rubble, or debris.
 - b. Soil materials are well-graded and free of lumps and/or cobbles larger than 3-inches in any dimension, with no more than twenty-five percent (25%) of the materials being larger than 2-inches in any dimension and no more than forty percent (40%) passing #200 sieve.
 - c. On-site clay soils are not considered suitable for use in engineered fill. Soil materials with an expansion index (EI) of less than 30 shall be used.
 - d. Moisture content at time of placement: between the optimum moisture content and three percent (3%) above optimum moisture content as specified in accordance with ASTM D1557.

2.02 WATER

A. Water used in compaction shall have a maximum chloride concentration of 500 mg/l, a maximum sulfate concentration of 500 mg/l, and shall have a pH of 7.0 to 9.0. Water shall be free of acid, alkali, or organic materials.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing grades and conditions are as indicated on the Project Drawings. Designate and identify datum elevation and project engineering reference points. Set required lines, levels, and elevations.
- B. Verify earthwork volume of soil to be filled.
- C. Notify County if indicated conditions on Project Drawings conflict with actual conditions. Non-notification of discrepancies between actual field conditions and the conditions shown on the Project Drawings, in writing, shall indicate Contractor's acceptance of such field conditions. Adjustments/modifications to the construction to accommodate the inconsistencies (without notification) shall be at no additional cost to the County.

3.02 PROTECTION

A. Protection of the jobsite during the performance of earthwork shall be the responsibility of the Contractor.

- B. Protect the jobsite from flooding, ponding, or inundation during site clearing, excavation, placement of fill and grading. Make temporary provisions during the rainy season to adequately direct surface drainage away from and off the jobsite. Dispose of water in a manner to prevent damage to adjacent property and in accordance with regulatory agency requirements.
- C. Use plastic sheeting to prevent unprotected slopes from becoming saturated. Install checkdams, desilting basins, riprap, sandbags, or other devices or methods necessary to control erosion.
- D. Following periods of rainfall, the County will visually assess rain related damage. At the request of the County, the Contractor shall make excavations in order to evaluate the extent of rain related damage.
- E. Rain related damage will be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions identified by the County.
- F. Where soil has been adversely affected by rain-related damage, it shall be overexcavated and replaced with compacted fill or other remedial grading as directed by the County. Repairs shall be performed at Contractor's expense.
- G. Call Underground Service Alert of Southern California (USA/SC) at 811, the one-call underground facility locating service two (2) Working Days prior to making an excavation. Contractor shall be responsible for such notification of Subcontractor's Work or shall require Subcontractor to assume this responsibility.
- H. Protect existing surface and subsurface features on-site and adjacent to jobsite as follows:
 - 1. Provide barricades, coverings, or other type of protection necessary to prevent damage to existing items indicated to remain in place.
 - 2. Protect and maintain benchmarks, monuments or other established reference points and property corners.
 - a. If disturbed or destroyed, Contractor shall replace at their own expense to full satisfaction of the County and controlling agency.
 - 3. Verify location of utilities:
 - a. Omissions or inclusion of utility items does not constitute nonexistence of definite location.
 - b. Secure and examine local utility records.
 - c. Take necessary precautions to protect existing utilities from damage due to any construction activity.
 - d. Remove abandoned utility service lines from areas of excavation. Cap, plug, or seal abandoned lines and identify termination points at grade level with markers.
 - e. Perform excavation work near utilities by hand and provide necessary shoring, sheeting, and supports as the Work progresses.

- f. Repair damages to utility items at Contractor's expense.
- g. In case of damage, notify County at once so required protective measures may be taken.
- 4. Maintain free of damage, existing concrete, structures, and pavement to the greatest extent possible.
 - a. Any item known or unknown or not properly located that is damaged shall be repaired to original condition.
 - b. All repairs to be made at Contractor's expense.
- 5. Provide full access to areas required for landfill operations and other points as designated by the County to prevent serious interruption of travel.
- 6. Maintain stockpiles and excavations in such a manner to prevent inconvenience or damage to structures on-site.
- 7. Avoid surcharge or excavation procedures which can result in heaving, caving, or slides.

3.03 PREPARATION

- A. The Contractor shall provide all construction staking and layout of all Work to be performed under the direction of a Professional Land Surveyor registered in the State of California.
 - 1. Stake all units, structures, piping, roads, parking areas and walks and establish their elevations.
 - 2. Perform other layout work required.
 - 3. Replace benchmarks, monuments, and/or property corner markers to original location if disturbed or destroyed.
 - 4. See Detailed Provisions Section 01 7123 Construction Surveying.
- B. Unless otherwise stated, equipment used in the excavation, transport, processing, installation, and compaction of all materials used in construction of the earthwork shall be standards of practice grading machinery of known specifications suitable for performing Work in a timely, proper, and efficient manner.

3.04 EXCAVATION

- A. Earth excavation shall include the satisfactory removal and disposal of all materials encountered, regardless of the nature of the materials, the condition of the materials at the time they are excavated, or the manner in which they were excavated.
- B. All excavated materials incorporated as part of compacted engineered fill must be inspected and approved to be suitable by the County and/or Testing/Inspection Provider.
- C. Excavation shall be performed to the lines and grades indicated. During excavation, material suitable for fill materials shall be stockpiled in an orderly manner within the

designated project limits at a minimum distance from the banks of excavation area equal to one-half the depth of the excavation, but in no instance closer than five (5) feet. At Contractor's expense, excavated material not required or not suitable for fill materials shall be disposed of in a lawful manner. If excess material contains no contaminants, material may be stockpiled at a location as approved and directed by the County for beneficial reuse as landfill daily cover material. If approved, material will be accepted for no-charge, but Contractor shall be responsible for hauling and stockpiling material within the landfill disposal area.

- D. Do not operate excavation equipment within five (5) feet of structures or utilities. Excavate with hand tools in these areas or light equipment as approved by the County.
- E. Excavate unsuitable materials extending below required elevations to depth as directed by the County and/or Testing/Inspection Provider. Over-excavation shall include the removal of all unsuitable materials that exists directly beneath a structure or within a zone outside and below the structure defined by a line sloping at one horizontal to one vertical (1H:1V) from the outside edge of the footing. Refill the over-excavated areas with compacted engineered fill material.
- F. Excavate to the depths and widths needed to accomplish the construction. Allow for forms, working space, structural backfill and grading. Unless unsuitable materials are encountered, do not carry excavation deeper than the elevations shown.
- G. Take every precaution to prevent water from entering, softening, and undercutting excavated areas, including but not limited to: pits, footings, and trenches.
- H. All excavations shall be barricaded in conformance with Cal-OSHA standards.
- I. Sheeting and shoring for the Work and for the safety of personnel shall be in compliance with Cal-OSHA regulations. Shoring is required for all trench portions greater than 4-feet in depth. Trenches greater than 20-feet in depth require protection systems designed by Professional Structural Engineer licensed in California.
- J. Notify the County immediately upon discovery of unsuitable materials or unforeseen site conditions. Excavation shall include the complete removal of the unsuitable materials and its legal disposal thereof.

3.05 PLACING AND COMPACTING FILL MATERIAL

A. Subgrade Preparation:

- 1. Excavate and shape subgrade to line, grade, and cross-section. Fill holes, open joints, rock fractures, and depressions created by the excavation to the required line, grade, and cross-sections with compacted engineered fill material.
- 2. The Contractor shall at all times maintain the subgrade surface in such condition as to readily drain effectively. Storage or stockpiling of heavy loads on the prepared subgrade will not be permitted. Contractor shall be responsible to repair any damage to the prepared subgrade.
- 3. Prior to placement of fill material, the Contractor shall:
 - a. Remove and replace unsuitable material to the satisfaction of the County and/or

Testing/Inspection Provider.

- b. Remove form materials and trash from the subgrade area.
- c. Obtain approval of the subgrade surface from the County and/or Testing/Inspection Provider.
- d. Scarify to a minimum depth of 8-inches, moisture condition to a moisture content between the optimum moisture content and three percent (3%) above the optimum moisture content, and compact to at least ninety-five percent (95%) of the maximum dry density per ASTM D1557.

B. Placement of Fill Material:

- 1. Any fill where site preparation, type of material, or compaction is not approved or observed by the County and/or the Testing/Inspection Provider shall be removed and/or recompacted until the requirements are satisfied.
- 2. Suitable and sufficient hauling, processing, grading and compaction equipment shall be continuously utilized to handle the amount of fill material being generated and placed. Excavation or hauling equipment shall be shut down temporarily in order to allow time for proper preparation, placement, and/or compaction of fill material. Sufficient moisture conditioning equipment shall be provided by the Contractor with consideration to the type of fill material, rate of placement, and weather conditions.
- 3. Fill materials shall be placed in uniform layers which, when loose, shall not exceed 6-inches for hand operated mechanical compactors and not to exceed 8-inches per layer for heavy equipment compactors. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to insure uniformity of material and moisture.
- 4. Each layer shall be moisture conditioned to a moisture content between the optimum moisture content and three percent (3%) above the optimum moisture content. If any material is placed that does not have correct moisture content, it shall be aerated if too wet or wetted if too dry. Fill materials shall be aerated by plowing, discing, blading, or other satisfactory methods until moisture content is acceptable. Aerating of material is considered incidental to the Work and no additional compensation will be allowed. "Puddling" or "soaking" is not permitted. Soft, spongy or springy material causing areas that "pump" when heavy loads pass over them shall be removed and replaced with suitable material. This condition shall be considered as sufficient evidence without further testing that the moisture content is not correct and the material shall be removed and no additional compensation will be allowed.
- 5. In areas of excess lift thickness, re-grading and compacting of the surface to the maximum lift thickness must be completed by the Contractor prior to construction of additional lifts.
- 6. Backfilling against concrete will not be permitted until the concrete has reached the specified strength as verified via the compressive strength testing or as approved by the County.

- 7. Existing sloped surfaces to receive fill material shall be keyed and benched. Excavate horizontal keys and vertical benches into the slope area to receive the fill material. Keying and benching shall provide at least 15-foot wide benches and a minimum of 4 feet of vertical bench height within the firm subgrade. Fill material shall be keyed into the subgrade a minimum of 5 feet deep at the toe of all fill slopes.
- 8. Where Work is interrupted by rain, fill operations shall not be resumed until observations and field tests by the County and/or Testing/Inspection Provider indicate in-place fills and/or materials intended for placement are within specification requirements.

C. Compaction:

- 1. Compaction testing shall be performed by a Testing/Inspection Provider procured by the County and shall be performed simultaneously with placement of fill materials.
- 2. Structural Fill and backfill material for trenched areas shall be compacted to at least ninety-five (95%) of the maximum dry density obtained per ASTM D1557. Unless otherwise specified or indicated, all other fill shall be compacted to at least ninety percent (90%) of the maximum dry density obtained per ASTM D1557.
- 3. Do not operate earthmoving equipment within 5-feet of concrete structures. Place and compact backfill adjacent to concrete walls with hand-operated tampers or other equipment that will not damage the structure.
- 4. The top of each previously compacted layer shall be scarified to provide a good bond between lift layers and minimize separation between lift layers.

3.06 GRADING

- A. Grade surfaces to assure areas drain away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade surfaces free from irregular surface changes and as follows:
 - 1. Rough Grading Plus or minus one tenth of a foot (0.10') subgrade tolerance. Finish required will be that ordinarily obtained from either blade-grader or scraper operations.
 - 2. Subgrade Provide subgrade free of exposed boulders or stones exceeding 4-inches in greatest dimension.
 - 3. Paved Areas Shape surface of subgrade areas to line, grade, and cross-section indicated. Provide compacted subgrade suitable to receive paving base materials. Subgrade tolerance plus zero inches (+0"), minus one-half inch (-1/2").
 - 4. Aggregate Base Grade subgrade surface smooth and even, free of voids to the required subgrade elevation. Provide compacted subgrade suitable to receive base materials. Tolerance one-half inch (1/2") in ten feet (10").
 - 5. Drainage Swales: Grade to profiles and cross-sections indicated.
- B. Finish Grade:

- 1. Remove exposed roots and rocks exceeding 3-inches in greatest dimension. Round tops of banks to circular curves to not less than a 6-foot radius. Neatly and smoothly trim rounded surfaces.
- 2. Finish grade tolerance plus or minus 0.05 feet to finished grades shown on the Project Drawings.
- 3. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored. Any disturbed slopes shall be track-walked and flatter grounds shall be finish graded with a blade-grader or approved equal, and graded to drain by the Contractor as directed by the County.

3.07 DUST ALLEVIATION AND CONTROL

A. The Contractor shall be responsible for and shall provide pollution and dust abatement and control measures continuously during the course of the Work.

3.08 FIELD QUALITY CONTROL

- A. The County may procure the services of a Testing/Inspection Provider to conduct inplace moisture-density tests for fill materials to assure that all Work complies with this Detailed Provisions Section.
- B. Moisture density relations, to be established by the soils testing agency and is required for all materials to receive compaction. This test shall be conducted when the material changes, based on visual observation of the soils, and/or based on in-place density test results of the compacted fill.
- C. Extent of compaction testing will be as necessary to assure compliance with Specifications.
- D. Contractor shall provide a minimum forty-eight (48) hour advance notice to County when ready for compaction or subgrade testing and inspection.
- E. Should any compaction density test or subgrade inspection fail to meet specification requirements, perform corrective work as necessary at no additional cost to the County.
- F. Contractor shall be responsible for all costs associated with corrective work and retesting resulting from failing compaction density tests.

G. Testing:

1. Testing/Inspection Provider shall perform the following minimum laboratory testing and field testing of fill materials at the frequency specified in the following table:

TEST	TEST DESIGNATION	TEST FREQUENCY	Project Minimum Value			
Field Testing						
In-place moisture/ density (nuclear)	ASTM D6938	Every 100 CY of soil subgrade material (engineered fill and/or existing inplace soil)	90% or 95% per project requirement of Maximum Dry Density and from 0% to 3% above OMC			
In-place moisture/ density (nuclear)	ASTM D6938	Every 100 CY of base material	90% or 95% per project requirement of Maximum Dry Density and from 0% to 3% above OMC			
In-place moisture/ density (sand cone)	ASTM D1556 and ASTM D4643	Every 500 CY; a minimum of one per day	90% or 95% per project requirement of Maximum Dry Density and from 0% to 3% above OMC			
Visual Soil Classification	ASTM D2488	Continuous				
Laboratory Testing						
Moisture Density Relationship	ASTM D1557	One per material type				

- 2. If compaction fails to meet the requirements of this Specification, the Contractor shall remove and replace fill material at proper density or shall bring the density up to specified level by other means acceptable to the County. Subsequent testing required to confirm that the reconstructed material has been brought up to specified density shall be paid for by the Contractor.
- 3. Contractor shall assure County and Testing/Inspection Provider staff have immediate access for testing of all soils related work.
- 4. Ensure excavations are safe for testing personnel.

END OF SECTION 31 2300



SPECIFICATIONS – DETAILED PROVISIONS SECTION 32 3113: CHAIN LINK FENCES AND GATES CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
1.02	QUALITY ASSURANCE	
1.03	SUBMITTALS	
1.04	QUALITY ASSURANCE	
1.05	DELIVERY, STORAGE AND HANDLING	
1.06	PROJECT CONDITIONS	
1.07	MANUFACTURER'S WARRANTY	
PART 2	PRODUCTS	4
2.01	FENCING FABRIC AND POSTS	4
2.02	SWING GATES	
2.03	ACCESSORIES	
2.04	FINISHES	
PART 3	S EXECUTION	
3.01	EXAMINATION	
3.02	PREPARATION	
3.03	FENCE POST LAYOUT	
3.04	IN-GROUND CONCRETE INSTALLATION	
3.05	CHAIN LINK FENCE INSTALLATION	8
3.06	GATE INSTALLMENT AND ADJUSTMENT	9
3.07	PROTECTION	9





SECTION 32 3113 CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

- 1. The work covered by this section shall consist of furnishing all necessary labor, materials, tools, equipment, transportation, services, coordination, supervision, and all other items necessary for the construction of facility perimeter chain link fencing and gates.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Division 03 Concrete.
 - 3. Section 32 3119 Decorative Metal Fences and Gates

1.02 QUALITY ASSURANCE

A. Reference Standards:

- 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A36 Standard Specification for Carbon Structural Steel.
 - b. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - c. ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
 - d. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - e. ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
 - f. ASTM A500 Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - g. ASTM A513 Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
 - h. ASTM A641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - i. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- j. ASTM A787 Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing.
- k. ASTM A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy (HSLA) and HSLA with Improved Formability, Solution Hardened and Bake Hardenable.
- 1. ASTM B6 Standard Specification for Zinc.
- m. ASTM B117 Standard Test Method of Salt Spray (Fog) Testing.
- n. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.
- o. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout.
- p. ASTM D1499 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics.
- q. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
- r. ASTM D2794 Standard Test Method for Resistance of Organic Coatings to the Effect of Rapid Deformation (Impact).
- s. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape Test.
- t. ASTM F626 Standard Specification for fence Fittings.
- u. ASTM F900 Standard Specification for Industrial and Commercial Steel Swing Gates.
- v. ASTM F934 Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
- w. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework.
- x. ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates.
- y. ASTM F2919 Standard Specification for Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer-Coated) with Variable Mesh Patterns or Meshes Greater than 6 Square Inch (3871 mm²) in Panels.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. Product data for fence and gate posts, rails, fittings, gates, and hardware, including:
 - a. Indicate materials, dimensions, sizes, weights, and finishes of components.

2. Shop Drawings:

- a. Show locations of fence, each gate, posts, rails, and details of swing gates, hardware, accessories and other operations as specified.
- b. Indicate plans, elevations, sections, swing gates and other required installation and operational clearances, and details of post anchorage, attachment, and bracing.
- c. Installation procedures and instructions describing details for a typical fence and gates.

3. Qualification Data:

a. Include list of Qualified Installer's completed projects with project names and addresses, names and addresses of architects and owners, and other information as specified.

C. Warranty Documentation

1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Minimum 2 years' experience installing fences and gates similar in material, design, and extent to those indicated for the Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Fences and Gates:
 - 1. Obtain each component for fences and gates from one source with resources to provide fences and gates of consistent quality in appearance and physical properties.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store products in Manufacturer's tagged and unopened packaging until ready for installation.
- B. Handle products in accordance with Manufacturer's instructions.

1.06 PROJECT CONDITIONS

- A. Existing Utilities:
 - 1. Do not interrupt utilities serving facilities occupied by the County unless permitted under the following conditions:
 - a. Notify local utility marking services before beginning work.
 - b. Unless otherwise indicated in the General Provisions, notify the County no less than two days in advance of the proposed utility interruptions.
 - c. Do not proceed with utility interruptions without the County's written permission.

CHAIN LINK FENCES AND GATES

B. Field Measurements:

1. Verify layout information for fences and gates shown on drawings in relation to property survey and exiting structures. Verify dimensions by field measurements.

1.07 MANUFACTURER'S WARRANTY

A. In addition to the two (2) year guarantee applicable to all Work, the Contractor shall provide and issue a five (5) year warranty in the County's name. Warranty period shall commence on the date of Final Completion.

PART 2 PRODUCTS

2.01 FENCING FABRIC AND POSTS

- A. Chain link fencing posts, fabric, braces, framing, rails, tension wire and accessories shall conform to Section 206-6, "Chain Link Fence" of the Standard Specifications.
- B. Submit requests for substitution in accordance with Detailed Provisions Section 01 6000 Product Requirements.
- C. Posts, braces, and rails shall be new galvanized pipe manufactured in accordance with ASTM A53 and shall be of the following sizes and weights:

Post Location	Nominal Pipe Size	Approximate Outside Diameter	Pipe Weight
End, Corner and Walk Gate Posts	2-1/2	2-7/8"	Standard
Line Posts	2	2-3/8"	Standard
Braces, rails and gate frames	1-1/4	1-5/8"	Standard
Concrete Strip Footing Sleeves	Inside Diameter equal to +1/8" Outside Diameter of Fence Post (3" I.D. for End Posts) (2" I.D. for Line Posts)		Minimum 10 gauge

- D. Braces shall be fitted with clamps on each end, one clamp to fit gate posts and the other clamp to fit standard line posts.
- E. Changes in alignment of more than 30 degrees shall be considered as corners, and corner posts and braces shall be installed.
- F. Chain link fabric shall be No. 11 AWG gauge galvanized steel wire woven in a 2" mesh, manufactured in accordance with the requirements of ASTM A392. The fabric shall have a zinc coating, Class 1, by hot-dip galvanizing after weaving.
- G. Concrete strip footing pipe sleeves shall be ASTM A36 steel pipe, 24" long and +1/8" diameter of fence post specified for installation. Pipe shall have a welded cap on one end and be lined with a two coat epoxy, Tnemac Series 66 or approved equal. Pipe sleeves that will not be receiving fence posts shall be capped at both ends.

CHAIN LINK FENCES AND GATES

- H. All tension wire shall be No. 7 AWG gauge galvanized, hard drawn, steel spring wire.
- I. All tie wire shall be No. 9 AWG gauge galvanized steel wire.
- J. Truss rods shall be made from 3/8" diameter galvanized steel rod, with drop forged turnbuckles, and galvanized in accordance with ASTM A153.
- K. All hardware, hinges, clamps, fasteners, bolts, nuts, turnbuckles, fittings, post caps, stretcher bars, and other ferrous material not previously covered in these specifications, shall be manufactured of steel and shall be galvanized in accordance with ASTM A153.
- L. Walk gates shall be five (5) feet wide. Gate frames shall be cross trussed with 3/8" steel truss rods equipped with drop forged turnbuckles. The corners of gate frames shall be fastened together and reinforced with a malleable iron fitting designed for the purpose or welded securely. Surplus welding material shall be removed prior to galvanizing. Chain link fabric shall be the same type as specified for the fence and shall be fastened to the frame by the use of stretcher bars, clamps, and tie wire as specified for the fence, and suitable tension connectors spaced at approximately 1' intervals. Gates shall be hung by hinges not less than three (3) inches in width so designed as to securely clamp to the gate post and permit the gate to swing back against the fence. Hinges shall be of high malleable iron of the ball and socket type which will permit the gate to swing back against the fence. The lower hinges of the gate shall support the entire vertical load of the gates as well as provide for the resultant horizontal reaction. Each gate shall be outfitted with approved latches and provisions for padlocking. Latches, hasps, and bolts shall be accessible from either side of the gate.

2.02 SWING GATES

- A. Configuration: Single swing or double swing gates.
- B. Gate Frames:
 - 1. Two (2) horizontal ASTM F900 galvanized steel tubes, 16 gauge, 1-5/8 in. outside diameter and two (2) vertical tubes of 2 in. outside diameter welded at intersections to create a rigid frame.
- C. Gate Posts:
 - 1. Material:
 - a. Cold-rolled 1008 grade steel to meet requirements of ASTM A500 and A787.
 - 2. Installation:
 - a. In-ground, post length as required by local frost line requirements.
 - 3. Post Size:
 - a. To be determined by Manufacturer.
- D. Gate Hardware:
 - 1. Material:
 - a. Hot-dipped galvanized steel conforming to ASTM F900

b. Non-moving components shall be powder-coated.

2. Hinge:

a. Structurally designed by Manufacturer to support gates without deformation during opening and closing.

3. Latch:

- a. Clamp-on, self-latching, gravity system.
- 4. Shared Access Keyed Lock-Box:
 - a. LOCINOX or approved equal with double levers, both sides of gates. Swing gate latching mechanism must be able to accommodate shared access for a minimum of four (4) individual locks.

2.03 ACCESSORIES

A. Concrete Footing:

- 1. Unless otherwise specified in Detailed Provisions Division 03 Concrete, provide the following:
 - a. Normal-weight concrete with not less than 3,000 psi 28-day compressive strength.
 - b. 3 in. slump and containing coarse aggregate of minimum diameter of 0.2 in. to maximum of ³/₄ in.
 - c. 5% to 7% air entrainment.

B. Non-shrink, Nonmetallic Grout:

- 1. Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107.
- 2. Provide grout, recommended in writing by the Manufacturer, for exterior applications.

C. Erosion-Resistant Anchoring Cement:

- 1. Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water on-site to create pourable anchoring, patching, and grouting compound.
- 2. Provide formulation resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and recommended in writing by the Manufacturer for exterior applications.
- D. Mounting kit including pedestals.

2.04 FINISHES

- A. Zinc coating:
 - 1. Wire mesh shall be coated with 0.5 oz/sq. ft. zinc in conformity with ASTM A641 Class 1.
 - 2. Fence posts and swing gate frames and posts shall be zinc coated (galvalume process) with a minimum of 0.9 oz/sq. ft. as per ASTM A653.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, or other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by the County.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 ft. or line of sight between stakes.
- B. Indicate locations of utilities, underground structures, benchmarks, and property monuments marked by a registered surveyor and utility companies.

3.03 FENCE POST LAYOUT

- A. Layout fencing on established boundaries within project limits.
- B. Terminal Posts Layout:
 - 1. Locate terminal end, corner, and gate posts at changes in horizontal or vertical alignment of:
 - a. 15 degrees or more.
- C. Post shall be spaced not more than ten (10) feet center to center of posts. Posts shall be set in a vertical position and carefully aligned. End, corner, and gate posts shall be braced to the nearest line post.

3.04 IN-GROUND CONCRETE INSTALLATION

- A. Drill or hand-excavate holes for posts to spacing indicated, in firm, undisturbed or compacted soil.
- B. Dig holes with a diameter four (4) times the diameter of the post and 6 in. deeper than the bottom of the post.
 - 1. Minimum 8 inches in diameter and 42 inches in depth.

CHAIN LINK FENCES AND GATES

- C. Concrete forms are not necessary or recommended. Crown concrete at top to shed water.
- D. Measure, batch, and mix on-site-mixed concrete according to ASTM C94. Pour concrete and let cure in accordance with ACI 301 and Detailed Provisions Section 03 3131 Concrete Mixing, Placing, Jointing and Curing.
- E. Concealed Concrete Footings:
 - 1. Stop footings 2 in. below grade or as indicated on the Project Drawings to allow covering with surface material.

F. Post Setting:

- 1. Set posts in concrete footing.
- 2. Protect portion of posts above ground from concrete splatter.
- 3. Place concrete around posts and consolidate.
- 4. Use of mechanical devices to set posts is not permitted.
- 5. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.

3.05 CHAIN LINK FENCE INSTALLATION

- A. Chain link fencing and gate shall be constructed in accordance with Section 304-3, "Chain link Fence" of the Standard Specifications.
 - 1. Install fence and gate in accordance with the fence manufacture's written installation instructions except as modified herein.
- B. Install chain link fence and gate on a prepared subgrade surface to line and grade as indicated in the Project Drawings.
- C. Install top and bottom rails before installing chain link fabric and pull wires taut. Top and bottom rails shall be within the respective fabric line.
- D. Once post installation is complete, chain link fabric shall be stretched taut and securely fastened to the posts, the top rails, and/or tension wires. The fabric shall be fastened to end, corner, and gate posts with 3/16" by 5/8" steel stretcher bars and not less than 1/8" by 1" steel stretcher bar bands spaced one (1) foot apart and fastened to line posts, rails, and tension wires with tie wires or metal bands spaced approximately 14" on line posts and 18" on rails and tension wires. Bottom tension wires and fabric shall be stretched straight from post to post.

3.06 GATE INSTALLMENT AND ADJUSTMENT

- A. Install gate posts in accordance with Manufacturer's instructions.
- B. Concrete Set Gate Posts:
 - 1. Drill holes in firm, undisturbed or compacted soil.
 - 2. Holes shall have a diameter four (4) times the outer diameter of the post and 6 in. deeper than the bottom of the frost level.
 - 3. Set post bottom 36 in. below surface when in firm, undisturbed soil.
 - 4. Excavate and set posts deeper where required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
 - 5. Place concrete around posts in a continuous pour, tamp for consolidation.
 - 6. Trowel finish around gate posts and slope to direct water away.
 - 7. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
- C. Install gates perfectly horizontal and levelled (at junction), plumb, and secure for full opening without interference.
- D. Attach hardware with nuts inside the property making the assembly tamper-proof to prevent unauthorized removal. Install ground-set items in concrete for anchorage.
- E. Furnish and install a gate keeper for each gate.
- F. Adjust hardware for smooth operation and lubricate where necessary to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.07 PROTECTION

- A. Protect installed products until completion of the Project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 32 3113





SPECIFICATIONS – DETAILED PROVISIONS SECTION 32 3119: DECORATIVE METAL FENCES AND GATES CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
1.02	QUALITY ASSURANCE	
1.03	SUBMITTALS	
1.04	QUALITY ASSURANCE	
1.05	DELIVERY, STORAGE AND HANDLING	3
1.06	PROJECT CONDITIONS	3
1.07	MANUFACTURER'S WARRANTY	4
PART 2	PRODUCTS	4
2.01	ACCEPTABLE MANUFACTURERS	
2.01	SITE FENCING AND GATES	
2.02	SWING GATES	
2.04	ACCESSORIES	
2.05	FINISHES	
	EXECUTION	
PARIS		
3.01	EXAMINATION	
3.02	PREPARATION	
3.03	FENCE POST LAYOUT	
3.04	IN-GROUND CONCRETE INSTALLATION	
3.05	ORNAMENTAL WELDED STEEL FENCE INSTALLATION	
3.06	GATE INSTALLMENT AND ADJUSTMENT	
3.07	PROTECTION	9





SECTION 32 3119 DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

- 1. The Work covered by this section shall consist of furnishing all necessary labor, materials, tools, equipment, transportation, services, coordination, supervision, and all other items necessary for the installation of metal fencing and gates.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Division 03 Concrete.
 - 3. Section 32 3113 Chain-Link Fences and Gates

1.02 QUALITY ASSURANCE

A. Reference Standards:

- 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A36 Standard Specification for Carbon Structural Steel.
 - b. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - c. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - d. ASTM A513 Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing.
 - e. ASTM A641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - f. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - g. ASTM A1008 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy (HSLA) and HSLA with Improved Formability, Solution Hardened and Bake Hardenable.
 - h. ASTM B117 Standard Test Method of Salt Spray (Fog) Testing.
 - i. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout.
 - j. ASTM D523 Standard Test Method for Specular Gloss.

- k. ASTM D714 Standard Test Method for Evaluating Degree of Blistering of Paints.
- 1. ASTM D822 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- m. ASTM D1654 Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- n. ASTM D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- o. ASTM D2794 Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- p. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape Test.
- q. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- r. ASTM F900 Standard Specification for Industrial and Commercial Steel Swing Gates.
- s. ASTM F934 Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
- t. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework.
- u. ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates.
- v. ASTM F2919 Standard Specification for Welded Wire Mesh Fence Fabric (Metallic-Coated or Polymer-Coated) with Variable Mesh Patterns or Meshes Greater than 6 Square Inch (3871 mm²) in Panels.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. Product data for fence and gate posts, rails, fittings, gates, and hardware, including:
 - a. Indicate materials, dimensions, sizes, weights, and finishes of components.
 - 2. Shop Drawings:
 - a. Show locations of fence, each gate, posts, rails, and details of swing gates, hardware, accessories, and other operations as specified.
 - b. Indicate plans, elevations, sections, swing gates and other required installation and operational clearances, and details of post anchorage, attachment, and bracing.

c. Installation procedures and instructions describing details for a typical fence and gates.

3. Qualification Data:

- a. Include list of Qualified Installer's completed projects with project names and addresses, names and addresses of architects and owners, and other information as specified.
- C. Warranty Documentation

1.04 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Minimum two (2) years' experience installing fences and gates similar in material, design, and extent to those indicated for the Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Fences and Gates:
 - 1. Obtain each component for fences and gates from one source with resources to provide fences and gates of consistent quality in appearance and physical properties.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in Manufacturer's tagged and unopened packaging until ready for installation.
- B. Handle products in accordance with Manufacturer's instructions.

1.06 PROJECT CONDITIONS

- A. Existing Utilities:
 - 1. Do not interrupt utilities serving facilities occupied by the County unless permitted under the following conditions:
 - a. Notify local utility marking services before beginning work.
 - b. Unless otherwise indicated in the General Provisions, notify the County no less than two days in advance of the proposed utility interruptions.
 - c. Do not proceed with utility interruptions without the County's written permission.
- B. Field Measurements:
 - 1. Verify layout information for fences and gates shown on drawings in relation to property survey and exiting structures. Verify dimensions by field measurements.

1.07 MANUFACTURER'S WARRANTY

A. In addition to the two (2) year guarantee applicable to all Work, the Contractor shall provide and issue a five (5) year warranty in the County's name. Warranty period shall commence on the date of Final Completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:
 - 1. V2 Steel Commercial Fencing; http://www.fortressfence.com
- B. Submit requests for substitution in accordance with Detailed Provisions Section 01 6000 Product Requirements.

2.02 SITE FENCING AND GATES

- A. Ornamental Welded Steel Fence Systems. Basic Design as indicated in project drawings, extended picket, plain iron panel, curved spear head picket, and airspace between pickets shall be 3-15/16 inch.
- B. Rails and pickets shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
- C. Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.

D. Components:

- 1. Line Posts: shall be 3 inch square, 12 gauge.
- 2. Horizontal Rails: Three (3) 1-1/2 inch square, 14 gauge per 8 foot section.
- 3. Pickets or vertical members with curved spear head shall be 1 inch square, 16 gauge with and airgap of 3-15/16 inch.
- 4. Coatings: All metal surfaces shall be powdered coated in color: Black Sand.
- E. Gates: Provide manufacturer's standard gates and hardware.

F. Fabrication:

- 1. Fence Panels: Fabricated in standard length of 90-1/2 inches. Panels shall comply with the requirements indicated for materials, thickness, design, and details of construction. Height of fence panels shall be 8 feet.
- 2. Pickets shall be welded to the rails with a patented pin hinge system which allows the panel to rake without metal fatigue or damage the finish.

- 3. Welded connections shall comply with AWS standards for recommended practice in shop welding.
- 4. Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
- 5. Panels shall be rackable to an 18 degree change in grade (30 inch vertical travel per panel).
- 6. Fence Panel shall be capable of meeting structural test load capabilities for commercial fence systems referenced in table 2 of ASTM 2409.
- 7. Fence Panels shall be capable of meeting coating performance required in table 3 of ASTM 2409.
- 8. Airspace Between Pickets: 3-15/16 inches.

2.03 SWING GATES

- A. Configuration: Double swing gates.
- B. Gate Frames:
 - 1. Three (3) horizontal ASTM F900 square steel tubes, 14 gauge, 1-½ in x 1-½ in., pickets or vertical members with curved spear head shall be 1 inch square, 16 gauge with and airgap of 3- 15/16 in., and two (2) vertical tubes 2 in. x 2 in., 12 gauge welded at intersections to create a rigid frame.

C. Gate Posts:

- 1. Material:
 - a. Cold-rolled 1008 grade steel to meet requirements of ASTM A500 and A787.
- 2. Installation:
 - a. In-ground, post length as required by local frost line requirements.
- 3. Post Size:
 - a. To be determined by Manufacturer.

D. Gate Hardware:

- 1. Material:
 - a. Hot-dipped galvanized steel conforming to ASTM F900
 - b. Non-moving components shall be powder-coated in color: Black Sand.
- 2. Hinge:
 - a. Structurally designed by Manufacturer to support gates without deformation during opening and closing.
- 3. Latch:
 - a. Clamp-on, self-latching, gravity system.

4. Shared Access Keyed Lock-Box:

a. LOCINOX or approved equal with double levers, both sides of gates. Swing gate latching mechanism must be able to accommodate shared access for a minimum of two (2) individual locks.

2.04 ACCESSORIES

A. Concrete Footing:

- 1. Unless otherwise specified in Detailed Provisions Division 03 Concrete, provide the following:
 - a. Normal-weight concrete with not less than 3,000 psi 28-day compressive strength.
 - b. 3 in. slump and containing coarse aggregate of minimum diameter of 0.2 in. to maximum of 3/4 in.
 - c. 5% to 7% air entrainment.

B. Non-shrink, Nonmetallic Grout:

- 1. Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107.
- 2. Provide grout, recommended in writing by the Manufacturer, for exterior applications.

C. Erosion-Resistant Anchoring Cement:

- 1. Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water on-site to create pourable anchoring, patching, and grouting compound.
- 2. Provide formulation resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and recommended in writing by the Manufacturer for exterior applications.
- D. Mounting kit including pedestals.

2.05 FINISHES

A. Finish:

- 1. Materials shall be coated with the process that includes galvanization, zinc phosphate, and architectural grade powder coat.
- 2. Metal parts shall be assembled and finished individually prior to shipment.
- 3. Galvanized steel fence components shall be cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.
- 4. Immediately after sealing, a powder finish coating is applied by the electrostatic spray process. This consists of a thermosetting carboxyl polyester resin topcoat with a minimum dry film thickness of 50 microns.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, or other conditions affecting performance.
 - 1. Do not begin installation before final grading is completed, unless otherwise permitted by the County.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 ft. or line of sight between stakes.
- B. Indicate locations of utilities, underground structures, benchmarks, and property monuments marked by a registered surveyor and utility companies.

3.03 FENCE POST LAYOUT

- A. Layout fencing on established boundaries within project limits.
- B. Terminal Posts Layout:
 - 1. Locate terminal end, corner, and gate posts at changes in horizontal or vertical alignment of:
 - a. 15 degrees or more.
- C. Post shall be spaced not more than eight (8) feet center to center of posts. Posts shall be set in a vertical position and carefully aligned.

3.04 IN-GROUND CONCRETE INSTALLATION

- A. Drill or hand-excavate holes for posts to spacing indicated, in firm, undisturbed or compacted soil.
- B. Dig holes with a diameter four (4) times the diameter of the post and 6 in. deeper than the bottom of the post.
 - 1. Minimum 8 inches in diameter and 42 inches in depth.
- C. Concrete forms are not necessary or recommended. Crown concrete at top to shed water.
- D. Measure, batch, and mix on-site-mixed concrete according to ASTM C94. Pour concrete and let cure in accordance with ACI 301 and Detailed Provisions Section 03 3131 Concrete Mixing, Placing, Jointing and Curing.
- E. Concealed Concrete Footings:
 - 1. Stop footings 2 in. below grade or as indicated on the Project Drawings to allow covering with surface material.

F. Post Setting:

- 1. Set posts in concrete footing.
- 2. Protect portion of posts above ground from concrete splatter.
- 3. Place concrete around posts and consolidate.
- 4. Use of mechanical devices to set posts is not permitted.
- 5. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.

3.05 ORNAMENTAL WELDED STEEL FENCE INSTALLATION

- A. Ornamental welded steel fencing and gate shall be constructed in accordance the fence manufacture's written installation instructions except as modified herein.
- B. Install ornamental welded steel fencing and gate on a prepared subgrade surface to line and grade as indicated in the Project Drawings.

3.06 GATE INSTALLMENT AND ADJUSTMENT

- A. Install gate posts in accordance with Manufacturer's instructions.
- B. Concrete Set Gate Posts:
 - 1. Drill holes in firm, undisturbed or compacted soil.
 - 2. Holes shall have a diameter four (4) times the outer diameter of the post and 6 in. deeper than the bottom of the frost level.
 - 3. Set post bottom 36 in. below surface when in firm, undisturbed soil.
 - 4. Excavate and set posts deeper where required for adequate support in soft and loose soils, and for posts with heavy lateral loads.
 - 5. Place concrete around posts in a continuous pour, tamp for consolidation.
 - 6. Trowel finish around gate posts and slope to direct water away.
 - 7. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
- C. Install gates perfectly horizontal and levelled (at junction), plumb, and secure for full opening without interference.
- D. Attach hardware with nuts inside the property making the assembly tamper-proof to prevent unauthorized removal. Install ground-set items in concrete for anchorage.
- E. Furnish and install a gate keeper for each gate.
- F. Adjust hardware for smooth operation and lubricate where necessary to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational

range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.07 PROTECTION

- A. Protect installed products until completion of the Project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 32 3113





SPECIFICATIONS – DETAILED PROVISIONS SECTION 32 3913: MANUFACTURED METAL BOLLARDS CONTENTS

PART 1	GENERAL	. 1
1.01	SUMMARY	. 1
	QUALITY ASSURANCE	
1.03	SUBMITTALS	. 1
1.04	DELIVERY, STORAGE, AND HANDLING	. 2
PART 2	PRODUCTS	. 2
2.01	ACCEPTABLE MANUFACTURERS	. 2
2.02	MANUFACTURED METAL BOLLARDS	. 2
PART 3	S EXECUTION	. 3
	EXAMINATION	
	INSTALLATION	
3.03	CLEANING AND PROTECTION	. 3





SECTION 32 3913 MANUFACTURED METAL BOLLARDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. The Work covered by this section shall consist of furnishing all necessary labor, materials, tools, equipment, transportation, services, coordination, supervision, and all other items necessary for the construction of manufactured metal bollards.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Divisions 01 General Requirements.
 - 2. Section 03 3100 Cast-In-Place Structural Concrete.
 - 3. Section 31 2300 Earthwork.

1.02 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
 - b. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - c. ASTM A312/A312M Standard Specification for Seamless, Welded, and Heavy Cold Worked Austenitic Stainless-Steel Pipes.
 - d. ASTM A500/A500M Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - e. ASTM A536 Standard Specification for Ductile Iron Castings.
 - f. ASTM B26/B26M Standard Specification for Aluminum-Alloy Sand Castings.
 - g. ASTM D1654 Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Approval Submittals:
 - 1. Product Data: Provide bollard type, component, finish, and any accessory specified.

2. Shop Drawings:

- a. Show mounted items and coordination required for Work specified in other Detailed Provisions Sections.
- b. Indicate construction and installation details.

3. Verification Samples:

- a. Provide one (1) sample of each product specified, representing colors and finishes to be installed.
- 4. Maintenance Information:
 - a. Submit manufacturer's touch-up, cleaning, and maintenance information.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect bollards and accessories during delivery, storage, and handling.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Calpipe Security Bollards; www.calpipebollards.com
 - 2. Lakewood Pipe & Steel; www.lakewoodpipe.com
 - 3. Alameda Pipe & Steel Co.; www.alamedapipe.com
- B. Submit requests for substitution in accordance with Detailed Provisions Section 01 6000 Product Requirements.

2.02 MANUFACTURED METAL BOLLARDS

- A. Overall Dimensions:
 - 1. Pipe Diameter: 4-inches
 - 2. Wall Thickness: Schedule 40
 - 3. Height: 4-feet (from Finished Surface Elevation to top of bollard)
- B. Material:
 - 1. Flat top carbon steel pipe completely filled with grout such that it has a rounded top.
- C. Concrete Footing:
 - 1. Concrete footing shall extend 6-inches on both sides of and below the bollard.
 - 2. Bollard shall be fixed, embedded into concrete footing a minimum of 3 feet.
- D. Finish:

- 1. Polymer powder coat finish utilizing an epoxy prime coat and a polyester topcoat.
- 2. Color: Safety Yellow, RAL 1023 and affix a reflecting tape completely around the circumference of the bollard two inches from the top.
- 3. Bollards shall be free of burrs and sharp corners.

E. Spacing:

- 1. Post location shall be ≥ 3-feet from the protected object or as shown in the Project Drawings.
- 2. Post spacing shall be ≤ 4-feet on-center of separation or as shown in the Project Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrate for compliance with manufacturer's requirements for placement and location of embedment, condition of substrate, and other conditions affecting installation procedures.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General: Comply with manufacturer's installation instructions and Construction Drawings.
- B. Concrete Pads:
 - 1. Bollards shall be positioned no more than six (6) inches from the corners of concrete pads requiring protection from vehicular traffic and spaced no more than five (5) feet along the concrete pad sides, as determined by the Engineer.
- C. Do not install damaged, cracked, chipped, deformed, or marred bollards. Field touchup minor imperfections in accordance with manufacturer's instructions. Replace bollards that cannot be field repaired.

3.03 CLEANING AND PROTECTION

- A. Protect bollards against damage.
- B. Immediately prior to Substantial Completion, clean bollards in accordance with manufacturer's instructions to remove dust, dirt, adhesives, and other foreign materials.
- C. Touch up damaged finishes according to manufacturer's instructions.

END OF SECTION 32 3913





SPECIFICATIONS – DETAILED PROVISIONS SECTION 33 0111: WELL DEVELOPMENT CONTENTS

PART 1	GENERAL	1
	SUMMARY QUALITY ASSURANCE SUBMITTALS DELIVERY, STORAGE AND HANDLING	1 1 2
PART 2	PRODUCTS	2
2.01	GENERAL	2
2.02	BAILER	2
2.03	AIR COMPRESSOR, AIRLINE AND EDUCTOR PIPE	2
2.04	MEASURING DEVICES	3
2.05	SUBMERSIBLE PUMP	3
2.06	HOLDING TANKS	3
2.07	DISCHARGE PIPING	4
2.08	SCREEN BRUSH	4
2.09	SURGE BLOCK	4
PART 3	EXECUTION	4
3.01	GENERAL	4
3.02	DAILY WELL DEVELOPMENT REPORTS	5
3.03	WELL DEVELOPMENT WATER:	5
3.04	WELL DEVELOPMENT	5
3.05	CLEANUP	7





SECTION 33 0111 WELL DEVELOPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. The Work covered by this Section shall consist of furnishing all necessary labor, materials, equipment, tools, permits, and supervision for the well development of newly constructed groundwater wells at approximate locations shown on the Project Drawings.
- B. Related Contract Document Sections include, but are not limited to:
 - 1. Detailed Provisions Section 01 1100 Summary of Work
 - 2. Detailed Provisions Section 01 2900 Payment Procedures
 - 3. Detailed Provisions Section 02 0100 Maintenance of Existing Conditions
 - 4. Detailed Provisions Section 33 1114 Non-Potable Water Production Wells
 - 5. Detailed Provisions Section 33 1153 Groundwater Monitoring Wells

1.02 **QUALITY ASSURANCE**

- A. Reference Standards:
 - 1. The "Greenbook" Standard Specifications for Public Works Construction.
 - 2. Water Well Standards: State of California (Bulletin 74-81 and 74-90).
 - 3. California Well Standards and Riverside County Ordinance No. 682.2.
- B. Quality Assurance:
 - 1. All Work shall be performed by a Contractor with a State of California C-57 Well Drilling License and registered with the Riverside County Department of Environmental Health.
 - 2. All Work shall be done to the satisfaction of the County and applicable regulatory agencies.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Daily Well Development Reports.
- C. Holding tank's condition and required tests if tanks are not new.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Delivery, Storage and Handling shall be made in accordance with the following:
 - 1. Maintain end caps through shipping, storage and handling to prevent damage and to prevent entrance of dirt, debris and moisture. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
 - 3. Use slings to handle materials if size requires handling by crane or lift. Rig materials to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
 - 4. Store plastic piping protected from direct sunlight and provide support to prevent sagging and bending.

PART 2 PRODUCTS

2.01 GENERAL

- A. All construction materials shall be new prior to delivery onsite.
- B. Construction and equipment substitutions require written notification at the time of the bid and shall not be accepted anytime thereafter, unless by written authorization from the County.
- C. All equipment supplied by the Contractor shall be available for inspection by the County prior to the beginning of well development operations.
 - 1. If, in the opinion of the County any of the equipment is not suitable for well development, either because of mechanical problems, excessive noise, deviation from the specifications, or the build-up of substances which could cause groundwater contamination (i.e., from oil, diesel, hydraulic leaks or exhaust residue, etc.), the Contractor shall adjust, replace or decontaminate it with suitable equipment at the Contractor's expense.

2.02 BAILER

A. A suction bailer shall be provided with the appropriate fittings to allow for the removal of debris, which may accumulate in the bottom of the well casing.

2.03 AIR COMPRESSOR, AIRLINE AND EDUCTOR PIPE

- A. An air compressor with airline, eductor pipe, and appropriate fittings shall be onsite during the initial airlifting phase of the well development.
- B. The air compressor shall be of ample size for maximum airlifting capabilities.
- C. The air compressor shall have an effective external air-oil separator.

WELL DEVELOPMENT

- D. Eductor pipe used in the development of the wells shall be a maximum of:
 - 1. 4-inch pipe size (i.e., well casing diameter) for monitoring wells.
 - 2. 8-inch pipe size (i.e., well casing diameter) for production wells.
- E. The size of the airline shall be a maximum ¾-inch inner diameter to ensure good flow rates through the eductor pipe (i.e., well casing), and shall be fitted with a dump valve capable of discharging "downhole" air to the atmosphere.

2.04 MEASURING DEVICES

A. Flow meter:

- 1. The flow meter shall be capable of measuring a maximum of 20-cfm of air, such as Dwyer Instruments Inc., Series RM Rate- Master Flow meter Model No. RMC-10-inch scale or approved equal.
- 2. The flow meter shall be mounted on the airline leading from the air compressor to the well in conjunction with a pressure gauge capable of measuring maximum air pressure on the airline, and fittings for a dump valve to discharge air to the atmosphere.

2.05 SUBMERSIBLE PUMP

A. A submersible pump compatible with each well casing size shall be used to pump each well as a final step in the well development process.

2.06 HOLDING TANKS

- A. The Contractor shall use a drum(s) or tank(s) to store groundwater generated during well development activities.
- B. The Contractor shall anticipate/provide adequate containment volume (e.g., number of drums or tanks) to maintain efficient operations.
- C. The well development water shall be temporarily stored on the landfill property.
- D. If the Contractor utilizes a holding tank that previously contained other liquids (i.e. a tank that is not new), laboratory test results of the holding tank rinsate shall be provided to the County, prior to the delivery of the subject holding tank to the site.
 - 1. The tank rinsate shall be tested for:
 - a. Volatile organic compounds by EPA Test Method 8260B,
 - b. Volatile fuel hydrocarbons by EPA Test Method 8015M,
 - c. Extractable fuel hydrocarbons by EPA Test Method 8015M.
 - 2. All tests shall be conducted by a laboratory certified by the State Water Resources Control Board, Environmental Laboratory Accreditation Program.
 - 3. None of the subject compounds shall be detected above the laboratory method detection limit.

WELL DEVELOPMENT

- E. Groundwater generated during well development activities for the non-potable water production well may be discharged into the borrow pit.
 - 1. The Contractor shall take every precaution to prevent erosion when discharging any groundwater into the borrow pit.

2.07 DISCHARGE PIPING

A. The Contractor shall provide the temporary discharge piping required to convey well development water to the appropriate holding tank(s).

2.08 SCREEN BRUSH

- A. The Contractor shall provide a nylon brush to remove fine grained materials from the screened interval in the well.
- B. The Brush shall be manufactured for the appropriate well casing diameter.
 - 1. 4-inch diameter for the monitoring wells.
 - 2. 8-inch diameter for the production well.

2.09 SURGE BLOCK

- A. A surge block consists of a rubber plunger specifically fabricated for the appropriate well casing diameter.
 - 1. 4-inch diameter for the monitoring wells.
 - 2. 8-inch diameter for the production well.
- B. The surge block shall fit tightly within the well casing to create the necessary vacuum and pressure in the groundwater column for surging procedures.

PART 3 EXECUTION

3.01 GENERAL

- A. The well development shall be performed in accordance with:
 - 1. Water Well Standards: State of California (Bulletin 74-81 and 74-90).
 - 2. California Well Standards and Riverside County Ordinance No. 682.3.
- B. The Contractor is cautioned to properly secure/stabilize the well during well development. Improper or poor security/stabilization of the well may lead to delays.
 - 1. Such delays will be the responsibility of the Contractor and the County shall not pay any cost associated with such delays.
- C. The Contractor shall use good practice during well development to ensure the integrity of the screen and casing is maintained.

3.02 DAILY WELL DEVELOPMENT REPORTS

- A. Daily well development reports shall be submitted to the County daily and include but not be limited to:
 - 1. Recording time and procedures completed during each Working Day
 - 2. Total chargeable hours for each Working Day
 - 3. Total gallons generated
 - 4. Flow rates
 - 5. Nephelometric Turbidity Units (NTU)
 - 6. Airline Length
 - 7. All other information as required by the County for the well development period.

3.03 WELL DEVELOPMENT WATER:

- A. All fluids generated during well development of the groundwater monitoring wells shall be temporarily contained by the Contractor in holding tank(s) provided by the Contractor.
- B. The County shall be responsible for the final disposal of the development water.
- C. If the Contractor chooses to retrieve the holding tank(s) that were used to temporarily store the development water, the County shall empty the holding tank(s) within seven (7) Working Days following completion of well development activities.
 - 1. The County shall dispose of the development water only. The County shall not clean or decontaminate the holding tank(s).
- D. Groundwater generated during well development activities for the non-potable water production well may be discharged into the borrow pit.
 - 1. The Contractor shall take every precaution to prevent erosion when discharging any groundwater into the borrow pit.

3.04 WELL DEVELOPMENT

- A. Payment for well development will be made at the unit price bid per hour for Well Development in Detailed Provision Section 01 2900 Payment Procedures.
 - 1. The time required for well development will be recorded by the hour with 15-minute intervals as the smallest unit of recorded time.
 - 2. The time recorded for payment shall commence when the equipment installed in the well is placed in operation and shall end when development has stopped at the direction of the County.
 - 3. No payment will be made for delays resulting from:
 - a. Equipment stuck in the well casing.
 - b. Equipment breakdown.

WELL DEVELOPMENT

- c. Arranging major drilling, pumping, or testing apparatus.
- d. Failure to conduct the operations in a diligent and workmanlike manner by which the desired results could ordinarily be expected.
- e. Additional development that is required as a result of damaged well casing or screen, voids in the gravel envelope, or any construction related defect resulting in additional well development.
- B. The initial development of a well is usually done by employing flushing, bailing, airlifting, and pumping.
 - 1. The actual well development procedure may vary from well to well dependent upon actual characteristics of the formations encountered during drilling.

C. Well Development Procedure:

- 1. The Contractor shall commence initial development no sooner than 24-hours after completion of the well.
 - a. Groundwater monitoring well completion shall include sanitary seal and well head protection.
 - b. Non-potable production well completion shall include sanitary seal and well head protection.
- 2. The Contractor will place a tremie down to the bottom of each casing open-ended, flush the well casing with at least two (2) casing volumes of fresh water, at the discretion of the County, and then airlift until clean.
- 3. Once airlifting is complete the Contractor shall remove the tremie, unless bailing is necessary, as directed by the County.
- 4. Each casing shall be bailed of sediment, as required, to clean the casing to the bottom.
 - a. If the sediment thickness is greater than five (5) feet, then the Contractor may be asked to utilize eductor pipe to airlift the sediment.
- 5. Following bailing, the Contractor shall measure and record the static water level in the casing and prepare for airlifting.
- 6. The Contractor will be required to fabricate an airlift discharge head to accommodate return flow and airline.
 - a. An airline submergence of at least sixty percent (60%) and eighty percent (80%) maximum is recommended.
- 7. The Contractor shall airlift and surge each well casing and record water quality parameters and purging data.
 - a. Data shall be recorded at 15-minute intervals until development of a well casing is deemed complete and/or as directed by the County.
 - b. The well casing shall be surged at 15-minute intervals or as directed by the County.

- c. During development the Contractor shall keep development records.
- 8. Should airlifting not be feasible due to the depth to groundwater or low specific capacity, a submersible pump may be used in-lieu of airlifting.
 - a. The submersible pump inlet shall be set as close to the screened interval as possible.
- 9. Once all well casings have been developed by airlifting or the approved method, the Contractor shall sound the bottom of each well.
- 10. If the level of sediment is within or above the perforation interval, then the Contractor shall bail the well until the perforations are clear of sediment.
- 11. Well development shall continue until the turbidity is similar to existing groundwater wells at the site.
 - a. The target turbidity, at which well development shall be considered complete, is less than 5.0 NTU.
 - b. The Contractor shall continue well development activities until the target turbidity is achieved or the County directs the Contractor to stop.

3.05 CLEANUP

- A. Any waste that is generated by the Contractor, which is incidental to any well development activities, shall be collected and properly disposed by the Contractor, as specified in Detailed Provision Section 01 5600 Project Environmental Controls and Section 01 7700 Closeout Procedures.
- B. The procedure for collecting and handling well development water is specified in Section 3.03 above.

END OF SECTION 33 0111





SPECIFICATIONS – DETAILED PROVISIONS SECTION 33 1114: NON-POTABLE WATER PRODUCTION WELLS CONTENTS

PART 1	GENERAL	. 1
1.01	SUMMARY	
1.02	QUALITY ASSURANCE	
1.03	SUBMITTALS	
1.04	DELIVERY, STORAGE AND HANDLING	. 3
PART 2	PRODUCTS	. 3
2.01	GENERAL	. 3
2.02	DRILLING METHODS	. 3
2.03	BOREHOLE	. 5
2.04	BAILER	
2.05	BLANK WELL CASING	
2.06	SLOTTED WELL SCREENS	
2.07	FILTER PACK	. 6
2.08	SURGE BLOCK	
2.09	TRANSITION SAND	
2.10	PELLET ANNULAR SEAL	
2.11	TRANSITION GROUT ANNULAR SEAL	
2.12	SANITARY SEAL	
2.13	ABOVEGROUND MONUMENT	. 9
PART 3	B EXECUTION	10
3.01	GENERAL	
3.02	BOREHOLE DRILLING	10
3.03	ROCK CLAUSE	
3.04	SUBSURFACE FORMATION SAMPLING	
3.05	DAILY CONSTRUCTION PROGRESS REPORT	
3.06	WELL CASING AND SCREEN INSTALLATION	
3.07	FILTER PACK AND TRANSITION SAND INSTALLATION	
3.08	PELLET ANNULAR SEAL INSTALLATION	_
3.09	TRANSITION GROUT ANNULAR SEAL INSTALLATION	
3.10	SANITARY SEAL INSTALLATION	
3.11	WELL HEAD CONFIGURATION	
3.12	CLEANUP	19





SECTION 33 1114 NON-POTABLE WATER PRODUCTION WELLS

PART 1 GENERAL

1.01 SUMMARY

- A. The Work covered by this Section shall consist of furnishing all necessary labor, materials, equipment, tools, permits, and supervision for the construction of a non-potable water production well at the approximate location shown on the Project Drawings.
- B. Related Contract Document Sections include, but are not limited to:
 - 1. General Provisions
 - 2. Detailed Provisions Section 01 1100 Summary of Work
 - 3. Detailed Provisions Section 01 2900 Payment Procedures
 - 4. Detailed Provisions Section 02 0100 Maintenance of Existing Conditions
 - 5. Detailed Provisions Section 32 3913 Manufactured Metal Bollards
 - 6. Detailed Provisions Section 33 0111 Well Development
 - 7. Detailed Provisions Section 33 1136 Submersible Well Pumps
 - 8. Detailed Provisions Section 33 1600 Water Utility Storage Tanks

1.02 QUALITY ASSURANCE

A. Reference Standards:

- 1. The "Greenbook" Standard Specifications for Public Works Construction.
- 2. Water Well Standards: State of California (Bulletin 74-81 and 74-90).
- 3. California Well Standards and Riverside County Ordinance No. 682.2.

B. Quality Assurance:

- 1. All Work shall be performed by a Contractor with a State of California C-57 Well Drilling License and registered with the Riverside County Department of Environmental Health.
 - a. To register with the Department of Environmental Health please visit: www.rivcoeh.org/OurServices/Wells.
- 2. All Work shall be done to the satisfaction of the County and applicable regulatory agencies.

1.03 SUBMITTALS

A. Submittal Procedures: See Detailed Provisions Section 01 3300 – Submittal Procedures for requirements for the mechanics and administration of the submittal process.

NON-POTABLE WATER PRODUCTION WELLS

B. Well Construction Permit:

- 1. The County shall obtain a Well Construction Permit from the Riverside County Department of Environmental Health for the subject project.
- 2. The Contractor shall sign the well construction permit prepared by the County and abide by the permit condition.
- 3. The Contractor shall keep a copy of the well construction permit onsite at all times.

C. Product Details:

- 1. Submit for County approval product details of the:
 - a. Blank Well Casing and Well Screens.
 - b. Filter Pack Gradation and Supplier.
 - c. Transition Sand Gradation and Supplier.
 - d. Bentonite to be used for Annular Seal.
 - e. Bentonite powder and Cement to be used to create Transition Seal.
 - f. Certified cement mix design receipts and delivery receipts for cement placed for Sanitary Seal, if applicable.
 - g. Above Ground Monument:
 - 1) The Contractor shall submit a schematic drawing of the above-ground monument and documentation from the manufacturer that the above-ground monument meets the requirements of this Section.

D. Measuring Device:

- 1. The Contractor shall submit details of the measuring device to be used to measure the level of the filter pack, transition sand, and pellet annular seal throughout the backfilling process.
- 2. The Contractor shall provide documentation acceptable to the County that the measurement method is proven to be accurate.
- E. Alternative Drilling Method, if applicable.
- F. Daily Construction Progress Report.
- G. Material Calculations for:
 - 1. Filter Pack and Transition Sand.
 - 2. Pellet Annular Seal.
 - 3. Transitional Grout Seal.
 - 4. Sanitary Seal.

H. Well Report:

1. The Contractor shall provide the County with a copy of the completed California Department of Water Resources (DWR) Well Completion Report for each well installed, within two (2) weeks after the well has been completed.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, Storage, and Handling shall be made in accordance with the following:
 - 1. Maintain end caps through shipping, storage, and handling to prevent damage and to prevent entrance of dirt, debris, and moisture. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
 - 3. Use slings to handle materials if size requires handling by crane or lift. Rig materials to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
 - 4. Store plastic piping protected from direct sunlight and provide support to prevent sagging and bending.

PART 2 PRODUCTS

2.01 GENERAL

- A. All construction materials shall be new prior to delivery onsite.
- B. Construction and equipment substitutions require written notification at the time of the bid and shall not be accepted anytime thereafter, unless by written authorization from the County.
- C. All equipment supplied by the Contractor shall be available for inspection by the County prior to the beginning of well construction operations.
 - 1. If, in the opinion of the County, any of the equipment is not suitable for well construction operations, either because of mechanical problems, excessive noise, deviation from the specifications, or the build-up of substances which could cause borehole contamination (i.e., from oil, diesel, hydraulic leaks or exhaust residue, etc.), the Contractor shall adjust, replace or decontaminate it with suitable equipment at the Contractor's expense.

2.02 DRILLING METHODS

- A. The drilling rig and drilling method is at the Contractor's discretion. All associated drilling equipment shall be in good condition and have sufficient capacity to drill to the depths specified in the Contract Documents.
 - 1. The mast and all running gear (hoists, cable, etc.) of the drill rig shall have a proven, sufficient and demonstrated capacity to lift three (3) times the buoyant weight of the drilling string.

B. Drill Pipe/Auger

1. If the Contractor chooses to use the drilling pipe/auger drilling method, the drilling pipe/auger shall be in good condition and shall be connected by standard tool joints.

- 2. The Contractor shall not use drilling pipe equipped with external air lines.
- 3. The drill pipe/auger shall be steam-cleaned prior to its arrival at the drilling site.
- 4. Drill pipe/auger suspected of being contaminated shall be removed and steam-cleaned at the Contractor's expense prior to its use at the site.
- 5. Pipe dope or other lubricating material such as "Gimmie the Green Stuff" or other environmentally safe material, as pre-approved by the County, can be used on the threads of the drill pipe/auger and tremie.

C. Air Rotary Drilling Equipment

- 1. If the Contractor chooses to use the air rotary drilling method, the Contractor shall utilize an oil-less, filtered air compressor with the capability of properly drilling to the minimum depth proposed in the Contract Documents.
- 2. The Contractor shall use an air cyclone or other acceptable method, pre-approved by the County, for the collection of drill cuttings at the point where air is returned to the surface (i.e., flow directed out of the discharge pipe).
- 3. The air cyclone shall function to allow the County to collect representative samples of the subsurface.
- 4. If samples cannot be adequately collected, drilling will cease until the problem can be corrected to the satisfaction of the County.

D. Conductor Casing

- 1. If the Contractor chooses to use a conductor casing with the air rotary drilling method, the conductor casing shall be in good condition and shall be connected by standard tool joints.
- 2. The conductor casing shall be decontaminated prior to its arrival at the site.
- 3. Conductor casing suspected of being contaminated shall be decontaminated at the Contractor's expense prior to its use at the site.
- 4. Pipe dope or other lubricating material such as "Gimmie the Green Stuff" or other environmentally safe material, as pre-approved by the County, can be used on the threads of the conductor casing if necessary.
- E. If the Contractor chooses to use a drilling method, other than auger drilling or air rotary drilling, the Contractor shall submit a written description of the proposed drilling method to the County, prior to mobilizing the drilling equipment.
 - 1. The County shall review the written submittal and may amend the Contract Documents to account for the proposed drilling method.
 - a. The scope of any amendments will be limited to specifications to ensure the environmental integrity of the borehole.
 - 2. The County shall authorize the proposed drilling method in writing.
 - a. The Contractor may mobilize drilling equipment after written approval.

- b. The County's approval of a Contractor's alternative drilling method does not relieve the Contractor of his responsibility to drill the boreholes to the depths specified in the Contract Documents or to construct the monitoring well.
- c. The County's authorization does not constitute approval or agreement that the alternative drilling method will allow the Contractor to successfully complete the Project.

2.03 BOREHOLE

- A. The purpose of the well borehole is to determine the thickness and nature of all formations penetrated, determine the location of water bearing strata, obtain other hydrological and geological information and allow for well construction.
- B. Each well borehole shall be drilled by a method chosen by the Contractor. Limitations and/or conditions for different drilling methods are specified in Section 2.02 of this Detailed Provisions.
- C. Payment for drilling and sampling of the well borehole shall be based on vertical feet drilled (first pass) measured from the ground surface. It shall include all materials, labor, tools, and equipment required to drill the borehole, collect formation samples, maintain circulation (depending on drilling method chosen) and protect the borehole from caving.
 - 1. No payment will be made for temporary casings installed at the Contractor's option.
- D. Payment will only be made for the Contractor's first pass successful drilling method.
 - 1. If the Contractor chooses drilling method(s) that are unsuccessful, the County will not make additional payment for vertical feet drilled for second, third or any subsequent passes by the Contractor to obtain the required borehole depth.
 - 2. No payment will be made for borehole corrections that may be necessary to comply with these specifications. Payment for any borehole corrections will be included in the unit price for the corresponding Borehole Drilling and Sampling.
- E. Payment for Borehole Drilling and Sampling shall be made at the unit price for Borehole Drilling and Sampling in Detailed Provisions Section 01 2900 Payment Procedures.
- F. Payment for stand-by time will be at the unit price for the corresponding Drill Rig Standby in Detailed Provisions Section 01 2900 Payment Procedures.
- G. Payment for rock clause drilling will be at the unit price for the corresponding Rock Clause Drilling in Detailed Provisions Section 01 2900 Payment Procedures.

2.04 BAILER

A. A suction bailer shall be provided with the appropriate fittings to allow for the removal of debris, which may accumulate in the bottom of the well casing.

2.05 BLANK WELL CASING

- A. The blank well casing shall be nominal 8-inch inner diameter, schedule 80 PVC as specified in ASTM D1785 (latest edition), equipped with threaded joints at the ends of the blank casing sections. The blank casings shall be factory assembled.
- B. Threaded joints shall be machined with beveled/interference compression fit shoulder seals to increase compressional strength.
- C. O-ring seals shall be provided within the threaded joints to mitigate leakage and contaminants from entering at the threaded joint.
- D. In all cases, the blank casing used in conjunction with the screen shall have the same inner diameter as the screen to ensure that the inside diameter of the blank casing matches the inside diameter of the screen.
- E. The bottom of each well casing shall be fitted with a threaded end cap. The end cap shall be of the same chemical and physical properties as the blank well casing.
- F. All casing material shall be new.
- G. Payment for blank well casing installation shall be based on measurement of vertical feet of blank well casing installed complete and in place, which includes furnishing and installing centralizer and end caps, at the unit price for Well Casing in Detailed Provisions Section 01 2900 Payment Procedures.

2.06 SLOTTED WELL SCREENS

- A. The well screens shall be nominal 8-inch diameter, schedule 80 PVC as specified in ASTM D1785 (latest edition), equipped with threaded joints at the end of the slotted well screen section. The screen shall be factory-assembled.
- B. The slotted well screen shall be machined 0.020-inch slot (20-slot).
- C. Threaded joints shall be machined with beveled/interference compression fit shoulder seals to increase compressional strength.
- D. O-ring seals shall be provided within the threaded joints to mitigate leakage and contaminants from entering at the threaded joint.
- E. In all cases, the slotted well screens used in conjunction with the blank casing shall have the same inner diameter as the screen to ensure that the inside diameter of the blank casing matches the inside diameter of the screen.
- F. All casing material shall be new.
- G. Payment for well screen installation shall be based on measurement of vertical feet of well screen installed complete and in place at the unit price for Well Screen in Detailed Provisions Section 01 2900 Payment Procedures.

2.07 FILTER PACK

A. All sand/gravel to be used for the filter pack shall be hard, water or air worn gravels, and washed clean of silt, sand, dirt and foreign matter. It shall be well rounded, graded, and shall have a coefficient of uniformity less than 2.5.

- B. The gravel/sand shall be kept free of all foreign matter. Gravel/sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the Contractor's expense prior to the arrival of new gravel/sand.
- C. Gravel shall be non-mixed (i.e., pure silica) #3 gradation blend by Oglebay Norton Industrial Sands, Inc. (formerly known as Colorado Silica Sand, Inc.), or approved equal.
- D. The #3 gradation blend shall meet the sieve analyses parameters specified below.

Sieve #	Sieve Opening (mm)	Cumulative Percent Passing
1/2-Inch	12.5	100
4	4.75	100
6	3.35	100
8	2.36	100-98
12	1.7	89-55
16	1.18	46-10
20	0.85	13-1
30	0.60	5-0

- E. Crushed gravel will not be accepted.
- F. All gravel is subject to approval by the County prior to use in the packing process.
- G. Filter pack payment will be based on measurement of vertical feet of filter pack installed form the bottom to the top of each specified interval at the unit price for Filter Pack in Detailed Provisions Section 01 2900 Payment Procedures.

2.08 SURGE BLOCK

- A. A surge block consists of a rubber plunger specifically fabricated for an 8-inch diameter well casing.
- B. The surge block shall fit tightly within the well casing to create the necessary vacuum and pressure in the groundwater column for surging procedures.

2.09 TRANSITION SAND

- A. All sand used for the transition sand layer shall be hard, water or air worn gravels, and washed clean of silt, dirt and foreign matter.
- B. The transition sand shall be kept free of all foreign matter. Transition sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the Contractor's expense prior to the arrival of new transition sand.
- C. Sand shall be a non-mixed (i.e., pure silica) #60 gradation blend by Oglebay Norton Industrial Sands, Inc. or approved equal.

D. The #60 gradation blend shall meet the sieve analyses parameters specified below.

Sieve #	Sieve Opening	Cumulative Precent
Sieve #	(mm)	Passing
20	0.85	100
30	0.60	100
40	0.425	100-94
50	0.30	60-25
70	0.212	15-5
100	0.15	4-0

- E. Crushed gravel will not be accepted.
- F. All sand is subject to approval by the County prior to use in the transition sand layer.
- G. Transition sand payment will be based on measurement of vertical feet of transition sand installed from the bottom to the top of each specified interval at the unit price for Transition Sand in Detailed Provisions Section 01 2900 Payment Procedures.

2.10 PELLET ANNULAR SEAL

- A. An approximate 5-foot thick seal consisting of dry non-coated medium-sized bentonite chips or tablets shall be installed above the screened interval, or as otherwise specified.
- B. Coated bentonite pellets, chips or tablets shall not be used to construct these seals.
- C. The bentonite chips or tablets shall be certified NSF/ANSI Standard 60, Drinking Water Treatment Chemicals Health Effects.
- D. Payment for annular seal materials will be based on measurement of vertical feet of seal installed from the bottom to top of the specified interval, at the unit price for Pellet Annular Seal in Detailed Provisions 01 2900 Payment Procedures.

2.11 TRANSITION GROUT ANNULAR SEAL

- A. The transition grout shall be composed of a bentonite-cement mixture.
- B. Cement used for the transition grout seal shall be a Type II Portland cement conforming to ASTM C150 (latest edition).
- C. Bentonite used in the grout shall be pulverized (powder or granular) and shall be certified NSF/ANSI Standard 60, Drinking Water Treatment Chemicals Health Effects.
- D. Water used for the cement mix shall be clean and of potable quality.
- E. The transition grout shall be composed of 1-gallon of water to 1- to 1¹/₄-pounds of bentonite powder. Cement shall be added to the bentonite grout at a ratio of 1- to 2-pounds of cement to 1-gallon of water.
- F. Transition Grout Mixture:
 - 1. Bentonite and water shall be mixed first, prior to the addition of cement.
 - 2. Bentonite, water and cement shall be mixed in the ratios specified in Section 2.12E.

- 3. The final mixture of transition grout shall be thoroughly blended before pumping.
- 4. Bentonite and cement shall be completely incorporated into the grout, no unmixed lumps of material shall exist in the grout.
- G. Payment for the transition grout annular seal will be based on measurement of vertical feet of seal installed at the unit price for Transition Seal in Detailed Provisions Section 01 2900 Payment Procedures.
 - 1. No stand-by time will be paid for any down-time between the placement of the transition grout annular seal and the sanitary seal.

2.12 SANITARY SEAL

- A. Cement used for the sanitary seal shall be a Type II Portland cement conforming to ASTM C150 (latest edition).
- B. The cement mix used for the sanitary seal shall be a 10.5-sack sand-cement grout. There shall be not more than two (2) parts by weight of sand to one (1) part by weight of cement. The water-cement ratio shall be 7-gallons per sack of cement (94 pounds).
- C. Water used for the cement mix shall be clean and of potable quality.
- D. Materials used as additives for Portland cement mixtures in the field shall meet the requirements of ASTM C494 (latest edition), "Standard Specifications for Chemical Admixtures for Concrete."
- E. Special quick-setting cement, retardants to setting, and other additives, including hydrated lime to make the mix fluid (up to ten percent (10%) of the volume of cement) may be used.
- F. Sanitary Seal Mixture:
 - 1. Water, sand and cement shall be mixed in the ratios specified in Section 2.12B.
 - 2. The final mixture of sanitary seal shall be thoroughly blended before pumping. Cement and sand shall be completely incorporated into the mixture, no unmixed lumps of material shall exist in the mixture.
- G. Payment for the sanitary seal will be based on measurement of vertical feet of sanitary seal installed at the unit price for Sanitary Seal in Detailed Provisions Section 01 2900 Payment Procedures.
 - 1. No stand-by time will be paid for any down-time between the placement of the transition seal and the installation of the sanitary seal, or during the 24 hours the sanitary seal is curing.

2.13 ABOVEGROUND MONUMENT

A. The aboveground monument installed to protect the wellhead shall be a 16 in x 7 ft round well protector, with a hinge lockable lid and sealed discharge pipe through-hole, or County approved equal.

1. Payment for the aboveground monument shall be made at the unit price for Aboveground Well Head Protection in Detailed Provisions Section 01 2900 – Payment Procedures.

PART 3 EXECUTION

3.01 GENERAL

- A. The well construction shall be performed in accordance with:
 - 1. Water Well Standards: State of California (Bulletin 74-81 and 74-90).
 - 2. California Well Standards and Riverside County Ordinance No. 682.3.
- B. The Contractor is cautioned to properly secure/stabilize the well during all phases of construction. Improper or poor security/stabilization of the well may lead to delays.
 - 1. Such delays will be the responsibility of the Contractor and the County shall not pay any cost associated with such delays.
- C. The Contractor shall use good practice during installation, backfilling and well development to ensure the integrity of the borehole, screen and casing is maintained.
- D. A general schematic diagram of the well construction, including location of the filter pack, transitional sand, pellet annular seal, transitional grout seal and sanitary seal is provided on Sheet 8 of the Project Drawings.

3.02 BOREHOLE DRILLING

- A. The Contractor shall not start drilling without the County onsite to confirm the location of the borehole.
- B. The Contractor shall provide all tools, accessories, air compressor, power, fuel, materials, supplies, lighting, other equipment and experienced personnel necessary to conduct safe and efficient drilling operations.
- C. A drilling superintendent (tool pusher) shall be available at all times at the request of the County.
- D. The Contractor shall prepare to drill the borehole to the total depth specified in the Contract Documents.
 - 1. The borehole diameter shall be a minimum of 14-inches.
 - 2. The County will be onsite during the drilling process to specify the exact depth of the borehole to be drilled based on drilling cuttings, the geologic log and the depth to groundwater encountered during drilling.
 - 3. The exact depth specified by the County may be more or less than the total depth specified in the Contract Documents.
- E. The Contractor shall take all measures necessary to protect the borehole from caving or raveling during drilling operations and at the conclusion of drilling operations, when the final depth has been achieved.

NON-POTABLE WATER PRODUCTION WELLS

- 1. Improper or poor security/stabilization of the borehole may lead to borehole collapse and delays prior to or during well construction.
- 2. Such collapse or delays will be the responsibility of the Contractor and the County shall not pay any costs associated with such delays or collapse.
- F. Soil drilling cuttings not placed in drums shall be placed on plastic sheeting that has a minimum 10-mil thickness. At the end of each day, the soil stockpile shall be covered with plastic sheeting that has a minimum 10-mil thickness. The County shall be responsible for the final handling, transportation and disposal of drilling cuttings, following the Contractor's demobilization from the site.
- G. Once groundwater is encountered in the borehole, soil drilling cuttings will be stored in 55-gallon drums. At the end of each well construction, the Contractor shall transport the drummed drilling cuttings to the soil drilling cutting storage location. The County shall be responsible for the final handling, transportation and disposal of drilling cuttings, following the Contractor's demobilization from the site.
- H. Upon completion of drilling a specific borehole to the depth specified in these Contract Documents or as directed by the County, the County will provide, within 24 hours, the Contractor with well construction details or request that the Contractor drill deeper.
 - 1. The Contractor shall be paid for stand-by time for each working hour beyond the 24-hour assessment period that the County does not provide the Contractor with well construction details or the request to drill deeper.
- I. The Contractor may discharge minor volumes of nuisance groundwater generated during drilling directly to the ground surface adjacent to the well site, as permitted by the State Water Resources Control Board Water Quality Order No. 2014-0057-DWQ.
- J. The Contractor shall implement appropriate best management practices (BMPs) to mitigate the discharge of sediment laden groundwater.
 - 1. Where necessary, BMPs shall also be implemented to mitigate groundwater discharge related erosion.
 - 2. The discharge of groundwater shall also be controlled to prevent contact with significant materials or equipment, including those of the Contractor and County.

3.03 ROCK CLAUSE

- A. The Rock Clause shall go into effect only after the Contractor verbally notifies the County that the drilling advancement rate is less than five (5) feet per hour and that the Contractor is requesting Rock Clause time.
 - 1. The decrease in the drilling rate shall be due to natural causes such as hard formations caused by gravel and boulders.
 - 2. The Contractor is cautioned to practice proper drilling techniques for gravel alluvium drilling environments.
 - 3. Reduction in drilling rate due to worn bits will not be grounds for invoking the Rock Clause.

- 4. Borehole caving problems and decreased penetration rates due to improper air flow rates or choice of drilling bits are not acceptable causes to invoke the Rock Clause.
- B. A recording device such as a "geolograph" shall be required to document Rock Clause time.

3.04 SUBSURFACE FORMATION SAMPLING

- A. The Contractor shall, at each change of formation, at five-foot intervals between changes in formation, and at intervals requested by the County, collect a representative sample of the interval or new formation. Each sample shall be given to the County for proper logging and storage.
- B. If the Contractor chooses to drill with hollow stem auger, the Contractor shall collect relatively undisturbed soil samples with a Standard Penetration Test split spoon sampler.
- C. If the Contractor chooses to drill with a form of air rotary, the Contractor shall provide an acceptable means to the County whereby the Contractor can safely obtain representative samples of formation cuttings from the air stream.
- D. The ground surface around the sampling area shall be kept graded and free from stockpiled drilling cuttings and shall be kept free of trash, equipment and other debris.
- E. If samples cannot be adequately collected, drilling will cease until the problem is corrected to the satisfaction of the County.

3.05 DAILY CONSTRUCTION PROGRESS REPORT

- A. The driller shall prepare a daily record of drilling activities completed each Working Day that drilling is completed.
- B. The Daily Construction Progress Report shall identify:
 - 1. First pass vertical footage drilled.
 - 2. Approved Rock Clause hours.
 - 3. Approved stand-by time hours.
- C. The report shall be submitted to the County for review and approval at the conclusion of each Working Day.

3.06 WELL CASING AND SCREEN INSTALLATION

- A. A typical well design will consist of a 160 to 200-foot long interval of well screen with approximately sixty (60) feet of blank casing below (silt trap) and the remainder of the blank casing located above the screen and extending to the ground surface.
- B. The proposed well casing and screen lengths are specified in the Contract Documents.
 - 1. These lengths are subject to change, as specified by the County, based on the subsurface conditions encountered during drilling.

- C. The County will submit the final well design depths/lengths to the Contractor within 24-hours after the County directs the Contractor to terminate drilling at a specific well location.
 - 1. While the well design is being completed, no additional payment for stand-by time shall be made, except where specified in Section 3.02H.1.
 - 2. The final well design will specify where the blank casing, screen intervals, filter pack intervals, seal intervals and sanitary seal will be placed in the borehole.

D. Joints:

1. All field joints, where blank casings and/or screen casing are joined together, shall be connected via the machine threaded ends.

E. Installation of casing and screen:

- 1. The well casing string shall be suspended at all times in tension from the surface by means of a clamp, landing plate, or equivalent method. The bottom of the casing string shall be at a sufficient distance above the bottom of the borehole to ensure that it is not supported by the bottom of the borehole.
- 2. The Contractor will measure and record the lengths of the casing as it is being installed into the borehole.
 - a. The casing lengths will be such that the screens are placed per the design interval and the total installed length of the casing is as specified in the design.

3. Centralizers:

- a. Centralizers shall be installed around the screen section, one near the bottom and one approximately every 40-feet of screen section.
- b. One centralizer shall be installed around the blank casing, at approximately mid-height.
- 4. If for any reason the casing cannot be placed in the correct position, or at a depth acceptable to the County, the Contractor shall take whatever measures are necessary to properly construct the well at his own expense, including abandoning the borehole.
- 5. If any of the casings should collapse or break prior to well completion, they shall be withdrawn and replaced at the Contractor's expense.
- 6. All Work required to be repeated because of the Contractor, and all additional materials, labor, and equipment required, shall be furnished at the expense of the Contractor and no claim for additional compensation shall be made or be allowed therefore, except as specifically provided herein.
- 7. The well casing shall be completed at ground surface, however extra casing length should be added to allow for well head configuration and construction to automatically supply the water tower as specified in Section 3.11 and as shown on Sheets 8 and 9 of the Project Drawings.
- F. Prior to backfilling the annular space around the casing string, the Contractor shall measure the bottom of the well casing to verify its total depth.

NON-POTABLE WATER PRODUCTION WELLS

3.07 FILTER PACK AND TRANSITION SAND INSTALLATION

A. Once drilling is completed, the bottom of the borehole is stabilized, if necessary, and the casing is installed within the borehole, the installation of the filter pack and transition sand can proceed.

B. Installation of Filter Pack:

- 1. The gravel/sand, if stockpiled onsite, shall be kept free of all foreign matter.
- 2. Gravel/sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the contractor's expense prior to the arrival of new gravel/sand on site.
- 3. Throughout the backfilling process, the Contractor shall complete calculations to determine the amount of material necessary to backfill the specified interval.
 - a. The Contractor shall record all calculations and volumes of material used to backfill the specified interval, as well as measurements obtained after the gravel/sand placement and verify those calculations with the County.
- 4. The gravel/sand filter pack shall be placed into the annulus of the well through a tremie.
- 5. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
- 6. The gravel/sand shall not be allowed to freefall more than 20-feet from the bottom of the tremie to the top of the gravel/sand.
- 7. The filter pack level shall be measured throughout the backfilling process.
- 8. The gravel/sand filter pack shall be installed from the bottom of the borehole to approximately five (5) feet above the top of screen.
- 9. Upon completion of installation of each filter pack, or portion thereof, no additional Work will be performed until the depth to the top of that filter pack has been determined by use of proven, accurate equipment.
- C. Prior to installing the transition sand materials, the Contractor shall consolidate the filter pack by gently surging the well screen with a tight-fitting surge block.
- D. The Contractor shall then re-measure the top of the filter pack and install additional gravel/sand to achieve the design depth.
- E. Following the installation of the filter pack, the Contractor shall install an approximate 5-foot thick layer of transition sand.
- F. Installation of Transition Sand:
 - 1. The transition sand, if stockpiled onsite, shall be kept free of all foreign matter.
 - 2. Transition sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the contractor's expense prior to the arrival of new sand on site.

- 3. Throughout the backfilling process, the Contractor shall complete calculations to determine the amount of material necessary to backfill the specified interval.
 - a. The Contractor shall record all calculations and volumes of material used to backfill the specified interval, as well as measurements obtained after the transition sand layer placement and verify those calculations with the County.
- 4. The transition sand shall be placed into the annulus of the well through a tremie.
- 5. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
- 6. The transition sand shall not be allowed to freefall more than 20 feet from the bottom of the tremie to the top of the transition sand.
- 7. The transition sand level shall be measured throughout the backfilling process.
- 8. The transition sand layer shall be installed from the top of the filter pack to a thickness of five (5) feet.
- 9. Upon completion of installation of the transition sand layer, or portion thereof, no additional Work will be performed until the depth to the top of that transition sand layer has been determined by use of proven, accurate equipment.

3.08 PELLET ANNULAR SEAL INSTALLATION

- A. Once the filter pack and transition sand are installed above the screened well casing, the annular seal can be installed.
- B. The annular seal seals the annular space between the borehole wall and the well casing.
- C. The seal shall be composed of medium-sized bentonite pellets and be installed in the annulus of the well to hydraulically separate the aquifer penetrated by the well casings.
- D. Annular Seal Installation.
 - 1. The Contractor shall calculate the amount of seal material necessary to backfill a specified interval.
 - a. The Contractor shall record all calculations and volumes of seal mixture used, and the measurements obtained after the seal placement and verify those calculations with the County.
 - 2. An approximate five-foot thick seal, consisting of bentonite chips or tablets, shall be installed by gravity via a tremie above the transition sand layer.
 - 3. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
 - 4. Seal materials shall not be allowed to freefall more than 20 feet from the bottom of the tremie to the depth established from previous measurement.
 - 5. The seal level shall be measured throughout the backfilling process.
 - 6. The seal shall be installed from the top of the transition sand to a thickness of five (5) feet in a continuous operation.

- 7. The Contractor shall measure the depth of the top of the seal after installation.
- 8. Upon complete installation of the annular seal, or portion thereof, no additional Work will be performed until the depth to the top of that seal has been determined by use of proven, accurate equipment.

3.09 TRANSITION GROUT ANNULAR SEAL INSTALLATION

- A. The transition grout annular seal seals the annular space between the borehole and the well casing in the upper portion of the borehole.
- B. Transition Grout Installation.
 - 1. The Contractor shall calculate the amount of transition grout necessary to complete the annular seal.
 - a. The volume placed shall not be less than the calculated volume of the annular space between the borehole and the well casing.
 - b. The Contractor shall record all calculations and volumes used, and measurements obtained after each interval is pumped.
 - c. The Contractor shall provide the calculations and volumes to the County for his review and approval.
 - 2. The transition grout shall be placed into the annulus of the well through a tremie.
 - 3. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
 - 4. The tremie pipe shall extend from the ground surface to the bottom of the zone to be grouted.
 - 5. Cement grout shall be placed from bottom to top, in a continuous operation.
 - 6. The tremie pipe shall be slowly raised as the grout is placed, but the discharge end of the grout pipe must be submerged in the emplaced grout at all times until grouting is completed.
 - 7. The Contractor shall take whatever precautions are necessary to prevent borehole and/or casing collapse during placement of the transition grout.
 - a. In the event any borehole and/or casing collapses prior to completion of the transition grout, the Contractor shall take whatever steps are necessary to reopen the borehole, replace the casing and place the seal as specified.
 - b. Any such remedial action shall be conducted at the Contractor's expense.
 - 8. No activity shall occur directly adjacent to the well site, nor will stand-by time be granted, during a minimum 1-hour period immediately following the placement of the transition grout.
 - 9. The casing shall be adequately secured such that no damage or contamination will occur during this period.

3.10 SANITARY SEAL INSTALLATION

- A. The sanitary seal seals the annular space between the borehole and the well casing in the upper portion of the borehole up to the ground surface.
- B. After placement of the casings, screens, filter pack, transition sand, pellet seal and transition seal, the sanitary seal shall be installed.
- C. Sanitary Seal Installation.
 - 1. The Contractor shall calculate the amount of seal material necessary to complete the sanitary seal.
 - a. The volume placed shall not be less than the calculated volume of the annular space between the borehole and the well casing.
 - b. The Contractor shall record all calculations and volumes used, and measurements obtained after each interval is pumped.
 - c. The Contractor shall provide the calculations and volumes to the County for his review and approval.
 - 2. The sanitary seal shall be placed into the annulus of the well through a tremie.
 - 3. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
 - 4. The tremie pipe shall extend from the ground surface to the bottom of the zone to be sealed.
 - 5. The sanitary seal shall be placed from bottom to top, in a continuous operation.
 - 6. The tremie pipe shall be slowly raised as the sanitary seal is placed, but the discharge end of the grout pipe must be submerged in the emplaced sanitary seal at all times until placement of the sanitary seal is completed.
 - 7. The Contractor shall take whatever precautions are necessary to prevent borehole and/or casing collapse during placement of the sanitary seal.
 - a. In the event any borehole and/or casing collapses prior to completion of the sanitary seal, the Contractor shall take whatever steps are necessary to reopen the borehole, replace the casing and place the seal as specified.
 - b. Any such remedial action shall be conducted at the Contractor's expense.
 - 8. No activity shall occur directly adjacent to the well site, nor will stand-by time be granted, during a minimum 24-hour period immediately following the placement of the sanitary seal.
 - 9. The casings shall be adequately secured such that no damage or contamination will occur during this period.
 - 10. After completion of the Sanitary Seal, the Contractor shall wait 24-hours before commencing well development procedures in accordance with Detailed Provisions Section 33 0111 Well Development.

3.11 WELL HEAD CONFIGURATION

- A. Upon completion of well development, the Contractor shall test pump the non-potable production well to determine aquifer characteristics, well efficiency and determine a suitable submersible vertical well pump in accordance with Detailed Provisions Section 33 1136 Submersible Vertical Well Pumps.
- B. After the non-potable production well has been tested pumped and an acceptable pump has been selected and installed in accordance with Detailed Provisions Section 33 1136
 Submersible Vertical Well Pumps, the Contractor shall complete the well head configuration.
- C. The well head configuration shall be connected to the water tower by underground discharge piping in accordance with Detailed Provisions Section 33 1600 Water Utility Storage Tanks.
- D. The well head configuration shall include all necessary equipment and apparatuses to automatically turn on the submersible well pump and motor and supply the water tower as specified in Detailed Provisions Section 33 1600 Water Utility Storage Tanks.
- E. The Contractor shall install an above ground monument surrounded by cement-filled bollards to protect the well head.
- F. Upon completion of well development, the Contractor shall excavate around the well casing to approximately 2.5 feet below ground surface, to a sufficient width, to facilitate the installation of the monument.
- G. The Contractor shall install an approximate six-inch thick layer of crushed rock base in the base area between the well casing and the excavation walls to support the monument.
 - 1. The rock base shall be compacted and leveled to provide a supportive surface.
- H. The Contractor shall install the monument on top of the crushed rock base such that the elevation of the top of the monument is approximately three (3) feet above the surrounding ground surface.
- I. The Contractor shall install an additional approximate six-inch layer of crushed rock base in the space between the monument and the well casing, and in the space between the monument and the surrounding excavation walls, to provide lateral stability to the vault.
 - 1. The rock base shall be compacted and leveled within the vault to provide a supportive surface free of trip hazards.
- J. The Contractor shall install concrete between the monument and the excavation walls, from the top of the rock base to an elevation matching the surrounding grade.
- K. Upon completion of all Work in connection with the well construction and well development, the well shall be capped by placing a hinge lockable lid with a sealed discharge pipe through-hole on the top of the casing.
- L. Contractor shall install a concrete pad measuring five feet by five feet by four inches in thickness, centered on the well head.

M. The Contractor shall install four (4) bollards in accordance with Detailed Provisions Section 32 3913 – Manufactured Metal Bollards, around the well head concrete pad to protect the well casing from vehicular traffic.

3.12 CLEANUP

- A. Any waste that is generated by the Contractor, which is incidental to any well construction activities, shall be collected and properly disposed by the Contractor, as specified in Detailed Provisions Section 01 5600 Project Environmental Controls and Section 01 7700 Closeout Procedures.
- B. The procedure for collecting and handling soil drilling cuttings is specified in Section 3.02.F and 3.02.G above.

END OF SECTION 33 1114





SPECIFICATIONS – DETAILED PROVISIONS SECTION 33 1136: SUBMERSIBLE WELL PUMPS CONTENTS

PART 1	[GENERAL	. 1
1.01 1.02 1.03 1.04	SUMMARYQUALITY ASSURANCESUBMITTALSDELIVERY, STORAGE AND HANDLING	. 1
PART 2	PRODUCTS	. 4
2.01	TEMPORARY TEST PUMP ASSEMBLY	. 4
2.02	SUBMERSIBLE PUMP	
2.03	SUBMERSIBLE MOTOR	
2.04	SUBMERSIBLE CABLE	. 7
2.05	COLUMN/DROP PIPE AND FITTINGS	
2.06	SOUNDING TUBE	. 9
2.07	PUMP CONTROL PANEL	. 9
2.08	WELL HEAD SANITARY SEAL	10
PART 3	S EXECUTION	10
3.01	TEST PUMPING	10
3.02	INSTALLATION	
3.03	INSPECTIONS AND TESTING	12
3.04	CLEANUP	13





SECTION 33 1136 SUBMERSIBLE WELL PUMPS

PART 1 GENERAL

1.01 SUMMARY

- A. The Work covered by this Section shall consists of furnishing all necessary labor, materials, tools, equipment, permits, and supervision to test pump the non-potable production well to determine aquifer characteristics and well efficiency and based on the results, select and install a suitable submersible vertical turbine pump and motor for a complete working system.
- B. Related Specification Sections include, but are not limited to:
 - 1. Division 01 General Requirements
 - 2. Division 26 Electrical
 - 3. Section 31 2133 Trenching, Backfilling, and Compacting for Utilities
 - 4. Section 33 0111 Well Development
 - 5. Section 33 1114 Non-Potable Production Wells
 - 6. Section 33 1600 Water Utility Storage Tanks

1.02 **QUALITY ASSURANCE**

- A. Reference Standards:
 - 1. American Iron and Steel Institute (AISI)
 - 2. American National Standards Institute (ANSI)
 - 3. American Society for Testing and Materials (ASTM):
 - a. ASTM A47/A47M Standard Specification for Ferritic Malleable Iron Castings
 - b. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - c. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 4. California Department of Water Resources (DWR):
 - a. DWR Bulletin 74-81 and 74-90: Water Well Standards
 - 5. Hydraulic Institute (HI):
 - a. HI Standards for Centrifugal, Rotary and Reciprocating Pumps, latest edition
 - 6. International Electrotechnical Commission (IEC)

- 7. National Electrical Contractors Association (NECA):
 - a. NECA 1 Standard for Good Workmanship in Electrical Construction
- 8. National Electrical Manufacturers Association (NEMA):
 - a. ICS 1 Industrial Controls and Systems
 - b. ICS 2 Controllers, Contactors and Overload Relays Rated 600 V
 - c. NEMA MG-1 Motors and Generators
- 9. National Electrical Testing Association (NETA):
 - a. ATS Acceptance Testing Specification Electrical Power Distribution Equipment and Systems

B. Quality Assurance:

- 1. Installer Qualifications:
 - a. Installer performing the Work shall possess an active C-57 (Well Drilling) Contractor's license from the California State License Board and be a registered well driller with the Riverside County Department of Environmental Health.
 - b. Installer shall be approved by pump manufacturer and provide laborers and supervisors who are familiar with the pump installation.

C. Pump Test:

- 1. The pump manufacturer shall perform the following tests on each pump before shipment from the factory:
 - a. Perform insulation resistance test (megger) on the pump to check for insulation breaks or moisture.
 - b. Check pump for correct rotation.
 - c. Confirm and publish "as-built" pump performance curve indicating the following:
 - 1) Pump Speed.
 - 2) Flow vs. head curve.
 - 3) Efficiency curve.
 - 4) Horsepower curve(s).
 - 5) Net Positive Suction Head Required (NPSHR).
 - 6) A written certified test report giving the above information shall be submitted to the County for review and approval of the pump prior to shipment.
- 2. The pump shall be tested on water.
- 3. Pump shall be meggered immediately after water test for insulation breaks or moisture.

4. The pump manufacturer's representative shall provide on-site check-out and startup testing of the pumping system following installation and submit a certificate verifying proper installation to the County.

D. Warranty:

1. A two (2) year warranty shall be required on all materials and workmanship which comprise the pump system.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Installer Qualifications.

C. Product Data:

- 1. Provide manufacturer's standard catalog pages and data sheets for all products specified in PART 2 of this Detailed Provisions Section.
- 2. Provide manufacturer's descriptive data and technical literature, performance charts and curves, efficiency, brake horsepower, capacity in gallons per minute, materials of construction, and dimensions for each pump model. Curves shall be based on factory tests by the manufacturer, in accordance with procedures recommended by the Hydraulic Institute. Data shall include a complete list of parts and supplies.
- 3. Provide pump manufacturer's sizing calculations and data for submersible pump cable.
- 4. Provide manufacturer's instructions describing the installation of the pumps and any recommended accessories to provide a complete pump system.

D. Shop Drawings

1. Test Pump:

- a. Assembly including pump, motor, discharge piping, etc.
- b. Technical information including applicable performance curves showing specified equipment capacity, rangeability and efficiencies.

2. Pump Control Panel:

- a. Unit ladder logic wiring for each unit depicting electrical wiring and identification of terminals where field devices or remote-control signals are to be terminated as indicated on the Project Drawings and/or loop descriptions.
- b. Schematic and connection wiring diagrams.
- c. In accordance with Detailed Provisions Section 26 2419 Motor-Control Centers.

E. Test Results and Reports:

1. Test Pump's results and report.

- 2. Selected vertical turbine pump:
 - a. Submit manufacturer's performance test reports on each pump prior to delivery.
 - b. Minimum information shall include the pump and motor serial number, technical pump and motor information and a chart listing flow versus water column head versus amp draw information.
 - c. Submit field logs and start-up pump testing results.

F. Operation and Maintenance (O&M) Manual:

- 1. Provide O&M documentation, including operating conditions, frequency of required maintenance, and spare parts list.
- 2. Provide operating instructions outlining the step-by-step procedures required for system start up, operation and shutdown.
 - a. The documentation shall include the manufacturer's name, model number, service manual, parts list and source of supply, and a brief description of all equipment and their basic operating features.
- 3. Provide maintenance instructions listing routine maintenance procedures, potential breakdown scenarios and repair options, and a troubleshooting guide.
- G. Warranties.
- H. Certificates:
 - 1. Certificate from pump manufacturer certifying proper installation.
 - 2. Column pipe steel mill certificate.
 - 3. Submit certified performance at the guarantee point for each pump.

1.04 DELIVERY, STORAGE AND HANDLING

A. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, and/or other contaminants.

PART 2 PRODUCTS

2.01 TEMPORARY TEST PUMP ASSEMBLY

- A. The Contractor shall furnish and install the necessary equipment capable of pumping a minimum of 100-gpm at an estimated static water level of 185-feet bgs, with the submersible test pump set at approximately 350-feet bgs.
- B. The temporary test pump assembly unit shall connect to the existing power source and contain controls, column piping, wellhead discharge piping and appurtenances necessary to conduct test pumping for a period of two (2) continuous hours.
- C. The Contractor shall provide temporary discharge piping, fittings and appurtenances of adequate capacity and length to convey water pumped during testing.

- D. Discharge piping shall be provided with a gate valve, flowmeter, pressure gauge and sand testing device.
- E. Pumping equipment shall have throttling devices so that the discharge flowrate may be reduced to 50-gpm if necessary.
- F. Basis of Design for the Test Pump Assembly:
 - 1. <u>Submersible Pump/Motor:</u> 6-inch Stainless Steel Submersible Vertical Turbine Pump, Model SP 230N250-7 with MS6000QFT40 3Ph, 460V, 60 Hz, 25 Hp motor as manufactured by Grundfos Pumps Corporation (http://us.grundfos.com/) or approved equal.
 - 2. <u>Column Piping:</u> 3-inch diameter, standard weight Schedule 40 steel pipe and/or 3-inch diameter Schedule 80 PVC Certa-Lok pipe, or approved equal.
 - 3. <u>Submersible Cable and Pump Control Panel:</u> Shall be per temporary test pump/motor manufacturer recommendations.
 - 4. Submit request for substitution in accordance with Detailed Provisions Section 01 6000 Product Requirements.

2.02 SUBMERSIBLE PUMP

- A. The pump will be driven by a motor attached below the pump section.
- B. The pump shall be supplied with motor, inlet screen, check valve, driver, flow inducer sleeve/shroud, thermal overload device, hanging hook, pump control panel and associated wires/cables.

C. Material:

- 1. All wetted parts shall be constructed of materials compatible with both the intended service and the corrosive effects of brackish water.
- 2. Materials specified as AISI Type 316 stainless steel shall be deemed as the minimum acceptable.
- 3. Bowls, Suction and Discharge Pieces:
 - a. Constructed of AISI 316 stainless steel
- 4. Bearings:
 - a. Top and intermediate bearings shall be nitrile rubber (Buna-N).
- 5. Impellers:
 - a. Constructed of AISI 316 stainless steel dynamically and hydraulically balanced. Impellers shall be securely fastened to the drive shaft in such a manner as to make it readily removable.
- 6. Pump Shaft:
 - a. Constructed of AISI 329 stainless steel.

7. Check Valve:

a. The check valve shall be constructed of AISI 316 stainless steel. The check valve seat shall be nitrile rubber (Buna-N).

8. Impeller Seal Rings:

a. Impeller seal rings shall be nitrile rubber (Buna-N).

D. Operating Conditions:

- 1. Final pump size and intake depth will be determined by the County after results from the test pumping are received.
- 2. Estimated Design Flow Rate: 100 gallons per minute (gpm)
- 3. Estimated Design Head: 400 ft. total dynamic head (TDH)
- 4. Estimated Pump Setting Depth: 350 ft. Below Ground Suface (bgs)
- 5. Estimated Pump Horsepower: 25 hp
- 6. Well Casing Inner Diameter (I.D.): 8-inches
- 7. Total Well Depth: Approximately 405 ft. bgs
- 8. Static Water Level: Approximately 185 ft. bgs
- 9. Well Screen Depths: 180 to 340 ft. bgs

E. Basis of Design:

1. Pump shall be a 6-inch stainless steel pump, Model SP 230N250-7 as manufactured by Grundfos Pumps Corporation (http://us.grundfos.com/) or approved equal. Submersible pump, motor, and motor controller shall be a "package" unit as furnished and recommended by single manufacturer.

2.03 SUBMERSIBLE MOTOR

- A. Submersible pump shall be driven by a continuous-duty motor designed for underwater operation and conform to the latest NEMA specifications for submersible motors.
- B. Motors shall have normal starting torque, low-starting-current characteristics, and shall be of sufficient size so that the nameplate horsepower rating will not be exceeded throughout the entire published pump characteristic curve.
- C. Motor bearings shall provide smooth operations under the conditions encountered for the life of the motor. Adequate thrust bearings shall be provided in the motor to carry the weight of all rotating parts and shall be capable of withstanding upthrust imposed during pump starting.

D. Materials:

- 1. All external surfaces in contact with water shall be constructed of AISI 904L stainless steel.
- 2. Shaft seal shall be a Silicon Carbide/Silicon Carbide (SiC/SiC) material. The output shaft shall be of AISI 318 LN stainless steel.

- 3. Radial bearings shall be silicon carbide/tungsten carbide. Thrust bearing shall be ceramic/carbon.
- 4. Rubber materials shall be nitrile rubber (Buna-N).
- E. Motors shall include a built-in temperature transmitter for protection against overheating. Pump control panel shall include read out and/or monitor to display motor temperature.
- F. Motors shall include built-in cooling chambers at the top and bottom of the motor, and by an internal circulation of motor liquid.
- G. The frame of the pump interconnector and shaft shall conform to the latest revision of NEMA standards for submersible motors especially made for water lubrication.
- H. Motor leads shall be of sufficient length so that they may be spliced above the bowl assembly and the leads shall be protected by an ANSI 316 stainless steel cable guard held in place with stainless steel banding.
 - 1. The guard shall be secured to the pump with ANSI 316 stainless steel bands.
- I. Motors shall conform to NEMA MG-1.
- J. Operating Condition:
 - 1. 25 horsepower (hp), 460 volts, three-phase, 60 Hz, 1.15 SF
- K. Basis of Design:
 - 1. Motor shall be Model MS6000QFT40 3x460/60 25 Hp as manufactured by Grundfos Pumps Corporation (http://us.grundfos.com/) or approved equal. Submersible pump, motor, and motor controller shall be a "package" unit as furnished and recommended by single manufacturer.

2.04 SUBMERSIBLE CABLE

- A. The pump manufacturer shall supply power cable from the submersible pump to reach the pump control panel. Cable shall be sized to limit the voltage drop to no more than two percent (2%) at the motor terminals. The cable shall have three (3) separate conductors and a ground and shall be included in a single continuous jacketed assembly. The insulation shall be suitable for 600 VAC, suitable for continuous immersion and impervious to oil and water.
- B. One (1) continuous length of cable shall connect the submersible motor leads to the above ground well head junction box. The cable should be adequately secured to the column pipe by synthetic vinyl tape and plastic ties, or other non-metallic means as approved by the County, at 10-foot intervals. An additional ten (10) feet of cable shall be housed beneath the wellhead for future splicing.
- C. One (1) continuous length of cable shall be installed from the wellhead junction box to pump control panel and may either be submersible cable as specified above or cable as specified in Detailed Provisions Section 26 0519 Wire and Cable: 600 Volt and Below. Underground cable from wellhead junction box to pump control panel shall be installed in concrete-encased Schedule 80 PVC conduit with detectable warning tape

installed above encasement (see Detailed Provisions Section 26 0543 – Electrical: Exterior Underground). Aboveground and underground conduit shall be as specified in Detailed Provisions Section 26 0533 – Raceways and Boxes.

D. Mechanical Shielding:

1. Electrical cables shall be protected by a corrosion-resistant cable guard where they pass the pump bowls. This guard shall be secured to the pump with Type 303 stainless steel bands.

E. Splices:

- 1. Only one (1) splice will be permitted in the submersible cable from the pump to the wellhead junction box. This splice, at the motor pigtail, shall be completed in a staggered manner so that no individual conductor splice shall be directly opposite another.
- 2. The conductors of the pigtail and power cable shall be joined with rosin core soldered copper butt connectors. The insulating overly shall be adhesive heat shrink insulation as manufactured by 3M Company (http://www.3m.com) or approved equal. The insulation shall be a minimum of 12-inch in length overlayed with vinyl tape and "Scotch-kote" as made by 3M Company or approved equal. The entire splice shall be banded to the drop pipe with protected ANSI 316 stainless steel banding and vinyl tape.
- 3. Termination of the cable at the wellhead junction box shall be made with electrical split bolts and rubber tape rated for 600 VAC. Each 600 VAC surface splice shall be overlaid with vinyl and "Scotch-Kote". Wire nuts are not acceptable.

2.05 COLUMN/DROP PIPE AND FITTINGS

- A. Column piping for the well shall consist of new 3-inch diameter hot-dipped galvanized standard weight Schedule 40 steel pipe conforming to ASTM A53 in combination with new 3-inch diameter Schedule 80 PVC Certa-Lok pipe (www.northamericanpipe.com).
 - 1. A Certa-Lok adapter will be used to transition from the steel piping to the PVC Certa-Lok piping.
- B. New steel pipe sections shall be approximately 21-feet long and shall be threaded and coupled.
- C. Steel mill certifications shall be submitted to the County for new steel pipe. Pipe may be of either domestic or import origin provided mill certificates are provided. Each section of pipe shall be permanently stenciled by the pipe manufacturer with the full specification reference.
- D. New steel piping shall be wrapped with minimum 2-inch wide and 10-mil thick, adhesive backed PVC tape such as Christy's Pipe Wrap, Winmore UPC, Polyken 900, Scotchwrap 50, or approved equal.
- E. Steel pipe fittings shall be 150-pound standard malleable iron fittings conforming to American National Standards, dimensions ANSI B16.3, threads ANSI B1.20.1.

- Fittings material shall conform to ASTM A47/A47M Grade 32510, hot dipped galvanized ASTM A153/A153M.
- F. Each connection of steel pipe shall be coated with a pipe dope that is approved in water systems by the National Sanitation Foundation (NSF). Lead based doping compounds are not permissible.
- G. The Contractor shall furnish and install all fittings to adapt the column pipe to the pump assembly, wellhead, and transition from the new steel pipe to the new PVC Certa-Lok piping.
- H. Steel pipe and fittings shall be secured to prevent unthreading during pump start-up. A minimum of ten (10) ft-lbs per pump motor horsepower is recommended, however, this is intended only as a guideline and Contractor shall be required to conform to pipe manufacturer torque recommendations.

2.06 SOUNDING TUBE

- A. Contractor shall furnish and install one (1) sounding tube in the well.
- B. The Sounding Tube shall be:
 - 1. Flush threaded 11/4-inch PVC, Schedule 40 pipe.
 - 2. Banded to the column piping using plastic ties, or other non-metallic means as approved by the County, at intervals not greater than 20 feet.
 - 3. Extend from the top of the well seal to ten (10) feet below the pump depth.
 - 4. Shall be plugged with a removable cap to prevent contamination and access for using electric sounder.

2.07 PUMP CONTROL PANEL

- A. Contractor shall salvage and reuse existing electrical control panel, NEMA Type 3 enclosure, and all other existing electrical components. Contractor shall furnish and install all necessary components as recommended by the pump manufacturer to ensure a complete working system. Panel shall be in conformance with Detailed Provisions Section 26 2419 Motor-Control Centers.
- B. As a minimum, the panel shall include the following components:
 - 1. Solid state starter/pump controller (rated for 25 hp) as manufactured by pump motor manufacturer.
 - 2. Fusible disconnect switch in conformance with Detailed Provisions Section 26 2800 Overcurrent and Short Circuit Protective Devices and Section 26 2816 Safety Switches.
 - 3. Integrated surge protection device in conformance with Detailed Provisions Section 26 4313 Low Voltage Surge Protection Devices (SPD). Lightning arrester shall be furnished as recommended by pump motor manufacturer.

- 4. Thermal overload and dry-running protection with motor temperature readout. Grundfos MP 204 electronic motor protector with Grundfos IO 112 measuring module or approved equal may be used to provide thermal overload and dry running protection, and in combination with Tempcon temperature transmitter and Pt100 sensor provide temperature readout at pump control panel.
- 5. HOA (hand-off-auto) switch, dry contacts, run light, and run time meter in conformance with Detailed Provisions Section 26 2419 Motor-Control Centers and Section 26 0916 Control Equipment Accessories.
- 6. Panel shall be independently mounted using steel-slotted support system supported by concrete post footings. Post footings shall be 6-inch diameter and minimum 18-inches deep. Concrete compressive strength shall be a minimum of 3,000 psi. Panel shall be supported and anchored to concrete post footings in accordance with Detailed Provisions Section 26 0529 Hangers and Supports for Electrical Systems.

2.08 WELL HEAD SANITARY SEAL

- A. New well head seal shall be installed to accommodate column piping, submersible pump cable, sounding tubes and well vent.
- B. The well seal shall be constructed as to prevent foreign matter from entering the well.
- C. The sanitary seal shall be installed to meet the requirements of California Department of Water Resources Bulletins 74-81 and 74-90, and all requirements of the County of Riverside Department of Environmental Health Services.
- D. Existing gate valve, pipe, well vent, fittings, electrical junction box and selectable run timer switch located at the wellhead may be salvaged and reinstalled by the Contractor upon inspection and approval of the County.

PART 3 EXECUTION

3.01 TEST PUMPING

- A. Furnish and install test pumping assembly (pump, motor, column piping, cables, wellhead discharge piping, pump control panel and appurtenances) using existing power source.
- B. The Contractor shall conduct a two (2) hour pumping test of the well at thirty (30) minute intervals to produce four (4) operating points at the following flow rates: 75-gpm, 100-gpm, 125-gpm and 150-gpm.
- C. The following measurements shall be taken and recorded by the Contractor for the four (4) operating points of the pump:
 - 1. Flow Rate and Discharge Pressure at Wellhead.
 - 2. Static Water Level and Pumping Water Level.
 - 3. Amperage and Voltage.

- 4. Sand Content.
- D. Groundwater from test pumping shall be discharged into adjacent borrow pit located directly north of the non-potable production well using temporary piping/hose provided by the Contractor.
- E. Contractor shall provide measures to dissipate energy of discharge flow to prevent erosion.
- F. Discharge of the pump shall be throttled with a gate valve and measured with a totalizing meter and stopwatch, circular orifice meter, or Venturi meter as approved by the County.
- G. The Contractor shall be responsible for furnishing all temporary equipment, materials, labor, and instruments to conduct testing.
- H. The Contractor shall prepare and submit field log containing all test pumping measurements and results to the County.
- I. A new submersible pump and motor equipment shall not be ordered until the County accepts the test pumping results and determines which pump will be suitable for the project based on the temporary pump results and performance.

3.02 INSTALLATION

- A. Provide a responsible Superintendent, whom is able to communicate effectively with the County's representatives and be on-site at all times while the Work is in progress.
- B. The Contractor shall furnish and install all fittings to adapt the column pipe to the pump assembly, wellhead, and transition from the new steel pipe to the new PVC Certa-Lok piping.
- C. Provide all materials necessary to ensure proper installation of the pumping equipment and proper alignment of the column piping.
- D. All pumping equipment shall be installed in accordance with the pump manufacturer's written instructions and recommendations. Pump intake shall be installed at an elevation approved by the County.
- E. The new steel piping shall be installed from the wellhead down to a depth of approximately 42-feet bgs.
- F. An approximately 6-foot long Certa-Lok adapter will be used to transition the steel piping to new 3-inch PVC Certa-Lok piping.
- G. The new 3-inch PVC Certa-Lok piping shall extend 300-feet to a depth of approximately 348 feet bgs and connect to the pump assembly.
- H. The pump shall be installed at approximately 348 feet bgs.
 - 1. The final pump depth shall be selected by the County after the test pump results.
- I. The sounding tube and electrical cables shall be banded to the column piping as the pump is being installed down the well casing.

3.03 INSPECTIONS AND TESTING

- A. Provide pre-delivery pump manufacturer testing information as specified in Section 1.02.C of this specification section. Testing information shall be accepted by the County prior to shipment.
- B. Contractor shall perform an insulation resistance test (megger) on the pump motor with pigtail and pump motor with submersible pump cable attached. Minimum resistance readings as measured with a 500-volt megger after one (1) minute of applied voltage shall be as follows:
 - 1. Motor only with pigtail ten (10) meg ohms.
 - 2. Motor with submersible cable attached and installed in well two (2) meg ohms.
- C. After completing all of the Work, the Contractor shall perform efficiency tests to determine that the pump is operating in a satisfactory manner free from vibration and noise. Tests shall assure that the units and appurtenances have been installed correctly, that there is no objectionable heating, vibration, or noise, and that all manual and automatic controls function properly.
 - 1. If a deficiency is revealed during any test, such deficiency shall be corrected by the Contractor and the test shall be re-conducted. The Contractor shall perform all rework, and bear all costs associated with rework necessary to correct errors and omissions to bring the Work into compliance with the Contract Documents.
 - 2. All tests performed shall be in accordance with HI, NETA, and NEMA standards with results provided to the County in writing.
- D. Pump start-up and efficiency testing shall be conducted in the presence of the County and pump manufacturer's representative. Unless recommended otherwise by the pump manufacturer, the Contractor shall perform a one (1) hour start-up test conducted at fifteen (15) minute intervals at the following flow rates: 75 gpm, 100 gpm, 125 gpm and 150 gpm.
 - 1. The Contractor shall record the following information in a field log for each flow rate interval: flow rate, water level (static and pumping), discharge pressure at wellhead, sand content, voltage and amperage readings. Discharge of the pump shall be throttled with a gate valve and measured with a totalizing meter and stopwatch, circular orifice meter, or Venturi meter as approved by the County.
 - 2. Water from start-up testing shall be discharged into adjacent borrow pit located directly north of non-potable production well using temporary piping/hose provided by the Contractor.
 - 3. The Contractor shall provide measures to dissipate energy of discharge flow to prevent erosion.
 - 4. Contractor shall be responsible for furnishing all temporary piping, hoses, meters, and instruments to conduct testing.

- E. At a minimum, County staff shall be present at the following installation/inspection points:
 - 1. Verification of pump/motor model and serial number.
 - 2. Meggering of the pump motor with pigtail and pump motor with submersible cable attached.
 - 3. Verification of column pipe materials and coupling methods.
 - 4. Verification of pump control panel and components.
 - 5. Underground electrical conduit installation. After installing conduit, the Contractor shall allow the County two (2) Working Days to survey conduit locations prior to concrete encasement and backfilling.
 - 6. Start-up testing.
- F. The Contractor is responsible for notifying the County 48-hours in advance of setting the pump and initiating start-up.
- G. Contractor shall keep accurate records of each pumping test and furnish copies of all records to the County and pump manufacturer upon completion of the test. The records shall also be available to the County for inspection at any time during testing activities.
- H. Contractor shall submit to the County pump manufacturer certification of the installation, testing, and start-up of pump system.
- I. Contractor shall procure pump manufacturer services to provide a minimum four (4) hour training of County staff.
- J. Contractor shall submit for the County's approval, Operations and Maintenance Manuals for the pump system in accordance with Detailed Provisions Section 01 7823
 Operation and Maintenance Manuals.

3.04 CLEANUP

A. Any waste that is generated by the Contractor, which is incidental to any well construction activities shall be collected and properly disposed by the Contractor, as specified in Detailed Provisions Section 01 5600 – Project Environmental Controls and Section 01 7700 – Closeout Procedures.

END OF SECTION 33 2001





SPECIFICATIONS – DETAILED PROVISIONS SECTION 33 1153: GROUNDWATER MONITORING WELLS CONTENTS

PART 1	GENERAL	1
1.01	SUMMARY	1
1.02	QUALITY ASSURANCE	
1.03	SUBMITTALS	
1.04	DELIVERY, STORAGE, AND HANDLING	3
PART 2	PRODUCTS	3
2.01	GENERAL	3
2.02	DRILLING METHODS	3
2.03	BOREHOLE	5
2.04	HOLDING TANKS	6
2.05	BAILER	
2.06	BLANK WELL CASING	6
2.07	SLOTTED WELL SCREENS	7
2.08	FILTER PACK	
2.09	SURGE BLOCK	
2.10	TRANSITION SAND	
2.11	PELLET ANNULAR SEAL	
2.12	TRANSITION GROUT ANNULAR SEAL	
2.13	SANITARY SEAL	_
2.14	ABOVEGROUND MONUMENT	10
PART 3	B EXECUTION	10
3.01	GENERAL	10
3.02	BOREHOLE DRILLING	11
3.03	ROCK CLAUSE	
3.04	SUBSURFACE FORMATION SAMPLING	
3.05	DAILY CONSTRUCTION PROGRESS REPORT	
3.06	WELL CASING AND SCREEN INSTALLATION	
3.07	FILTER PACK AND TRANSITION SAND INSTALLATION	
3.08	PELLET ANNULAR SEAL INSTALLATION	
3.09	TRANSITION GROUT ANNULAR SEAL INSTALLATION	
3.10	SANITARY SEAL INSTALLATION	
3.11	ABOVE GROUND WELL HEAD PROTECTION	
3 12	CIFANIIP	10





SECTION 33 1153 GROUNDWATER MONITORING WELLS

PART 1 GENERAL

1.01 SUMMARY

- A. The Work covered by this Section shall consist of furnishing all necessary labor, materials, equipment, tools, permits, and supervision for the construction of two (2) groundwater monitoring wells at the approximate locations shown on the Project Drawings.
- B. Related Contract Document Sections include, but are not limited to:
 - 1. Detailed Provisions Division 1 General Requirements
 - 2. Detailed Provisions Section 02 0100 Maintenance of Existing Conditions
 - 3. Detailed Provisions Section 32 3913 Manufactured Metal Bollards
 - 4. Detailed Provisions Section 33 0111 Well Development

1.02 QUALITY ASSURANCE

A. Reference Standards:

- 1. The "Greenbook" Standard Specifications for Public Works Construction.
- 2. Water Well Standards: State of California (Bulletin 74-81 and 74-90).
- 3. California Well Standards and Riverside County Ordinance No. 682.2.

B. Quality Assurance:

- 1. All Work shall be performed by a Contractor with a State of California C-57 Well Drilling License and registered with the Riverside County Department of Environmental Health.
 - a. To register with the Department of Environmental Health please visit: www.rivcoeh.org/OurServices/Wells.
- 2. All Work shall be done to the satisfaction of the County and applicable regulatory agencies.

1.03 SUBMITTALS

- A. Submittal Procedures: See Detailed Provisions Section 01 3300 Submittal Procedures for requirements for the mechanics and administration of the submittal process.
- B. Well Construction Permit:
 - 1. The County shall obtain a Well Construction Permit from the Riverside County Department of Environmental Health for the subject project.
 - 2. The Contractor shall sign the well construction permit prepared by the County and abide by the permit condition.

3. The Contractor shall keep a copy of the well construction permit onsite at all times.

C. Product Details:

- 1. Submit for County approval product details of the:
 - a. Blank Well Casing and Well Screens.
 - b. Filter Pack Gradation and Supplier.
 - c. Transition Sand Gradation and Supplier.
 - d. Bentonite to be used for Annular Seal.
 - e. Bentonite powder and Cement to be used to create Transition Seal.
 - f. Certified cement mix design receipts and delivery receipts for cement placed for Sanitary Seal, if applicable.
 - g. Above Ground Monument:
 - 1) The Contractor shall submit a schematic drawing of the above-ground monument and documentation from the manufacturer that the above-ground monument meets the requirements of this Section.

D. Measuring Device:

- 1. The Contractor shall submit details of the measuring device to be used to measure the level of the filter pack, transition pack, transition sand, and pellet annular seal throughout the backfilling process.
- 2. The Contractor shall provide documentation acceptable to the County that the measurement method is proven to be accurate.
- E. Alternative Drilling Method, if applicable.
- F. Daily Construction Progress Report.
- G. Material Calculations for:
 - 1. Filter Pack and Transition Sand.
 - 2. Pellet Annular Seal.
 - 3. Transitional Grout Seal.
 - 4. Sanitary Seal.

H. Well Report:

1. The Contractor shall provide the County with a copy of the completed California Department of Water Resources (DWR) Well Completion Report for each well installed, within two (2) weeks after the well has been completed.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, Storage, and Handling shall be made in accordance with the following:
 - 1. Maintain end caps through shipping, storage and handling to prevent damage and to prevent entrance of dirt, debris and moisture. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect from weather. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
 - 3. Use slings to handle materials if size requires handling by crane or lift. Rig materials to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
 - 4. Store plastic piping protected from direct sunlight and provide support to prevent sagging and bending.

PART 2 PRODUCTS

2.01 GENERAL

- A. All construction materials shall be new prior to delivery onsite.
- B. Construction and equipment substitutions require written notification at the time of the bid and shall not be accepted anytime thereafter, unless by written authorization from the County.
- C. All equipment supplied by the Contractor shall be available for inspection by the County prior to the beginning of well construction operations.
 - 1. If, in the opinion of the County, any of the equipment is not suitable for well construction operations, either because of mechanical problems, excessive noise, deviation from the specifications, or the build-up of substances which could cause borehole contamination (i.e., from oil, diesel, hydraulic leaks or exhaust residue, etc.), the Contractor shall adjust, replace or decontaminate it with suitable equipment at the Contractor's expense.

2.02 DRILLING METHODS

A. The drilling rig and drilling method is at the Contractor's discretion. All associated drilling equipment shall be in good condition and have sufficient capacity to drill to the depths specified in the Contract Documents.

The borehole for the groundwater monitoring wells shall be drilled at the Site. The table below summarizes the drilling method, total depth and depth to bedrock for each existing groundwater monitoring well previously installed at the Site. Refer to Appendix D – Existing Site Groundwater Data for a copy of the groundwater well boring logs and a site map showing where the existing groundwater wells are located at the site.

		Total Depth of	Depth to Bedrock from Ground
Well ID	Drilling Method	Borehole	Surface
	Air-rotary casing		
BG-01	hammer	256 feet bgs	No bedrock
	Air-rotary casing		
BG-02	hammer	218 feet bgs	No bedrock
	Air-rotary casing		
BG-03	hammer	209.5 feet bgs	No bedrock
	Air-rotary casing		
BG-05A	hammer	187.5 feet bgs	No bedrock
	Dull-wall direct-		
BG-06	drive hammer	180 feet bgs	No bedrock

1. The mast and all running gear (hoists, cable, etc.) of the drill rig shall have a proven, sufficient and demonstrated capacity to lift three (3) times the buoyant weight of the drilling string.

B. Drill Pipe/Auger

- 1. If the Contractor chooses to use the drilling pipe/auger drilling method, the drilling pipe/auger shall be in good condition and shall be connected by standard tool joints.
- 2. The Contractor shall not use drilling pipe equipped with external air lines.
- 3. The drill pipe/auger shall be steam-cleaned prior to its arrival at the drilling site.
- 4. Drill pipe/auger suspected of being contaminated shall be removed and steam-cleaned at the Contractor's expense prior to its use at the site.
- 5. Pipe dope or other lubricating material such as "Gimmie the Green Stuff" or other environmentally safe material, as pre-approved by the County, can be used on the threads of the drill pipe/auger and tremie.

C. Air Rotary Drilling Equipment

- 1. If the Contractor chooses to use the air rotary drilling method, the Contractor shall utilize an oil-less, filtered air compressor with the capability of properly drilling to the minimum depth proposed in the Contract Documents.
- 2. The Contractor shall use an air cyclone or other acceptable method, pre-approved by the County, for the collection of drill cuttings at the point where air is returned to the surface (i.e., flow directed out of the discharge pipe).
- 3. The air cyclone shall function to allow the County to collect representative samples of the subsurface.
- 4. If samples cannot be adequately collected, drilling will cease until the problem can be corrected to the satisfaction of the County.

D. Conductor Casing

- 1. If the Contractor chooses to use a conductor casing with the air rotary drilling method, the conductor casing shall be in good condition and shall be connected by standard tool joints.
- 2. The conductor casing shall be decontaminated prior to its arrival at the site.
- 3. Conductor casing suspected of being contaminated shall be decontaminated at the Contractor's expense prior to its use at the site.
- 4. Pipe dope or other lubricating material such as "Gimmie the Green Stuff" or other environmentally safe material, as pre-approved by the County, can be used on the threads of the conductor casing if necessary.
- E. If the Contractor chooses to use a drilling method, other than auger drilling or air rotary drilling, the Contractor shall submit a written description of the proposed drilling method to the County, prior to mobilizing the drilling equipment.
 - 1. The County shall review the written submittal and may amend the Contract Documents to account for the proposed drilling method.
 - a. The scope of any amendments will be limited to specifications to ensure the environmental integrity of the borehole.
 - 2. The County shall authorize the proposed drilling method in writing.
 - a. The Contractor may mobilize drilling equipment after written approval.
 - b. The County's approval of a Contractor's alternative drilling method does not relieve the Contractor of his responsibility to drill the boreholes to the depths specified in the Contract Documents or to construct the monitoring wells.
 - c. The County's authorization does not constitute approval or agreement that the alternative drilling method will allow the Contractor to successfully complete the Project.

2.03 BOREHOLE

- A. The purpose of the well borehole is to determine the thickness and nature of all formations penetrated, determine the location of water bearing strata, obtain other hydrological and geological information and allow for well construction.
- B. Each well borehole shall be drilled by a method chosen by the Contractor. Limitations and/or conditions for different drilling methods are specified in Section 2.02 of this Detailed Provisions.
- C. Payment for drilling and sampling of the well borehole shall be based on vertical feet drilled (first pass) measured from the ground surface. It shall include all materials, labor, tools, and equipment required to drill the borehole, collect formation samples, maintain circulation (depending on drilling method chosen) and protect the borehole from caving.
 - 1. No payment will be made for temporary casings installed at the Contractor's option.
- D. Payment will only be made for the Contractor's first pass successful drilling method.

- 1. If the Contractor chooses drilling method(s) that are unsuccessful, the County will not make additional payment for vertical feet drilled for second, third or any subsequent passes by the Contractor to obtain the required borehole depth.
- 2. No payment will be made for borehole corrections that may be necessary to comply with these specifications. Payment for any borehole corrections will be included in the unit price for the corresponding Borehole Drilling and Sampling.
- E. Payment for Borehole Drilling and Sampling shall be made at the unit price for Borehole Drilling and Sampling in Detailed Provisions Section 01 2900 Payment Procedures.
- F. Payment for stand-by time will be at the unit price for the corresponding Drill Rig Standby in Detailed Provisions Section 01 2900 Payment Procedures.
- G. Payment for rock clause drilling will be at the unit price for the corresponding Rock Clause Drilling in Detailed Provisions Section 01 2900 Payment Procedures.

2.04 HOLDING TANKS

- A. The Contractor shall use a drum(s) or tank(s) to store groundwater generated during well construction activities.
- B. The Contractor shall anticipate/provide adequate containment volume (e.g., number of drums or tanks) to maintain efficient operations.
- C. The water shall be temporarily stored on the landfill property.

2.05 BAILER

A. A suction bailer shall be provided with the appropriate fittings to allow for the removal of debris, which may accumulate in the bottom of the well casing.

2.06 BLANK WELL CASING

- A. The blank well casing shall be nominal 4-inch inner diameter, schedule 80 PVC as specified in ASTM D1785 (latest edition), equipped with threaded joints at the ends of the blank casing sections. The blank casings shall be factory assembled.
- B. Threaded joints shall be machined with beveled/interference compression fit shoulder seals to increase compressional strength.
- C. O-ring seals shall be provided within the threaded joints to mitigate leakage and contaminants from entering at the threaded joint.
- D. In all cases, the blank casing used in conjunction with the screen shall have the same inner diameter as the screen to ensure that the inside diameter of the blank casing matches the inside diameter of the screen.
- E. The bottom of each well casing shall be fitted with a threaded end cap. The end cap shall be of the same chemical and physical properties as the blank well casing.
- F. All casing material shall be new.

G. Payment for blank well casing installation shall be based on measurement of vertical feet of blank well casing installed complete and in place, which includes furnishing and installing centralizer and end caps, at the unit price for Well Casing in Detailed Provisions Section 01 2900 – Payment Procedures.

2.07 SLOTTED WELL SCREENS

- A. The well screens shall be nominal 4-inch diameter, schedule 80 PVC as specified in ASTM D1785 (latest edition), equipped with threaded joints at the end of the slotted well screen section. The screen shall be factory-assembled.
- B. The slotted well screen shall be machined 0.020-inch slot (20-slot).
- C. Threaded joints shall be machined with beveled/interference compression fit shoulder seals to increase compressional strength.
- D. O-ring seals shall be provided within the threaded joints to mitigate leakage and contaminants from entering at the threaded joint.
- E. In all cases, the slotted well screens used in conjunction with the blank casing shall have the same inner diameter as the screen to ensure that the inside diameter of the blank casing matches the inside diameter of the screen.
- F. All casing material shall be new.
- G. Payment for well screen installation shall be based on measurement of vertical feet of well screen installed complete and in place at the unit price for Well Screen in Detailed Provisions Section 01 2900 Payment Procedures.

2.08 FILTER PACK

- A. All sand/gravel to be used for the filter pack shall be hard, water or air worn gravels, and washed clean of silt, sand, dirt and foreign matter. It shall be well rounded, graded, and shall have a coefficient of uniformity less than 2.5.
- B. The gravel/sand shall be kept free of all foreign matter. Gravel/sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the Contractor's expense prior to the arrival of new gravel/sand.
- C. Gravel shall be non-mixed (i.e., pure silica) #3 gradation blend by Oglebay Norton Industrial Sands, Inc. (formerly known as Colorado Silica Sand, Inc.), or approved equal.
- D. The #3 gradation blend shall meet the sieve analyses parameters specified below.

Sieve #	Sieve Opening	Cumulative Percent
Sieve #	(mm)	Passing
1/2-Inch	12.5	100
4	4.75	100
6	3.35	100
8	2.36	100-98
12	1.7	89-55

16	1.18	46-10
20	0.85	13-1
30	0.60	5-0

- E. Crushed gravel will not be accepted.
- F. All gravel is subject to approval by the County prior to use in the packing process.
- G. Filter pack payment will be based on measurement of vertical feet of filter pack installed form the bottom to the top of each specified interval at the unit price for Filter Pack in Detailed Provisions Section 01 2900 Payment Procedures.

2.09 SURGE BLOCK

- A. A surge block consists of a rubber plunger specifically fabricated for a 4-inch diameter well casing.
- B. The surge block shall fit tightly within the well casing to create the necessary vacuum and pressure in the groundwater column for surging procedures.

2.10 TRANSITION SAND

- A. All sand used for the transition sand layer shall be hard, water or air worn gravels, and washed clean of silt, dirt and foreign matter.
- B. The transition sand shall be kept free of all foreign matter. Transition sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the Contractor's expense prior to the arrival of new transition sand.
- C. Sand shall be a non-mixed (i.e., pure silica) #60 gradation blend by Oglebay Norton Industrial Sands, Inc. or approved equal.
- D. The #60 gradation blend shall meet the sieve analyses parameters specified below.

Sieve #	Sieve Opening	Cumulative Precent
	(mm)	Passing
20	0.85	100
30	0.60	100
40	0.425	100-94
50	0.30	60-25
70	0.212	15-5
100	0.15	4-0

- E. Crushed gravel will not be accepted.
- F. All sand is subject to approval by the County prior to use in the transition sand layer.
- G. Transition sand payment will be based on measurement of vertical feet of transition sand installed from the bottom to the top of each specified interval at the unit price for Transition Sand in Detailed Provisions Section 01 2900 Payment Procedures.

2.11 PELLET ANNULAR SEAL

- A. An approximate 5-foot thick seal consisting of dry non-coated medium-sized bentonite chips or tablets shall be installed above the screened interval, or as otherwise specified.
- B. Coated bentonite pellets, chips or tablets shall not be used to construct these seals.
- C. The bentonite chips or tablets shall be certified NSF/ANSI Standard 60, Drinking Water Treatment Chemicals Health Effects.
- D. Payment for annular seal materials will be based on measurement of vertical feet of seal installed from the bottom to top of the specified interval, at the unit price for Pellet Annular Seal in Detailed Provisions 01 2900 Payment Procedures.

2.12 TRANSITION GROUT ANNULAR SEAL

- A. The transition grout shall be composed of a bentonite-cement mixture.
- B. Cement used for the transition grout seal shall be a Type II Portland cement conforming to ASTM C150 (latest edition).
- C. Bentonite used in the grout shall be pulverized (powder or granular) and shall be certified NSF/ANSI Standard 60, Drinking Water Treatment Chemicals Health Effects.
- D. Water used for the cement mix shall be clean and of potable quality.
- E. The transition grout shall be composed of 1-gallon of water to 1- to 1½-pounds of bentonite powder. Cement shall be added to the bentonite grout at a ratio of 1- to 2-pounds of cement to 1-gallon of water.
- F. Transition Grout Mixture:
 - 1. Bentonite and water shall be mixed first, prior to the addition of cement.
 - 2. Bentonite, water and cement shall be mixed in the ratios specified in Section 2.12E.
 - 3. The final mixture of transition grout shall be thoroughly blended before pumping.
 - 4. Bentonite and cement shall be completely incorporated into the grout, no unmixed lumps of material shall exist in the grout.
- G. Payment for the transition grout annular seal will be based on measurement of vertical feet of seal installed at the unit price for Transition Seal in Detailed Provisions Section 01 2900 Payment Procedures.
 - 1. No stand-by time will be paid for any down-time between the placement of the transition grout annular seal and the sanitary seal.

2.13 SANITARY SEAL

- A. Cement used for the sanitary seal shall be a Type II Portland cement conforming to ASTM C150 (latest edition).
- B. The cement mix used for the sanitary seal shall be a 10.5-sack sand-cement grout. There shall be not more than two (2) parts by weight of sand to one (1) part by weight of cement. The water-cement ratio shall be 7-gallons per sack of cement (94 pounds).

- C. Water used for the cement mix shall be clean and of potable quality.
- D. Materials used as additives for Portland cement mixtures in the field shall meet the requirements of ASTM C494 (latest edition), "Standard Specifications for Chemical Admixtures for Concrete."
- E. Special quick-setting cement, retardants to setting, and other additives, including hydrated lime to make the mix fluid (up to ten percent (10%) of the volume of cement) may be used.
- F. Sanitary Seal Mixture:
 - 1. Water, sand and cement shall be mixed in the ratios specified in Section 2.13B.
 - 2. The final mixture of sanitary seal shall be thoroughly blended before pumping. Cement and sand shall be completely incorporated into the mixture, no unmixed lumps of material shall exist in the mixture.
- G. Payment for the sanitary seal will be based on measurement of vertical feet of sanitary seal installed at the unit price for Sanitary Seal in Detailed Provisions Section 01 2900 Payment Procedures.
 - 1. No stand-by time will be paid for any down-time between the placement of the transition seal and the installation of the sanitary seal, or during the 24 hours the sanitary seal is curing.

2.14 ABOVEGROUND MONUMENT

- A. The aboveground monument installed to protect the wellhead shall be a 12 in x 7 ft round well protector, with a hinge lockable lid, or County approved equal.
 - 1. Payment for the aboveground monument shall be made at the unit price for Aboveground Well Head Protection in Detailed Provisions Section 01 2900 Payment Procedures.

PART 3 EXECUTION

3.01 GENERAL

- A. The well construction shall be performed in accordance with:
 - 1. Water Well Standards: State of California (Bulletin 74-81 and 74-90)
 - 2. California Well Standards and Riverside County Ordinance No. 682.3.
- B. The Contractor is cautioned to properly secure/stabilize the well during all phases of construction. Improper or poor security/stabilization of the well may lead to delays.
 - 1. Such delays will be the responsibility of the Contractor and the County shall not pay any cost associated with such delays.
- C. The Contractor shall use good practice during installation, backfilling and well development to ensure the integrity of the borehole, screen and casing is maintained.

D. A general schematic diagram of the well construction, including location of the filter pack, transitional sand, pellet annular seal, transitional grout seal and sanitary seal is provided in Sheet 8 of the Project Drawings.

3.02 BOREHOLE DRILLING

- A. The Contractor shall not start drilling without the County onsite to confirm the location of the borehole.
- B. The Contractor shall provide all tools, accessories, air compressor, power, fuel, materials, supplies, lighting, other equipment, and experienced personnel necessary to conduct safe and efficient drilling operations.
- C. A drilling superintendent (tool pusher) shall be available at all times at the request of the County.
- D. The Contractor shall prepare to drill the borehole to the total depth specified in the Contract Documents.
 - 1. The borehole diameter shall be a minimum of 10-inches.
 - 2. The County will be onsite during the drilling process to specify the exact depth of the borehole to be drilled based on drilling cuttings, the geologic log and the depth to groundwater encountered during drilling.
 - 3. The exact depth specified by the County may be more or less than the total depth specified in the Contract Documents.
- E. The Contractor shall take all measures necessary to protect the borehole from caving or raveling during drilling operations and at the conclusion of drilling operations, when the final depth has been achieved.
 - 1. Improper or poor security/stabilization of the borehole may lead to borehole collapse and delays prior to or during well construction.
 - 2. Such collapse or delays will be the responsibility of the Contractor and the County shall not pay any costs associated with such delays or collapse.
- F. Soil drilling cuttings not placed in drums shall be placed on plastic sheeting that has a minimum 10-mil thickness. Soil drilling cuttings placed on plastic sheeting may be placed near the borehole, as long as the location does not interfere with daily landfilling activities. The County shall be responsible for the final handling, transportation and disposal of drilling cuttings, following the Contractor's demobilization from the site.
- G. Once groundwater is encountered in the borehole, soil drilling cuttings will be stored in 55-gallon drums. At the end of each well construction, the Contractor shall transport the drummed drilling cuttings to the soil drilling cutting storage location. The County shall be responsible for the final handling, transportation and disposal of drilling cuttings, following the Contractor's demobilization from the site.
- H. Upon completion of drilling a specific borehole to the depth specified in these Contract Documents or as directed by the County, the County will provide, within twenty-four (24) hours, the Contractor with well construction details or request that the Contractor drill deeper.

- 1. The Contractor shall be paid for stand-by time for each working hour beyond the 24-hour assessment period that the County does not provide the Contractor with well construction details or the request to drill deeper.
- I. The Contractor may discharge minor volumes of nuisance groundwater generated during drilling directly to the ground surface adjacent to the well site, as permitted by the State Water Resources Control Board Water Quality Order No. 2014-0057-DWQ.
- J. The Contractor shall implement appropriate best management practices (BMPs) to mitigate the discharge of sediment laden groundwater.
 - 1. Where necessary, BMPs shall also be implemented to mitigate groundwater discharge related erosion.
 - 2. The discharge of groundwater shall also be controlled to prevent contact with significant materials or equipment, including those of the Contractor and County.

3.03 ROCK CLAUSE

- A. The Rock Clause shall go into effect ONLY after the Contractor verbally notifies the County that the drilling advancement rate is less than five (5) feet per hour and that the Contractor is requesting Rock Clause time.
 - 1. The decrease in the drilling rate shall be due to natural causes such as hard formations caused by gravel and boulders.
 - 2. The Contractor is cautioned to practice proper drilling techniques for gravel alluvium drilling environments.
 - 3. Reduction in drilling rate due to worn bits will not be grounds for invoking the Rock Clause.
 - 4. Borehole caving problems and decreased penetration rates due to improper air flow rates or choice of drilling bits are not acceptable causes to invoke the Rock Clause.
- B. A recording device such as a "geolograph" shall be required to document Rock Clause time.

3.04 SUBSURFACE FORMATION SAMPLING

- A. The Contractor shall, at each change of formation, at five-foot intervals between changes in formation, and at intervals requested by the County, collect a representative sample of the interval or new formation. Each sample shall be given to the County for proper logging and storage.
- B. If the Contractor chooses to drill with hollow stem auger, the Contractor shall collect relatively undisturbed soil samples with a Standard Penetration Test split spoon sampler.
- C. If the Contractor chooses to drill with a form of air rotary, the Contractor shall provide an acceptable means to the County whereby the Contractor can safely obtain representative samples of formation cuttings from the air stream.

- D. The ground surface around the sampling area shall be kept graded and free from stockpiled drilling cuttings and shall be kept free of trash, equipment and other debris.
- E. If samples cannot be adequately collected, drilling will cease until the problem is corrected to the satisfaction of the County.

3.05 DAILY CONSTRUCTION PROGRESS REPORT

- A. The driller shall prepare a daily record of drilling activities completed each Working Day that drilling is completed.
- B. The Daily Construction Progress Report shall identify:
 - 1. First pass vertical footage drilled.
 - 2. Approved Rock Clause hours.
 - 3. Approved stand-by time hours.
- C. The report shall be submitted to the County for review and approval at the conclusion of each Working Day.

3.06 WELL CASING AND SCREEN INSTALLATION

- A. A typical well design will consist of a 40 to 50-foot long interval of well screen with approximately five (5) feet of blank casing below (silt trap) and the remainder of the blank casing located above the screen and extending to the ground surface.
- B. The proposed well casing and screen lengths are specified in the Contract Documents.
 - 1. These lengths are subject to change, as specified by the County, based on the subsurface conditions encountered during drilling.
- C. The County will submit the final well design depths/lengths to the Contractor within 24-hours after the County directs the Contractor to terminate drilling at a specific well location.
 - 1. While the well design is being completed, no additional payment for stand-by time shall be made, except where specified in Section 3.02.H.1.
 - 2. The final well design will specify where the blank casing, screen intervals, filter pack intervals, seal intervals and sanitary seal will be placed in the borehole.

D. Joints:

- 1. All field joints, where blank casings and/or screen casing are joined together, shall be connected via the machine threaded ends.
- E. Installation of casing and screen:
 - 1. The well casing string shall be suspended at all times in tension from the surface by means of a clamp, landing plate, or equivalent method. The bottom of the casing string shall be at a sufficient distance above the bottom of the borehole to ensure that it is not supported by the bottom of the borehole.

- 2. The Contractor will measure and record the lengths of the casing as it is being installed into the borehole.
 - a. The casing lengths will be such that the screens are placed per the design interval and the total installed length of the casing is as specified in the design.

3. Centralizers:

- a. Two centralizers shall be installed around the screen section, one near the bottom and one approximately mid-height.
- b. One centralizer shall be installed around the blank casing, at approximately mid-height.
- 4. If for any reason the casing cannot be placed in the correct position, or at a depth acceptable to the County, the Contractor shall take whatever measures are necessary to properly construct the well at his own expense, including abandoning the borehole.
- 5. If any of the casings should collapse or break prior to well completion, they shall be withdrawn and replaced at the Contractor's expense.
- 6. All Work required to be repeated because of the Contractor, and all additional materials, labor, and equipment required, shall be furnished at the expense of the Contractor and no claim for additional compensation shall be made or be allowed therefore, except as specifically provided herein.
- 7. The well casing shall be completed at ground surface.
 - a. Wells requiring above ground well head protection shall have extra casing length added to allow for construction as specified in Section 3.11 and as shown on Sheet 8 of the Project Drawings.
- F. Prior to backfilling the annular space around the casing string, the Contractor shall measure the bottom of the well casing to verify its total depth.

3.07 FILTER PACK AND TRANSITION SAND INSTALLATION

- A. Once drilling is completed, the bottom of the borehole is stabilized, if necessary, and the casing is installed within the borehole, the installation of the filter pack and transition sand can proceed.
- B. Installation of Filter Pack:
 - 1. The gravel/sand, if stockpiled onsite, shall be kept free of all foreign matter.
 - 2. Gravel/sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the contractor's expense prior to the arrival of new gravel/sand on site.
 - 3. Throughout the backfilling process, the Contractor shall complete calculations to determine the amount of material necessary to backfill the specified interval.

- a. The Contractor shall record all calculations and volumes of material used to backfill the specified interval, as well as measurements obtained after the gravel/sand placement and verify those calculations with the County.
- 4. The gravel/sand filter pack shall be placed into the annulus of the well through a tremie.
- 5. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
- 6. The gravel/sand shall not be allowed to freefall more than 20-feet from the bottom of the tremie to the top of the gravel/sand.
- 7. The filter pack level shall be measured throughout the backfilling process.
- 8. The gravel/sand filter pack shall be installed from the bottom of the borehole to approximately five (5) feet above the top of screen.
- 9. Upon completion of installation of each filter pack, or portion thereof, no additional Work will be performed until the depth to the top of that filter pack has been determined by use of proven, accurate equipment.
- C. Prior to installing the transition sand materials, the Contractor shall consolidate the filter pack by gently surging the well screen with a tight-fitting surge block.
- D. The Contractor shall then re-measure the top of the filter pack and install additional gravel/sand to achieve the design depth.
- E. Following the installation of the filter pack, the Contractor shall install an approximate 5-foot thick layer of transition sand.
- F. Installation of Transition Sand:
 - 1. The transition sand, if stockpiled onsite, shall be kept free of all foreign, matter.
 - 2. Transition sand suspected of being contaminated with dust, oil or other contaminants will not be accepted and shall be removed at the contractor's expense prior to the arrival of new sand on site.
 - 3. Throughout the backfilling process, the Contractor shall complete calculations to determine the amount of material necessary to backfill the specified interval.
 - a. The Contractor shall record all calculations and volumes of material used to backfill the specified interval, as well as measurements obtained after the transition sand layer placement and verify those calculations with the County.
 - 4. The transition sand shall be placed into the annulus of the well through a tremie.
 - 5. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
 - 6. The transition sand shall not be allowed to freefall more than 20 feet from the bottom of the tremie to the top of the transition sand.
 - 7. The transition sand level shall be measured throughout the backfilling process.

- 8. The transition sand layer shall be installed from the top of the filter pack to a thickness of five (5) feet.
- 9. Upon completion of installation of the transition sand layer, or portion thereof, no additional Work will be performed until the depth to the top of that transition sand layer has been determined by use of proven, accurate equipment.

3.08 PELLET ANNULAR SEAL INSTALLATION

- A. Once the filter pack and transition sand are installed above the screened well casing, the annular seal can be installed.
- B. The annular seal seals the annular space between the borehole wall and the well casing.
- C. The seal shall be composed of medium-sized bentonite pellets and be installed in the annulus of the well to hydraulically separate the aquifer penetrated by the well casings.
- D. Annular Seal Installation.
 - 1. The Contractor shall calculate the amount of seal material necessary to backfill a specified interval.
 - a. The Contractor shall record all calculations and volumes of seal mixture used, and the measurements obtained after the seal placement and verify those calculations with the County.
 - 2. An approximate five-foot thick seal, consisting of bentonite chips or tablets, shall be installed by gravity via a tremie above the transition sand layer.
 - 3. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
 - 4. Seal materials shall not be allowed to freefall more than 20 feet from the bottom of the tremie to the depth established from previous measurement.
 - 5. The seal level shall be measured throughout the backfilling process.
 - 6. The seal shall be installed from the top of the transition sand to a thickness of five (5) feet in a continuous operation.
 - 7. The Contractor shall measure the depth of the top of the seal after installation.
 - 8. Upon complete installation of the annular seal, or portion thereof, no additional Work will be performed until the depth to the top of that seal has been determined by use of proven, accurate equipment.

3.09 TRANSITION GROUT ANNULAR SEAL INSTALLATION

- A. The transition grout annular seal seals the annular space between the borehole and the well casing in the upper portion of the borehole.
- B. Transition Grout Installation.
 - 1. The Contractor shall calculate the amount of transition grout necessary to complete the annular seal.

- a. The volume placed shall not be less than the calculated volume of the annular space between the borehole and the well casing.
- b. The Contractor shall record all calculations and volumes used, and measurements obtained after each interval is pumped.
- c. The Contractor shall provide the calculations and volumes to the County for his review and approval.
- 2. The transition grout shall be placed into the annulus of the well through a tremie.
- 3. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
- 4. The tremie pipe shall extend from the ground surface to the bottom of the zone to be grouted.
- 5. Cement grout shall be placed from bottom to top, in a continuous operation.
- 6. The tremie pipe shall be slowly raised as the grout is placed, but the discharge end of the grout pipe must be submerged in the emplaced grout at all times until grouting is completed.
- 7. The Contractor shall take whatever precautions are necessary to prevent borehole and/or casing collapse during placement of the transition grout.
 - a. In the event any borehole and/or casing collapses prior to completion of the transition grout, the Contractor shall take whatever steps are necessary to reopen the borehole, replace the casing and place the seal as specified.
 - b. Any such remedial action shall be conducted at the Contractor's expense.
- 8. No activity shall occur directly adjacent to the well site, nor will stand-by time be granted, during a minimum 1-hour period immediately following the placement of the transition grout.
- 9. The casing shall be adequately secured such that no damage or contamination will occur during this period.

3.10 SANITARY SEAL INSTALLATION

- A. The sanitary seal seals the annular space between the borehole and the well casing in the upper portion of the borehole up to the ground surface.
- B. After placement of the casings, screens, filter pack, transition sand, pellet seal and transition seal, the sanitary seal shall be installed.
- C. Sanitary Seal Installation.
 - 1. The Contractor shall calculate the amount of seal material necessary to complete the sanitary seal.
 - a. The volume placed shall not be less than the calculated volume of the annular space between the borehole and the well casing.

- b. The Contractor shall record all calculations and volumes used, and measurements obtained after each interval is pumped.
- c. The Contractor shall provide the calculations and volumes to the County for his review and approval.
- 2. The sanitary seal shall be placed into the annulus of the well through a tremie.
- 3. The Contractor shall ensure that the well casing and tremie are sufficiently aligned to prevent binding while raising the tremie during the backfilling process.
- 4. The tremie pipe shall extend from the ground surface to the bottom of the zone to be sealed.
- 5. The sanitary seal shall be placed from bottom to top, in a continuous operation.
- 6. The tremie pipe shall be slowly raised as the sanitary seal is placed, but the discharge end of the grout pipe must be submerged in the emplaced sanitary seal at all times until placement of the sanitary seal is completed.
- 7. The Contractor shall take whatever precautions are necessary to prevent borehole and/or casing collapse during placement of the sanitary seal.
 - a. In the event any borehole and/or casing collapses prior to completion of the sanitary seal, the Contractor shall take whatever steps are necessary to reopen the borehole, replace the casing and place the seal as specified.
 - b. Any such remedial action shall be conducted at the Contractor's expense.
- 8. No activity shall occur directly adjacent to the well site, nor will stand-by time be granted, during a minimum 24-hour period immediately following the placement of the sanitary seal.
- 9. The casings shall be adequately secured such that no damage or contamination will occur during this period.

3.11 ABOVE GROUND WELL HEAD PROTECTION

- A. The Contractor shall install an above ground monument surrounded by cement-filled bollards to protect the well head.
- B. Upon completion of well development, the Contractor shall excavate around the well casing to approximately 2.5 feet below ground surface, to a sufficient width, to facilitate the installation of the monument.
- C. The Contractor shall cut off the well casing such that the casing extends approximately 24 inches above the top of surrounding ground surface.
 - 1. The cut edges shall be regular in appearance and Contractor shall file the edges to remove all burrs and sharp corners from the edge.
 - 2. Contractor shall equip each cut well casing with a fitted J-plug.
- D. The Contractor shall install an approximate six-inch thick layer of crushed rock base in the base area between the well casing and the excavation walls to support the monument.

- 1. The rock base shall be compacted and leveled to provide a supportive surface.
- E. Contractor shall install the monument on top of the crushed rock base such that the elevation of the top of the monument is approximately three (3) feet above the surrounding ground surface.
- F. Contractor shall install an additional approximate six-inch layer of crushed rock base in the space between the monument and the well casing, and in the space between the monument and the surrounding excavation walls, to provide lateral stability to the vault.
 - 1. The rock base shall be compacted and leveled within the vault to provide a supportive surface free of trip hazards.
- G. Contractor shall install concrete between the monument and the excavation walls, from the top of the rock base to an elevation matching the surrounding grade.
- H. Contractor shall install a concrete pad measuring 4-feet by 4-feet by 4-inches in thickness, centered on the monument.
 - 1. The concrete pad shall consist of structural concrete installed in a single pour at the same time the concrete is placed surrounding the monument.
- I. The Contractor shall install four (4) bollards in accordance with Detailed Provisions Section 32 3913 Manufactured Metal Bollards, around the well monument to protect the well casing from vehicular traffic.
- J. After completion of the aboveground well head protection, the Contractor shall wait 24-hours before commencing well development procedures in accordance with Detailed Provisions Section 33 0111 Well Development.
- K. Upon completion of all Work in connection with the well construction and well development, the well shall be capped by placing a lockable J-plug on the top of the casing.

3.12 CLEANUP

- A. Any waste that is generated by the Contractor, which is incidental to any well construction activities, shall be collected and properly disposed by the Contractor, as specified in Detailed Provisions Section 01 5600 Project Environmental Controls and Section 01 7700 Closeout Procedures.
- B. The procedure for collecting and handling soil drilling cuttings is specified in Section 3.02.F and 3.02.G above.

END OF SECTION 33 1153





SPECIFICATIONS – DETAILED PROVISIONS SECTION 33 1600: WATER UTILITY STORAGE TANKS CONTENTS

PART 1	GENERAL	. 1
	SUMMARY	
	QUALITY ASSURANCE	
	PORTABLE WATER TOWER DESCRIPTION	
	SUBMITTALS	
	PRODUCTS	
2.01	ACCEPTABLE MANUFACTURERS	. 3
	PIPING	
	ELECTRICAL EQUIPMENT	
	FOUNDATION	
PART 3	EXECUTION	. 4
3.01	PORTABLE WATER TOWER INSTALLATION	. 4
3.02	PIPING INSTALLATION	. 5
3.03	FIELD OLIALITY CONTROL	5





SECTION 33 1600 WATER UTILITY STORAGE TANKS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

- 1. Contractor shall provide all design, labor, equipment, tools, material, fabrication, erection, installation, and training for a portable elevated steel water storage tank and tower including, but not limited to, risers, piping, drains, level indicators, and automatic fill system controls.
- B. Related Detailed Provisions Sections include, but are not limited to:
 - 1. Division 01 General Requirements.
 - 2. Division 26 Electrical.
 - 3. Section 31 2133 Trenching, Backfilling, and Compacting for Utilities.
 - 4. Section 33 1114 Non-Potable Water Production Well

1.02 **OUALITY ASSURANCE**

A. Reference Standards:

- 1. American Society of Mechanical Engineers (ASME):
 - a. ASME B16.5 Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard.
 - b. ASME B16.9 Factory-Made Wrought Buttwelding Fittings.
 - c. ASME B36.10M Welded and Seamless Wrought Steel Pipe.
- 2. American Society for Testing and Materials (ASTM):
 - a. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
 - b. ASTM A135/A135M Standard Specification for Electric-Resistance-Welded Steel Pipe.
 - c. ASTM A795/A795M Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
 - d. ASTM A234/A234M Standard Specification for Piping Fittings for Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - e. ASTM D1785 Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - f. ASTM D2564 Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

- g. ASTM F656 Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
- 3. American Water Works Association (AWWA):
 - a. AWWA C606 Standard for Grounded and Shouldered Joints.
- 4. Department of Transportation (DOT)
 - a. DOT 406
- 5. International Code Council (ICC)
- 6. Underwriters Laboratories, Inc. (UL).
 - a. All electrical components shall be UL listed.

1.03 PORTABLE WATER TOWER DESCRIPTION

- A. The portable water tower shall be designed in accordance with the following:
 - 1. Portable water tower tank shall be constructed using A36 structural steel.
 - 2. Exterior of portable water tower tank shall be coated with primer and epoxy paint.
 - 3. Interior of portable water tower tank shall be coated with a rust-resistant three-coat epoxy coating system to prevent corrosion.
 - 4. Minimum Capacity: 12,000-gallons
 - 5. Portable Water Tower Accessories:
 - a. Steel-Fitted Heads
 - b. 10-inch Diameter Discharge Tube (approximately 14' from Grade)
 - c. Dual 3-inch Fill Pipe with Approved Air Gaps, Valves, Float Assemblies, and Camlock on End of Pipe
 - d. Mechanical Float System (Fill Controlled by Water Depth)
 - e. Automatic Shut Off Valve
 - f. Tank Access Hatch
 - g. OSHA-Approved Access Ladder
 - h. Optional Items That Can Be Removed After Delivery and Installation for a Cost Credit to the County:
 - 1) Fifth Wheel Hitch
 - 2) Removeable Hydraulic Pump and Motor
 - 3) Heavy-Duty Long-Life Axle, Suspension, and Air Brake System
 - 4) Dual Wheels and Tires
 - 6. Wiring, conduit connections, and necessary switch controls for the water in the portable water tower to automatically fill via the groundwater well pumping system.

1.04 SUBMITTALS

A. Submittal Procedures: See Detailed Provisions Section 01 3300 – Submittal Procedures for requirements for the mechanics and administration of the submittal process.

B. Product Data:

- 1. Provide manufacturer's standard catalog pages and data sheets for all products including, but not limited to:
 - a. Portable Water Tower and Accessories
 - b. Piping
 - c. Valves
 - d. Tank Coating System
 - e. Electrical Equipment

C. Shop Drawings:

- 1. Dimensioned portable water tower fabrication drawings indicating all accessories and appurtenances with detailed plan and elevation views.
- 2. Single-Line diagram(s) for electrical equipment.

D. Samples:

1. For County's exterior tank coating color selection, submit standard color samples from manufacturer's full line of colors.

E. Foundation Design:

1. Foundation design shall be in accordance with tank manufacture's installation requirements and recommendations. Must be stamped by a professional structural engineer registered in the State of California.

F. Closeout Submittals:

1. Operation and Maintenance (O&M) Manual Content: Provide O&M manual documentation as required by Detailed Provisions Section 01 7823 – Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers or approved equals are acceptable:
 - 1. Portable Water Tower and Accessories:
 - a. Valew 12,000-Gallon Portable Water Tower, www.valew.com
 - b. Rain for Rent 12,000-Gallon Portable Water Tower, www.rainforrent.com
 - c. Klein KPT-120, www.kleinproducts.com

B. Submit request for substitution in accordance with Detailed Provisions Section 01 6000 – Product Requirements.

2.02 PIPING

A. Steel Pipe:

- 1. Schedule 40, black-steel pipe: ASTM A135; ASTM A795; or ASME B36.10. Pipe ends may be factory or field formed to match joining method. Steel pipe shall be epoxy lined and coated.
- 2. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.
- 3. Steel Welded Fittings: ASTM A234 and ASME B16.9
- 4. Grooved-End Pipe Couplings for Steel Piping: AWWA C606 and UL 213, ridged pattern, unless otherwise indicated for steel pipe dimensions. Include ferrous housing selections, EPDM-rubber gasket, and bolts and nuts.

B. PVC Pipe:

1. Schedule 40: ASTM D1785. Joints shall be solvent-welded per ASTM D2564 with using primer per ASTM F656.

2.03 ELECTRICAL EQUIPMENT

- A. Contractor shall provide and install all necessary electrical equipment such that the portable water tower tank automatically fills when the water level in the tank falls below a specified height. Electrical equipment shall include, but is not limited to: wiring and wiring connections, electrical conduit, switch controls, and enclosures. The portable water tower tank shall be filled via a well pump as stated in Detailed Provision Sections 33 1114 Non-Potable Production Wells and shown on the Project Drawings.
- B. Electrical equipment shall be installed as specified in Detailed Provisions Division 26 Electrical.

2.04 FOUNDATION

A. The Contractor shall be responsible to ensure the existing native earthen pad and/or water tower restraint system is in accordance with tank manufacture's installation requirements and recommendations. The Contractor shall scarify upper one-foot of subgrade and recompact to 90% relative compaction or as recommended by tank manufacture.

PART 3 EXECUTION

3.01 PORTABLE WATER TOWER INSTALLATION

A. Install equipment as shown on approved Shop Drawings and per portable water tower manufacturer's recommendations.

- B. Portable water tower shall be installed to accommodate a minimum vertical clearance from grade to 10-inch discharge pipe of 14-feet.
- C. Once portable water tank is installed, the Contactor can remove the fifth wheel hitch, removable hydraulic pump and motor, axle, suspension, and air brake system, and the wheels for a cost credit to the County.

3.02 PIPING INSTALLATION

A. Install piping and fittings in accordance with pipe manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

A. Functional and performance testing of the water storage and distribution system shall be conducted by the Contractor in the presence of a County Representative.

END OF SECTION 33 1600



APPENDIX A: FUGITIVE DUST CONTROL REQUIREMENTS

APPENDIX A-1: MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT (MDAQMD) RULE 403 - FUGITIVE DUST CONTROL REQUIREMENTS

APPENDIX A-2: SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE 403 & 403.1 (SUPPLEMENTAL FOR COACHELLA VALLEY) - FUGITIVE DUST



APPENDIX A-1: MOJAVE DESERT AIR QUALITY MANAGEMENT DISTRICT (MDAQMD) RULE 403 - FUGITIVE DUST CONTROL REQUIREMENTS



(Adopted: 05/07/76; CARB Ex. Ord. G-73: 02/01/77; Readopted: 07/25/77; Amended: 10/28/20)

Rule 403 Fugitive Dust Control

(A) General

- (1) Purpose
 - (a) The purpose of this rule is to reduce the amount of PM₁₀ entrained in the ambient air from anthropogenic Fugitive Dust sources within the District by requiring actions to prevent, reduce, or mitigate Fugitive Dust.
- (2) Applicability
 - (a) This Rule shall apply to the following Active Operations:
 - (i) A project or Facility with a Disturbed Surface Area of at least twenty acres (including Mining, Stone, Asphalt, and Clay Facilities);
 - (ii) Residential Construction/Demolition Activity with a Disturbed Surface Area of at least ten (10) acres;
 - (iii) Non-residential Construction/Demolition Activity with a Disturbed Surface Area of at least five (5) acres;
 - (iv) Moving, depositing, or relocating more than 2,500 cubic yards per day of Bulk Materials on at least three consecutive days;
 - (v) Solar Projects capable of generating at least one (1) megawatt of electrical energy or covering at least one (1) acre;
 - (vi) Heavily-Traveled unpaved roads used for industrial activity; and
 - (vii) Any other project or facility where visible fugitive dust beyond the property line of the emissions source causes injury, detriment, nuisance, or annoyance to any considerable number of persons or the general public, or so designated by the APCO.
 - (b) In addition, this Rule also applies to the Owner/Operator of Disturbed Surface Areas.

(B) Definitions

The definitions contained in District Rule 102 – *Definition of Terms* shall apply unless the term is otherwise defined herein:

(1) "<u>Active Operation</u>" – Activity capable of generating Fugitive Dust, including, but not limited to: Bulk Material storage, handling and processing; Earth-Moving Activity; Construction/Demolition Activity; and movement of vehicles on

- Unpaved roads, unpaved access areas, unpaved traffic areas, disturbed surface areas, and unpaved equipment storage areas.
- (2) "<u>Bulk Material</u>" Sand, gravel, soil, aggregate, and any other organic or inorganic solid matter capable of releasing Fugitive Dust when stored, disturbed, or handled, and is generally un-packaged.
- (3) "<u>Construction/Demolition Activity</u>" Any on-site mechanical activity preparatory to or related to building, altering, rehabilitating, demolishing, or improving property that results in Disturbed Surface Area, including, but not limited to, the following activities: grading; excavation; loading; crushing; cutting; planing; shaping; or ground breaking.
- (4) "Disturbed Surface Area" Portion of the earth's surface that has been physically moved, uncovered, destabilized, or otherwise modified from its undisturbed natural condition, thereby increasing the potential for emission of Fugitive Dust. Does not include areas restored to a natural state with vegetative ground cover and soil characteristics similar to adjacent or nearby natural conditions; paved or otherwise covered by a permanent structure; and sustained a vegetative ground cover over at least 70 percent of an area for period of at least six months. Includes projects with planned or forecasted disturbances.
- (5) "<u>Dust Control Plan" (DCP)</u> A document that describes what fugitive dust control measures will be taken for the full duration of a project to comply with this Rule.
- (6) "Earth-Moving Activity" The use of any equipment for any activity where soil is being moved or uncovered, and shall include, but is not limited to the following: grading, earth cutting and filling, loading or unloading of dirt or other Bulk Materials, adding to or removing from Open Storage Piles of Bulk Materials, landfilling, and soil mulching.
- (7) "<u>Fugitive Dust</u>" Any solid particulate matter that becomes airborne, without first passing through a stack or duct, directly or indirectly as a result of anthropogenic activities.
- (8) "Heavily-Traveled" Typically carrying more than 800 vehicle trips per day.
- (9) "<u>High Winds</u>" When the wind speed instantaneously exceeds 40 kilometers (25 miles) per hour, or when the average wind speed is greater than 24 kilometers (15 miles) per hour. The average wind speed determination shall be on a 15-minute average at the nearest District-approved meteorological station.
- (10) "Hygroscopic Materials" Any materials that are readily capable of absorbing moisture from the air. Chemical/organic stabilization/suppression materials control PM₁₀ emissions from fugitive dust by applying any non-toxic chemical or organic dust suppressant, other than water, which meets any specifications, criteria, or tests required by any federal, state, or local water agency and is not prohibited for use by any applicable law, rule, or regulation.

- "Mining, Stone, Asphalt, and Clay Facilities" Any company, business, facility, process, or operation which uses or processes crustal materials including stone, asphalt and clay materials and is classified under Standard Industrial Classification (SIC) 10, 14, 29, and 32.
- (12) "Open Storage Pile" Any accumulation of Bulk Material not fully enclosed, covered, or chemically Stabilized with five percent (5%) or greater Silt content. Pile Silt content shall be assumed to be five percent (5%) or greater, unless a person can show, by sampling and analysis in accordance with ASTM method C-136 or other equivalent method approved in writing by the APCO and the California Air Resources Board, that the Silt content is less.
- (13) "Paved Road" An improved street, highway, alley, public way, or easement that is covered by typical roadway materials excluding access roadways that connect a facility with a public Paved Road and are not open to through traffic. Public Paved Roads are those open to public access and that are owned by any federal, state, county, municipal, or any other governmental or quasi-governmental agencies. Private Paved Roads are any paved Roads not defined as public.
- (14) "<u>Publicly Maintained</u>" Under the jurisdiction of, physically maintained by, and owned by Federal, State, county, municipal, or other governmental or quasigovernmental agencies.
- (15) "Road Surface Silt Loading" A measurement of the amount of loose material accumulated on a road surface in terms of weight of material per unit area. For the purposes of this Rule, Road Surface Silt Loading shall be calculated in ounces of silt per square yard and be determined by sweeping or vacuuming at least 5 pounds of material from representative strips of known area of the surface and establishing the 75 micrometers or silt fraction through the use of a No. 200 sieve (USEPA AP-42 "Compilation of Air Pollutant Emission Factors" Section 11.2.6, ASTM Standard D-75 "Standard practice for Sampling Aggregates," and ASTM Standard C-136 "Sieve Analysis of Fine and Course Aggregates").
- (16) "Silt" Any aggregate material with a particle size less than 75 micrometers in diameter which passes through a No. 200 sieve.
- 17) "Stabilize" To reduce the Visible Fugitive Dust generating capability of a surface by paving, chemically treating, watering, or compacting. For purposes of this definition, a surface with a Visible Crust is deemed Stabilized. Chemical treatment must be performed with a non-toxic chemical dust suppressant substance not disapproved for such use by the applicable Regional Water Quality Control Board, the California Air Resources Board, the United States Environmental Protection Agency, or any applicable law, rule, or regulation, and should moreover meet any specifications, criteria, or tests required by any federal, state, or local water agency.
- (18) "<u>Trackout</u>" Visible Bulk Material deposited upon public roadways as a result of Active Operations, including any Bulk Material that adheres to and agglomerates

- on the exterior surface of motor vehicles, haul trucks, and equipment (including tires) that have been released onto a Paved Road and can be removed by a vacuum sweeper or a broom sweeper under normal conditions.
- (19) "<u>Unpaved</u>" Not covered by one or more of the following: concrete, asphaltic concrete, recycled asphalt, or asphalt. Public unpaved roads are any unpaved roadway owned by Federal, State, county, municipal, or other governmental or quasi-governmental agencies. Private unpaved roads are all other unpaved roadways not defined as public. This definition excludes horse trails, hiking paths, bicycle paths, or other similar pathways used exclusively for purposes other than travel by motorized vehicles.
- (20) "Visible Crust" Having a surface that "passes" the dropped ball test method pursuant to Attachment C of this Rule.
- (21) "<u>Visible Fugitive Dust</u>" Dust emissions from a fugitive source as dark as or darker in shade than that shade designated No. 1 on the Ringelmann Chart or equivalent, as published by the United States Bureau of Mines, or of equivalent opacity, for a period or periods aggregating more than three (3) minutes in any one (1) hour.

(C) Requirements

- (1) Any person shall not cause or allow the emissions of Fugitive Dust from any transport, handling, construction or storage activity so that the Visible Fugitive Dust remains visible in the atmosphere beyond the property line of the emission source, except during High Winds.
- (2) A person shall take every reasonable precaution to minimize Fugitive Dust emissions from wrecking, excavation, grading, clearing of land, and solid waste disposal operations.
- (3) A person shall not cause or allow PM₁₀ to exceed 100 micrograms per cubic meter when determined as the difference between upwind and downwind samples collected on federal reference method samplers at the property line for a minimum of five hours, except during High Winds. Installation of samplers or monitors to determine compliance with this subsection shall be required at the APCO's discretion.
- (4) Cities, Towns, and the County of San Bernardino shall collectively:
 - (a) Stabilize sufficient Publicly Maintained Heavily Traveled Unpaved Roads to reduce fugitive dust entrainment and wind erosion by at least 1,541 tons per year of PM₁₀ emissions relative to 1990.
- (5) The Owner/Operator of a site undergoing weed abatement activity shall not:
 - (a) Disrupt the soil crust to the extent that Visible Fugitive Dust is created due to wind erosion.

- (6) The Owner/Operator of any Construction/Demolition activities subject to this Rule in accordance with subsection (A)(2) of this Rule shall:
 - (a) Obtain and maintain a District-approved Dust Control Plan as set forth by Section (D) of this Rule; and
 - (b) Use periodic watering for short-term stabilization of Disturbed Surface Area to minimize visible fugitive dust emissions. For the purposes of this Rule, use of a water truck to maintain moist disturbed surfaces and actively spread water during visible dusting episodes shall be considered sufficient to maintain compliance; and
 - (c) Take actions sufficient to prevent project-related Trackout onto paved surfaces; and
 - (d) Cover loaded haul Vehicles while operating on Publicly Maintained paved surfaces; and
 - (e) Stabilize graded site surfaces upon completion of grading when subsequent development is delayed or expected to be delayed more than thirty days, except when such delay is due to precipitation that dampens the disturbed surface sufficiently to eliminate Visible Fugitive Dust emissions; and
 - (f) Cleanup project-related Trackout or spills on Publicly Maintained paved surfaces within twenty-four hours; and
 - (g) Reduce non-essential Earth-Moving Activity under High Wind conditions. For purposes of this Rule, a reduction in Earth-Moving Activity when visible dusting occurs from moist and dry surfaces due to wind erosion shall be considered sufficient to maintain compliance; and
 - (h) Maintain the natural topography to the extent possible during grading and other earth movement; and
 - (i) Provide a construction schedule that specifies construction of parking lots and paved roads first, where feasible, and upwind structures prior to downwind structures; and
 - (j) Cover or otherwise contain Bulk Material carried on haul trucks operating on paved roads; and
 - (k) Remove Bulk Material tracked onto paved road surfaces.
- (7) In addition to the provisions of subsections (C)(6) of this Rule, the Owner/Operator of a Construction/Demolition source disturbing 10 or more acres shall:

- (a) Provide Stabilized access route(s) to the project site as soon as is feasible. For purposes of this Rule, as soon as is feasible shall mean prior to the completion of Construction/Demolition activity;
- (b) Maintain natural topography to the extent possible;
- (c) Construct parking lots and paved roads first, where feasible; and
- (d) Construct upwind portions of project first, where feasible;
- (8) The Owner/Operator of a Mining, Stone, Asphalt, and/or Clay Facility shall:
 - (a) Obtain and maintain a District-approved Dust Control Plan as set forth by Section (D) of this Rule; and
 - (b) Stabilize industrial Unpaved Roads carrying more than ten vehicle trips per day with the majority of those vehicles weighing 30 tons or more;
 - (c) Enclose exterior belt conveyors sufficiently to cover the top and sides of the Bulk Material being transferred (including portable belt conveyors where feasible), or employ an alternate suppression system sufficient to prevent Visible Fugitive Dust;
 - (d) Manage or treat Bulk Material Open Storage Piles sufficiently to prevent Visible Fugitive Dust emissions. For purposes of this Rule, active watering during visible dusting episodes shall be sufficient to maintain compliance;
 - (e) Cover loaded Bulk Material haul vehicles while traveling upon publicly maintained paved surfaces. For the purposes of this Rule, maintain at least six (6) inches of freeboard on haul vehicles when transporting Bulk Material (equivalent to the vehicle freeboard requirements of the California Vehicle Code (§23114));
 - (f) Employ a dust suppression system at Bulk Material transfer points sufficient to prevent Visible Fugitive Dust;
 - (g) Stabilize or eliminate Bulk Material Open Storage piles that have been or are expected to be inactive for at least one (1) year;
 - (h) Stabilize as much unpaved operations area as is feasible;
 - (i) Vacuum sweep Bulk Material spills on paved surfaces weekly or more often, as needed;
 - (j) Prevent facility-related Bulk Material Trackout on Publicly Maintained paved surfaces;

- (k) Clean up facility-related Bulk material Trackout and spills on Publicly Maintained roads within twenty-four hours; and
- (l) Employ belt cleaners and/or conveyor return scrapers to minimize conveyor spillage where feasible (including portable conveyor belts).
- (9) The Owner/Operator of any Solar Project subject to this Rule in accordance with Subsection (A)(2) of this Rule shall:
 - (a) Obtain and maintain a District-approved Dust Control Plan as set forth by Section (D) of this Rule; and
 - (b) Not cause or allow PM₁₀ to exceed 100 micrograms per cubic meter when determined as the difference between upwind and downwind samples collected on federal reference method samplers at the property line for more than four (4) hours in any consecutive 24 hours, except during High Winds.

A written request to remove said monitors may be sent to the APCO after thirty-six consecutive months of data demonstrate compliance, and subsequently removed upon APCO approval of such written request.

- (10) Searles Valley Minerals or its successor shall comply with the following requirements:
 - (a) Obtain and maintain a District-approved Dust Control Plan as set forth by Section (D) of this Rule; and
 - (b) Treat and maintain a minimum of 12 miles of heavily traveled unpaved roads on Searles Dry Lake in a manner sufficient to maintain Road Surface Silt Loading less than or equal to 0.58 ounces per square yard:
 - (i) For purposes of this subsection, weekly brackish watering of non-Heavily Traveled Searles Dry Lake unpaved roads is presumed to be sufficient to maintain Road Surface Silt Loadings less than or equal to 0.58 ounces per yard.
 - (ii) Searles Valley Minerals or its successor shall maintain records of treatment activity sufficient to establish location, type, and timing of such treatment.
 - (c) Treat and maintain a minimum of eight (8) miles of heavily traveled unpaved roads on the Searles Dry Lake, in a manner sufficient to maintain Road Surface Silt Loading less than or equal to 0.17 ounces per square yard.
 - (i) For the purposes of this subsection, treatment with salt and weekly brackish watering is sufficient to maintain Road Surface Silt Loadings less than or equal to 0.17 ounces per square yard.

- (ii) Searles Valley Minerals or its successor shall maintain records of treatment activity sufficient to establish location, type, and timing of treatment.
- (d) Clean paved roads used for industrial activity on a biweekly basis or more often as needed to ensure that spilled and tracked-on Bulk material is removed rapidly.
 - (i) Searles Valley Minerals or its successor shall maintain records of cleaning activities sufficient to establish location, time, and amount of cleaning activities.
- (e) Treat or clean heavily traveled paved roads and areas used for industrial activity in a manner sufficient to maintain Road Surface Silt Loading less than or equal to 2.94 ounces per square yard.
 - (i) For purposes of this subsection, mechanical sweeping, and collection on a biweekly basis is sufficient to maintain Road Surface Silt loadings less than or equal to 2.94 ounces per square yard.
 - (ii) Searles Valley Minerals or its successor shall maintain records of mechanical sweeping and collection sufficient to establish location, time, and amount of vacuum sweeping.
- (f) Enclose exterior belt conveyors greater than thirty feet in length sufficient to cover the top and sides of Bulk Material being transferred.
- (g) Permanently eliminate at least 2,750 square feet of Bulk Material storage pile surface area that was exposed during 1990:
 - (i) Searles Valley Minerals or its successor shall maintain records of storage pile reduction or limitation shall be maintained sufficient to identify the location, type (including storage pile silt content) and timing of storage pile modification.
- (h) Cover or otherwise contain Bulk Material carried on haul trucks while operating on paved roads:
 - (i) Fly and bottom ash haul trucks maintaining the moisture content of at least 12 percent need not be covered.
- (i) Treat and maintain Heavily Traveled Unpaved/Paved Road access points in a manner sufficient to maintain a Road Surface Silt loading of 2.94 ounces per square yard on the Paved Road surface adjacent to the Unpaved Road:
 - (i) For purposes of this subsection, mechanical sweeping and collection on a biweekly basis is sufficient to maintain Road

- Surface Silt loadings less than or equal to 2.94 ounces per square vard.
- (ii) Searles Valley Minerals or its successor shall maintain records of activities performed to maintain the specified Road Surface Silt Loading sufficient to establish location, time, and type of treatment.

(D) Dust Control Plans

- (1) Any Owner/Operator required by Section (C) above or as directed by the APCO in writing shall obtain and maintain a District-approved Dust Control Plan (DCP).
- (2) The Owner/Operator shall submit a DCP as per Attachment A of this Rule to the APCO prior to the start of any Active Operations. An Owner/Operator may submit one (1) DCP covering multiple projects/facilities/sites at different sites where Active Operations will commence within the next 12 months provided the DCP includes each project/facility/site size, location, and types of activities to be performed. The DCP shall specify the expected start and completion date of each project.
- (3) The Owner/Operator shall install and maintain project/facility/site signage that meets the minimum standards of Attachment B prior to the start of any Active Operations.
- (4) Active Operations shall not commence until the APCO has approved the DCP.
- (5) The APCO shall approve, disapprove, or conditionally approve the DCP within ten days of DCP submittal. The approved DCP shall remain valid until the termination of all Active Operations. Failure to comply with the provisions of an approved DCP is deemed to be a violation of this rule.
- (6) The Owner/Operator shall submit a copy of the DCP approval to the land use agency upon request.
- (7) The Owner/Operator shall provide written notification to the APCO not less than ten days prior to the commencement of Active Operations via delivery, facsimile, mail or confirmed email. Prior to the start of any Active Operations, the Owner/Operator must meet with a District staff on-site to review DCP requirements and confirm compliance with this rule.
- (8) The Owner/Operator must notify the District within ten days if a significant change occurs to the project/facility/site or operations covered by the DCP. An appropriately modified DCP must be submitted to the District within thirty days of the change.
- (9) An approved DCP shall be valid for a period of one (1) year from the date of approval of the DCP. DCPs must be resubmitted annually to recertify the measures included in the DCP, at least sixty days prior to the expiration date, or the DCP shall become disapproved as of the expiration date. If all Fugitive Dust

sources and corresponding control measures or special circumstances remain identical to those identified in the previously approved DCP, the resubmittal may contain a simple statement of 'no change', in which case all corresponding resubmittal fees shall be waived.

- (10) The Owner/Operator shall notify the APCO in writing within thirty days after a project/facility/site no longer qualifies as an Active Operation.
- (11) Any person subject to a DCP requirement shall be assessed the following fees that must be paid in full for the DCP to be processed and approved:
 - (a) Any person subject to a DCP submittal pursuant to this Rule shall be assessed applicable filing and evaluation fees pursuant to Regulation III *Fees*.
 - (b) The submittal of an annual statement of 'no change,' pursuant to this Rule, shall not be subject to filing fees pursuant to Regulation III *Fees*.
 - (c) The performance of a DCP site inspection or DCP site stability inspection will incur inspection fees pursuant to Regulation III *Fees*.
- (12) Failure to comply with any provisions in an approved or conditionally approved DCP shall be a violation of this Rule.

(E) Exemptions

- (1) The requirements of this Rule shall not apply to:
 - (a) Agricultural Operations, as defined by California Health & Safety Code §41074(b), including such operations on Unpaved Roads;
 - (b) Construction/Demolition projects disturbing less than one-half total acre or 21,780 square feet;
 - (c) Active Operations required by federal or state endangered species legislation, rule, policy or biological opinion, or any Active Operation, Open Storage Pile, or Disturbed Surface Area for which necessary Visible Fugitive Dust preventive or mitigative actions are in conflict with the Federal Endangered Species Act (50 CFR §402.01);
 - (d) Active Operations conducted during emergency life-threatening situations, or in conjunction with any officially (by local, regional, state or federal government) declared disaster or state of emergency;
 - (e) Active Operations conducted by essential service utilities to provide electricity, natural gas, telephone, water and sewer services during periods of unplanned service outages and emergency disruptions;

- (f) Non-periodic (occurring no more than three (3) times per year and lasting less than thirty cumulative days per year) or emergency maintenance of flood control channels and water spreading basins;
- (g) Emergency fire suppression operations ordered, performed or sanctioned by Federal, state, or local government (including, but not limited to, creation of fuel breaks);
- (h) The removal of debris due to storms, earthquakes, or other emergency situations.
- (i) APCO-approved motion picture, television, and video production activities when dust emissions are required for visual effects. In order to obtain this approval, the APCO must receive notification in writing at least 72 hours in advance of any such activity.
- (j) Officially-designated public parks and recreational areas, including national parks, national monuments, national forests, state parks, state recreational parks, and county regional parks.
- (k) Paved and Unpaved roads under the jurisdiction of and maintained by a public authority and open to public travel.
- (l) Activities within the fence line of Edwards Air Force Base, China Lake Naval Air Weapons Station, National Training Center Fort Irwin, Marine Corps Logistics Base, Marine Corps Air Ground Combat Center (or any other military installation so designated by the APCO), so long as those activities do not create Visible Fugitive Dust beyond the fence line.
- (m) Weed abatement operations disturbing less than one (1) acre on a lot that includes a residence;
- (n) Dust generated by mowing performed for weed abatement purposes;

(F) Record Keeping

- (1) The Owner/Operator of an Active Operation shall maintain the following records (as applicable) on site, or readily accessible, for at least two (2) years after the date of each entry (or through the completion of the project). Such records shall be provided to the District upon request:
 - (a) The District-approved DCP; and,
 - (b) Supporting documents to demonstrate compliance with the requirements of this Rule only for those days that a control measure was implemented, such as operational records, information regarding operations, source tests, laboratory analyses, monitoring data, and other appropriate information in a manner and form sufficient in demonstrating compliance with the DCP.

(G) Compliance Schedule

- (1) All Active Operations subject to this Rule existing as of October 26, 2020 shall submit a DCP to the APCO within sixty days of October 26, 2020. Existing Active Operations covered by a DCP approved by the APCO prior to October 26, 2020 shall submit a DCP in accordance with this Rule at the direction of the APCO.
- (2) All new Active Operations subject to this Rule shall submit a DCP to the APCO prior to the commencement of Active Operations.
- (3) Any Project or Facility required to install PM₁₀ monitors by this Rule shall have those monitors installed and operating within six (6) months of October 26, 2020, or within six (6) months of written notification of such a requirement by the APCO.

(H) Contingency Measures

The requirements of this section only apply if the USEPA makes a finding, as evidenced by publication in the Federal Register, that there has been a violation of the PM₁₀ National Ambient Air Quality Standard (NAAQS) within MDAQMD boundaries.

- (1) Contingent Requirements
 - (a) Cities, Towns, and the County of San Bernardino shall:
 - (i) Stabilize sufficient Unpaved Roads to generate at least 2,267 tons per year of fugitive PM₁₀ emission reductions.

Attachment A Mandatory Fugitive Dust Control Plan Elements

- (a) Project, facility, or site name, address, major cross streets, and city.
- (b) Land use agency name and assessor's parcel number (if necessary to locate the project/site/facility).
- (c) Mailing address, telephone number, mobile phone number and email address for:
 - (i) Project or facility owner
 - (ii) Project general contractor
 - (iii) Project or facility contact person
 - (iv) Project or facility 24-hour contact person¹ (if separate from the above)
 - (v) Dust Control Plan preparer (if separate from the above), specifying contact person
- (d) Total area of disturbed land surface (in acres), total area of entire project or facility site (in acres), and total disturbed area to be left inactive for more than seven (7) days (in acres).
- (e) Expected start and completion dates of Active Operations. For phased projects attach a map indicating phase areas and specify date ranges for each phase area.
- (f) Specify location(s) of required fugitive dust contact information signage, including posting loaded haul truck speed limit signage on permanent private roads.
- (g) Specify fugitive dust control measures that will be used to Stabilize each of the following activities (as applicable):
 - (i) Structural demolition; Pre-activity; Active Operations; Inactive operations (including after work hours, weekends and holidays); Temporary Stabilization of disturbed areas to be left inactive for more than seven days; Unpaved access areas, unpaved haul roads, unpaved traffic areas, and unpaved equipment storage areas (including a suggested 15 miles per hour speed limit for loaded haul trucks which may be exceeded if Visible Fugitive Dust is not generated); Wind events; Outdoor handling of Bulk Materials; Outdoor storage of Bulk Materials; On-site transportation of Bulk Materials; Off-site transportation of Bulk Materials; and Outdoor transport using chutes and conveyors.
- (h) Specify water application equipment and/or dust suppressant types, number, capacity, water and/or dust suppressant application frequency, hours of operation, including water

Fugitive Dust Control

 ¹ 24 hour contact person is an individual available by telephone at any hour of the day or night and capable of marshaling a response to a dust complaint
 403-13
 MDAQMD Rule 403

and/or dust suppressant application equipment and/or dust suppressants available for use after normal working hours, on weekends and holidays with name and phone number of after-hours contact, and for an alternate after-hours contact. Specify water supply and/or dust suppressant type, number, capacity and source, including distance to off-site source and specifying details of approval for access to off-site source (owner, contact name and telephone number).

- (i) Applicable dust suppressants are inclusive of water, Hygroscopic Materials, or chemical/organic stabilization/suppression materials.
- (i) Specify dust suppressants other than water that will be used (if applicable), including area of application, product name, contractor name and telephone number, application rate, application frequency, application equipment type and capacity. Attach product specifications, instructions and environmental impacts (and approvals or certifications related to the appropriate and safe use for ground application).
- (j) Specify other dust control methods as applicable, including physical barriers, speed limit signs, use of vegetation, gravel, and pavement. Physical barriers, if used, will include a minimum of four feet of wind fencing on the entire perimeter of the project, which will be maintained as needed to be kept intact and to remove windblown dropout.
- (k) Specify contingency measures that will be implemented if any of the above become inoperable or are found to be insufficient. Active Operations will cease whenever visible dust emissions cannot be effectively controlled.
- (l) Specify long-term stabilization methods. Including the stabilization of storage piles and disturbed surfaces which are idle for two weeks or more.
- (m) Specify carryout and trackout prevention and cleanup procedures as applicable, including grizzlies, gravel pads, paved access areas, wheel washers, haul truck housekeeping, cleanup method and frequency.
- (n) If required by the APCO or this Rule, specify the type of PM_{10} monitors, the upwind location, the downwind location, the monitoring frequency, and the data storage method, and acknowledge that all monitored PM_{10} data shall be provided to District personnel upon request.
- (o) Specify any actions or procedures required by other District Rules (as and if applicable) if not already listed above.
- (p) A responsible official certification including printed name, title, signature, date of signature, telephone number, mobile number and email address.

Attachment B Signage Minimum Requirements

This signage allows the public to contact the responsible party if Fugitive Visual Dust emissions or Trackout of material is observed from a project or facility.

Sign size	48" x 96"
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Sign Template

Permit # (if applicable)	4"	
Site Name	4"	
Project Name	4"	
IF YOU SEE DUST COMING FROM THIS SITE CALL	4"	
Contact: (XXX) XXX-XXXX	6"	
If You Do Not Receive a Response, Please Call The Mojave Desert AQMD at		
1-800-635-4617	3"	

Signage must be located within 50 feet of each public site entrance.

One sign is sufficient for multiple site entrances with the approval of the APCO.

Text height shall be at a minimum as shown on right side of sign template above.

Sign background must contrast with lettering, typically black text with white background.

Sign should be one-inch AC laminated plywood board.

The lower edge of the sign board must be a minimum of six feet and a maximum of seven feet above grade.

The telephone number listed for the contact must be a local or a toll-free number and shall be accessible 24 hours per day. The contact name requirement may be waived with the approval of the APCO.

If contactor phone number changes the sign must be updated with new contact information within 30 days.

Original signage used during site construction will satisfy the signage requirement during operations and can remain if contact information is current and the sign is in satisfactory condition.

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Attachment C

Dropped Ball Test Method

Equipment: One steel ball, 0.625 inches in diameter (5/8 inch), 16.33 grams

A ruler or measuring tape

(Optional) A cardboard frame with a one foot by one foot opening

Step 1. Select a one foot by one foot survey area that is representative, or typical, of the crusted surface. Remove any blow sand from the survey area (loose grains which have not originated from the surface you are testing).

- Step 2. Hold the small steel ball one foot above the survey area, using the ruler or tape to ensure that the ball is at the correct height. Drop the ball into the survey area.
- Step 3. Observe the ground around the dropped ball closely.
 - A. Did the ball sink into the surface so that it is partially or fully surrounded by loose grains of dirt?
 - B. Did the ball drop out of view entirely?

Pick up the ball from the survey area and observe the impact location closely.

C. Are loose grains of dirt visible?

If any of the three questions posed in this step can be answered "yes" then this location on the surface does not pass the dropped ball test.

- Step 4. Select two additional areas within the survey area to drop the ball. Repeat Steps 2 and 3 on each location. If more than one location within the survey area fails Step 3, the survey area fails the dropped ball test.
- Step 5. Select at least two other representative survey areas. Pick the areas randomly and spaced out.
- Step 6. Examine results. If all survey areas have passed Step 4 the surface is stable and has a Visible Crust.

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APPENDIX A-2: SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) RULE 403 & 403.1 (SUPPLEMENTAL FOR COACHELLA VALLEY) - FUGITIVE DUST



(Adopted May 7, 1976) (Amended November 6, 1992) (Amended July 9, 1993) (Amended February 14, 1997) (Amended December 11, 1998)(Amended April 2, 2004) (Amended June 3, 2005)

RULE 403. FUGITIVE DUST

(a) Purpose

The purpose of this Rule is to reduce the amount of particulate matter entrained in the ambient air as a result of anthropogenic (man-made) fugitive dust sources by requiring actions to prevent, reduce or mitigate fugitive dust emissions.

(b) Applicability

The provisions of this Rule shall apply to any activity or man-made condition capable of generating fugitive dust.

(c) Definitions

- (1) ACTIVE OPERATIONS means any source capable of generating fugitive dust, including, but not limited to, earth-moving activities, construction/demolition activities, disturbed surface area, or heavy- and light-duty vehicular movement.
- (2) AGGREGATE-RELATED PLANTS are defined as facilities that produce and / or mix sand and gravel and crushed stone.
- (3) AGRICULTURAL HANDBOOK means the region-specific guidance document that has been approved by the Governing Board or hereafter approved by the Executive Officer and the U.S. EPA. For the South Coast Air Basin, the Board-approved region-specific guidance document is the Rule 403 Agricultural Handbook dated December 1998. For the Coachella Valley, the Board-approved region-specific guidance document is the Rule 403 Coachella Valley Agricultural Handbook dated April 2, 2004.
- (4) ANEMOMETERS are devices used to measure wind speed and direction in accordance with the performance standards, and maintenance and calibration criteria as contained in the most recent Rule 403 Implementation Handbook.
- (5) BEST AVAILABLE CONTROL MEASURES means fugitive dust control actions that are set forth in Table 1 of this Rule.

- (6) BULK MATERIAL is sand, gravel, soil, aggregate material less than two inches in length or diameter, and other organic or inorganic particulate matter.
- (7) CEMENT MANUFACTURING FACILITY is any facility that has a cement kiln at the facility.
- (8) CHEMICAL STABILIZERS are any non-toxic chemical dust suppressant which must not be used if prohibited for use by the Regional Water Quality Control Boards, the California Air Resources Board, the U.S. Environmental Protection Agency (U.S. EPA), or any applicable law, rule or regulation. The chemical stabilizers shall meet any specifications, criteria, or tests required by any federal, state, or local water agency. Unless otherwise indicated, the use of a non-toxic chemical stabilizer shall be of sufficient concentration and application frequency to maintain a stabilized surface.
- (9) COMMERCIAL POULTRY RANCH means any building, structure, enclosure, or premises where more than 100 fowl are kept or maintained for the primary purpose of producing eggs or meat for sale or other distribution.
- (10) CONFINED ANIMAL FACILITY means a source or group of sources of air pollution at an agricultural source for the raising of 3,360 or more fowl or 50 or more animals, including but not limited to, any structure, building, installation, farm, corral, coop, feed storage area, milking parlor, or system for the collection, storage, or distribution of solid and liquid manure; if domesticated animals, including horses, sheep, goats, swine, beef cattle, rabbits, chickens, turkeys, or ducks are corralled, penned, or otherwise caused to remain in restricted areas for commercial agricultural purposes and feeding is by means other than grazing.
- (11) CONSTRUCTION/DEMOLITION ACTIVITIES means any on-site mechanical activities conducted in preparation of, or related to, the building, alteration, rehabilitation, demolition or improvement of property, including, but not limited to the following activities: grading, excavation, loading, crushing, cutting, planing, shaping or ground breaking.
- (12) CONTRACTOR means any person who has a contractual arrangement to conduct an active operation for another person.
- (13) DAIRY FARM is an operation on a property, or set of properties that are contiguous or separated only by a public right-of-way, that raises cows or

- produces milk from cows for the purpose of making a profit or for a livelihood. Heifer and calf farms are dairy farms.
- (14) DISTURBED SURFACE AREA means a portion of the earth's surface which has been physically moved, uncovered, destabilized, or otherwise modified from its undisturbed natural soil condition, thereby increasing the potential for emission of fugitive dust. This definition excludes those areas which have:
 - (A) been restored to a natural state, such that the vegetative ground cover and soil characteristics are similar to adjacent or nearby natural conditions;
 - (B) been paved or otherwise covered by a permanent structure; or
 - (C) sustained a vegetative ground cover of at least 70 percent of the native cover for a particular area for at least 30 days.
- (15) DUST SUPPRESSANTS are water, hygroscopic materials, or non-toxic chemical stabilizers used as a treatment material to reduce fugitive dust emissions.
- (16) EARTH-MOVING ACTIVITIES means the use of any equipment for any activity where soil is being moved or uncovered, and shall include, but not be limited to the following: grading, earth cutting and filling operations, loading or unloading of dirt or bulk materials, adding to or removing from open storage piles of bulk materials, landfill operations, weed abatement through disking, and soil mulching.
- (17) DUST CONTROL SUPERVISOR means a person with the authority to expeditiously employ sufficient dust mitigation measures to ensure compliance with all Rule 403 requirements at an active operation.
- (18) FUGITIVE DUST means any solid particulate matter that becomes airborne, other than that emitted from an exhaust stack, directly or indirectly as a result of the activities of any person.
- (19) HIGH WIND CONDITIONS means that instantaneous wind speeds exceed 25 miles per hour.
- (20) INACTIVE DISTURBED SURFACE AREA means any disturbed surface area upon which active operations have not occurred or are not expected to occur for a period of 20 consecutive days.
- (21) LARGE OPERATIONS means any active operations on property which contains 50 or more acres of disturbed surface area; or any earth-moving operation with a daily earth-moving or throughput volume of 3,850 cubic

- meters (5,000 cubic yards) or more three times during the most recent 365-day period.
- (22) OPEN STORAGE PILE is any accumulation of bulk material, which is not fully enclosed, covered or chemically stabilized, and which attains a height of three feet or more and a total surface area of 150 or more square feet.
- (23) PARTICULATE MATTER means any material, except uncombined water, which exists in a finely divided form as a liquid or solid at standard conditions.
- (24) PAVED ROAD means a public or private improved street, highway, alley, public way, or easement that is covered by typical roadway materials, but excluding access roadways that connect a facility with a public paved roadway and are not open to through traffic. Public paved roads are those open to public access and that are owned by any federal, state, county, municipal or any other governmental or quasi-governmental agencies. Private paved roads are any paved roads not defined as public.
- (25) PM₁₀ means particulate matter with an aerodynamic diameter smaller than or equal to 10 microns as measured by the applicable State and Federal reference test methods.
- (26) PROPERTY LINE means the boundaries of an area in which either a person causing the emission or a person allowing the emission has the legal use or possession of the property. Where such property is divided into one or more sub-tenancies, the property line(s) shall refer to the boundaries dividing the areas of all sub-tenancies.
- (27) RULE 403 IMPLEMENTATION HANDBOOK means a guidance document that has been approved by the Governing Board on April 2, 2004 or hereafter approved by the Executive Officer and the U.S. EPA.
- (28) SERVICE ROADS are paved or unpaved roads that are used by one or more public agencies for inspection or maintenance of infrastructure and which are not typically used for construction-related activity.
- (29) SIMULTANEOUS SAMPLING means the operation of two PM_{10} samplers in such a manner that one sampler is started within five minutes of the other, and each sampler is operated for a consecutive period which must be not less than 290 minutes and not more than 310 minutes.
- (30) SOUTH COAST AIR BASIN means the non-desert portions of Los Angeles, Riverside, and San Bernardino counties and all of Orange

- County as defined in California Code of Regulations, Title 17, Section 60104. The area is bounded on the west by the Pacific Ocean, on the north and east by the San Gabriel, San Bernardino, and San Jacinto Mountains, and on the south by the San Diego county line.
- (31) STABILIZED SURFACE means any previously disturbed surface area or open storage pile which, through the application of dust suppressants, shows visual or other evidence of surface crusting and is resistant to wind-driven fugitive dust and is demonstrated to be stabilized. Stabilization can be demonstrated by one or more of the applicable test methods contained in the Rule 403 Implementation Handbook.
- (32) TRACK-OUT means any bulk material that adheres to and agglomerates on the exterior surface of motor vehicles, haul trucks, and equipment (including tires) that have been released onto a paved road and can be removed by a vacuum sweeper or a broom sweeper under normal operating conditions.
- (33) TYPICAL ROADWAY MATERIALS means concrete, asphaltic concrete, recycled asphalt, asphalt, or any other material of equivalent performance as determined by the Executive Officer, and the U.S. EPA.
- (34) UNPAVED ROADS means any unsealed or unpaved roads, equipment paths, or travel ways that are not covered by typical roadway materials. Public unpaved roads are any unpaved roadway owned by federal, state, county, municipal or other governmental or quasi-governmental agencies. Private unpaved roads are all other unpaved roadways not defined as public.
- (35) VISIBLE ROADWAY DUST means any sand, soil, dirt, or other solid particulate matter which is visible upon paved road surfaces and which can be removed by a vacuum sweeper or a broom sweeper under normal operating conditions.
- (36) WIND-DRIVEN FUGITIVE DUST means visible emissions from any disturbed surface area which is generated by wind action alone.
- (37) WIND GUST is the maximum instantaneous wind speed as measured by an anemometer.

(d) Requirements

(1) No person shall cause or allow the emissions of fugitive dust from any active operation, open storage pile, or disturbed surface area such that:

- (A) the dust remains visible in the atmosphere beyond the property line of the emission source; or
- (B) the dust emission exceeds 20 percent opacity (as determined by the appropriate test method included in the Rule 403 Implementation Handbook), if the dust emission is the result of movement of a motorized vehicle.
- (2) No person shall conduct active operations without utilizing the applicable best available control measures included in Table 1 of this Rule to minimize fugitive dust emissions from each fugitive dust source type within the active operation.
- (3) No person shall cause or allow PM_{10} levels to exceed 50 micrograms per cubic meter when determined, by simultaneous sampling, as the difference between upwind and downwind samples collected on high-volume particulate matter samplers or other U.S. EPA-approved equivalent method for PM_{10} monitoring. If sampling is conducted, samplers shall be:
 - (A) Operated, maintained, and calibrated in accordance with 40 Code of Federal Regulations (CFR), Part 50, Appendix J, or appropriate U.S. EPA-published documents for U.S. EPA-approved equivalent method(s) for PM₁₀.
 - (B) Reasonably placed upwind and downwind of key activity areas and as close to the property line as feasible, such that other sources of fugitive dust between the sampler and the property line are minimized.
- (4) No person shall allow track-out to extend 25 feet or more in cumulative length from the point of origin from an active operation. Notwithstanding the preceding, all track-out from an active operation shall be removed at the conclusion of each workday or evening shift.
- (5) No person shall conduct an active operation with a disturbed surface area of five or more acres, or with a daily import or export of 100 cubic yards or more of bulk material without utilizing at least one of the measures listed in subparagraphs (d)(5)(A) through (d)(5)(E) at each vehicle egress from the site to a paved public road.
 - (A) Install a pad consisting of washed gravel (minimum-size: one inch) maintained in a clean condition to a depth of at least six inches and extending at least 30 feet wide and at least 50 feet long.

- (B) Pave the surface extending at least 100 feet and at least 20 feet wide.
- (C) Utilize a wheel shaker/wheel spreading device consisting of raised dividers (rails, pipe, or grates) at least 24 feet long and 10 feet wide to remove bulk material from tires and vehicle undercarriages before vehicles exit the site.
- (D) Install and utilize a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit the site.
- (E) Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the actions specified in subparagraphs (d)(5)(A) through (d)(5)(D).
- (6) Beginning January 1, 2006, any person who operates or authorizes the operation of a confined animal facility subject to this Rule shall implement the applicable conservation management practices specified in Table 4 of this Rule.

(e) Additional Requirements for Large Operations

- (1) Any person who conducts or authorizes the conducting of a large operation subject to this Rule shall implement the applicable actions specified in Table 2 of this Rule at all times and shall implement the applicable actions specified in Table 3 of this Rule when the applicable performance standards can not be met through use of Table 2 actions; and shall:
 - submit a fully executed Large Operation Notification (Form 403
 to the Executive Officer within 7 days of qualifying as a large operation;
 - (B) include, as part of the notification, the name(s), address(es), and phone number(s) of the person(s) responsible for the submittal, and a description of the operation(s), including a map depicting the location of the site;
 - (C) maintain daily records to document the specific dust control actions taken, maintain such records for a period of not less than three years; and make such records available to the Executive Officer upon request;

- (D) install and maintain project signage with project contact signage that meets the minimum standards of the Rule 403 Implementation Handbook, prior to initiating any earthmoving activities;
- (E) identify a dust control supervisor that:
 - (i) is employed by or contracted with the property owner or developer;
 - (ii) is on the site or available on-site within 30 minutes during working hours;
 - (iii) has the authority to expeditiously employ sufficient dust mitigation measures to ensure compliance with all Rule requirements;
 - (iv) has completed the AQMD Fugitive Dust Control Class and has been issued a valid Certificate of Completion for the class; and
- (F) notify the Executive Officer in writing within 30 days after the site no longer qualifies as a large operation as defined by paragraph (c)(18).
- (2) Any Large Operation Notification submitted to the Executive Officer or AQMD-approved dust control plan shall be valid for a period of one year from the date of written acceptance by the Executive Officer. Any Large Operation Notification accepted pursuant to paragraph (e)(1), excluding those submitted by aggregate-related plants and cement manufacturing facilities must be resubmitted annually by the person who conducts or authorizes the conducting of a large operation, at least 30 days prior to the expiration date, or the submittal shall no longer be valid as of the expiration date. If all fugitive dust sources and corresponding control measures or special circumstances remain identical to those identified in the previously accepted submittal or in an AQMD-approved dust control plan, the resubmittal may be a simple statement of no-change (Form 403NC).

(f) Compliance Schedule

The newly amended provisions of this Rule shall become effective upon adoption. Pursuant to subdivision (e), any existing site that qualifies as a large operation will have 60 days from the date of Rule adoption to comply with the notification and recordkeeping requirements for large operations. Any Large Operation

Notification or AQMD-approved dust control plan which has been accepted prior to the date of adoption of these amendments shall remain in effect and the Large Operation Notification or AQMD-approved dust control plan annual resubmittal date shall be one year from adoption of this Rule amendment.

(g) Exemptions

- (1) The provisions of this Rule shall not apply to:
 - (A) Dairy farms.
 - (B) Confined animal facilities provided that the combined disturbed surface area within one continuous property line is one acre or less.
 - (C) Agricultural vegetative crop operations provided that the combined disturbed surface area within one continuous property line and not separated by a paved public road is 10 acres or less.
 - (D) Agricultural vegetative crop operations within the South Coast Air Basin, whose combined disturbed surface area includes more than 10 acres provided that the person responsible for such operations:
 - (i) voluntarily implements the conservation management practices contained in the Rule 403 Agricultural Handbook;
 - (ii) completes and maintains the self-monitoring form documenting sufficient conservation management practices, as described in the Rule 403 Agricultural Handbook; and
 - (iii) makes the completed self-monitoring form available to the Executive Officer upon request.
 - (E) Agricultural vegetative crop operations outside the South Coast Air Basin whose combined disturbed surface area includes more than 10 acres provided that the person responsible for such operations:
 - (i) voluntarily implements the conservation management practices contained in the Rule 403 Coachella Valley Agricultural Handbook; and
 - (ii) completes and maintains the self-monitoring form documenting sufficient conservation management practices, as described in the Rule 403 Coachella Valley Agricultural Handbook; and
 - (iii) makes the completed self-monitoring form available to the Executive Officer upon request.

- (F) Active operations conducted during emergency life-threatening situations, or in conjunction with any officially declared disaster or state of emergency.
- (G) Active operations conducted by essential service utilities to provide electricity, natural gas, telephone, water and sewer during periods of service outages and emergency disruptions.
- (H) Any contractor subsequent to the time the contract ends, provided that such contractor implemented the required control measures during the contractual period.
- (I) Any grading contractor, for a phase of active operations, subsequent to the contractual completion of that phase of earthmoving activities, provided that the required control measures have been implemented during the entire phase of earth-moving activities, through and including five days after the final grading inspection.
- (J) Weed abatement operations ordered by a county agricultural commissioner or any state, county, or municipal fire department, provided that:
 - (i) mowing, cutting or other similar process is used which maintains weed stubble at least three inches above the soil; and
 - (ii) any discing or similar operation which cuts into and disturbs the soil, where watering is used prior to initiation of these activities, and a determination is made by the agency issuing the weed abatement order that, due to fire hazard conditions, rocks, or other physical obstructions, it is not practical to meet the conditions specified in clause (g)(1)(H)(i). The provisions this clause shall not exempt the owner of any property from stabilizing, in accordance with paragraph (d)(2), disturbed surface areas which have been created as a result of the weed abatement actions.
- (K) sandblasting operations.
- (2) The provisions of paragraphs (d)(1) and (d)(3) shall not apply:
 - (A) When wind gusts exceed 25 miles per hour, provided that:

- (i) The required Table 3 contingency measures in this Rule are implemented for each applicable fugitive dust source type, and;
- (ii) records are maintained in accordance with subparagraph (e)(1)(C).
- (B) To unpaved roads, provided such roads:
 - (i) are used solely for the maintenance of wind-generating equipment; or
 - (ii) are unpaved public alleys as defined in Rule 1186; or
 - (iii) are service roads that meet all of the following criteria:
 - (a) are less than 50 feet in width at all points along the road;
 - (b) are within 25 feet of the property line; and
 - (c) have a traffic volume less than 20 vehicle-trips per day.
- (C) To any active operation, open storage pile, or disturbed surface area for which necessary fugitive dust preventive or mitigative actions are in conflict with the federal Endangered Species Act, as determined in writing by the State or federal agency responsible for making such determinations.
- (3) The provisions of (d)(2) shall not apply to any aggregate-related plant or cement manufacturing facility that implements the applicable actions specified in Table 2 of this Rule at all times and shall implement the applicable actions specified in Table 3 of this Rule when the applicable performance standards of paragraphs (d)(1) and (d)(3) can not be met through use of Table 2 actions.
- (4) The provisions of paragraphs (d)(1), (d)(2), and (d)(3) shall not apply to:
 - (A) Blasting operations which have been permitted by the California Division of Industrial Safety; and
 - (B) Motion picture, television, and video production activities when dust emissions are required for visual effects. In order to obtain this exemption, the Executive Officer must receive notification in writing at least 72 hours in advance of any such activity and no nuisance results from such activity.
- (5) The provisions of paragraph (d)(3) shall not apply if the dust control actions, as specified in Table 2, are implemented on a routine basis for

- each applicable fugitive dust source type. To qualify for this exemption, a person must maintain records in accordance with subparagraph (e)(1)(C).
- (6) The provisions of paragraph (d)(4) shall not apply to earth coverings of public paved roadways where such coverings are approved by a local government agency for the protection of the roadway, and where such coverings are used as roadway crossings for haul vehicles provided that such roadway is closed to through traffic and visible roadway dust is removed within one day following the cessation of activities.
- (7) The provisions of subdivision (e) shall not apply to:
 - (A) officially-designated public parks and recreational areas, including national parks, national monuments, national forests, state parks, state recreational areas, and county regional parks.
 - (B) any large operation which is required to submit a dust control plan to any city or county government which has adopted a District-approved dust control ordinance.
 - (C) any large operation subject to Rule 1158, which has an approved dust control plan pursuant to Rule 1158, provided that all sources of fugitive dust are included in the Rule 1158 plan.
- (8) The provisions of subparagraph (e)(1)(A) through (e)(1)(C) shall not apply to any large operation with an AQMD-approved fugitive dust control plan provided that there is no change to the sources and controls as identified in the AQMD-approved fugitive dust control plan.

(h) Fees

Any person conducting active operations for which the Executive Officer conducts upwind/downwind monitoring for PM_{10} pursuant to paragraph (d)(3) shall be assessed applicable Ambient Air Analysis Fees pursuant to Rule 304.1. Applicable fees shall be waived for any facility which is exempted from paragraph (d)(3) or meets the requirements of paragraph (d)(3).

Source Category	Control Measure	Guidance
Backfilling	 O1-1 Stabilize backfill material when not actively handling; and O1-2 Stabilize backfill material during handling; and O1-3 Stabilize soil at completion of activity. 	 ✓ Mix backfill soil with water prior to moving ✓ Dedicate water truck or high capacity hose to backfilling equipment ✓ Empty loader bucket slowly so that no dust plumes are generated ✓ Minimize drop height from loader bucket
Clearing and grubbing	 Maintain stability of soil through pre-watering of site prior to clearing and grubbing; and Stabilize soil during clearing and grubbing activities; and Stabilize soil immediately after clearing and grubbing activities. 	 ✓ Maintain live perennial vegetation where possible ✓ Apply water in sufficient quantity to prevent generation of dust plumes
Clearing forms	 Use water spray to clear forms; or Use sweeping and water spray to clear forms; or Use vacuum system to clear forms. 	✓ Use of high pressure air to clear forms may cause exceedance of Rule requirements
Crushing	 O4-1 Stabilize surface soils prior to operation of support equipment; and O4-2 Stabilize material after crushing. 	 ✓ Follow permit conditions for crushing equipment ✓ Pre-water material prior to loading into crusher ✓ Monitor crusher emissions opacity ✓ Apply water to crushed material to prevent dust plumes

Source Category	Control Measure	Guidance
Cut and fill	O5-1 Pre-water soils prior to cut and fill activities; and O5-2 Stabilize soil during and after cut and fill activities.	 ✓ For large sites, pre-water with sprinklers or water trucks and allow time for penetration ✓ Use water trucks/pulls to water soils to depth of cut prior to subsequent cuts
Demolition – mechanical/manual	 O6-1 Stabilize wind erodible surfaces to reduce dust; and O6-2 Stabilize surface soil where support equipment and vehicles will operate; and O6-3 Stabilize loose soil and demolition debris; and O6-4 Comply with AQMD Rule 1403. 	prevent the generation of visible dust plumes
Disturbed soil	07-1 Stabilize disturbed soil throughout the construction site; and 07-2 Stabilize disturbed soil between structures	 ✓ Limit vehicular traffic and disturbances on soils where possible ✓ If interior block walls are planned, install as early as possible ✓ Apply water or a stabilizing agent in sufficient quantities to prevent the generation of visible dust plumes
Earth-moving activities	08-1 Pre-apply water to depth of proposed cuts; and 08-2 Re-apply water as necessary to maintain soils in a damp condition and to ensure that visible emissions do not exceed 100 feet in any direction; and 08-3 Stabilize soils once earth-moving activities are complete.	 ✓ Grade each project phase separately, timed to coincide with construction phase ✓ Upwind fencing can prevent material movement on site ✓ Apply water or a stabilizing agent in sufficient quantities to prevent the generation of visible dust plumes

Source Category	Control Measure	Guidance
Importing/exporting of bulk materials	 O9-1 Stabilize material while loading to reduce fugitive dust emissions; and O9-2 Maintain at least six inches of freeboard on haul vehicles; and O9-3 Stabilize material while transporting to reduce fugitive dust emissions; and O9-4 Stabilize material while unloading to reduce fugitive dust emissions; and O9-5 Comply with Vehicle Code Section 23114. 	 ✓ Use tarps or other suitable enclosures on haul trucks ✓ Check belly-dump truck seals regularly and remove any trapped rocks to prevent spillage ✓ Comply with track-out prevention/mitigation requirements ✓ Provide water while loading and unloading to reduce visible dust plumes
Landscaping	10-1 Stabilize soils, materials, slopes	 ✓ Apply water to materials to stabilize ✓ Maintain materials in a crusted condition ✓ Maintain effective cover over materials ✓ Stabilize sloping surfaces using soil binders until vegetation or ground cover can effectively stabilize the slopes ✓ Hydroseed prior to rain season
Road shoulder maintenance	 11-1 Apply water to unpaved shoulders prior to clearing; and 11-2 Apply chemical dust suppressants and/or washed gravel to maintain a stabilized surface after completing road shoulder maintenance. 	 ✓ Installation of curbing and/or paving of road shoulders can reduce recurring maintenance costs ✓ Use of chemical dust suppressants can inhibit vegetation growth and reduce future road shoulder maintenance costs

Source Category	Control Measure	Guidance
Screening	 12-1 Pre-water material prior to screening; and 12-2 Limit fugitive dust emissions to opacity and plume length standards; and 12-3 Stabilize material immediately after screening. 	 ✓ Dedicate water truck or high capacity hose to screening operation ✓ Drop material through the screen slowly and minimize drop height ✓ Install wind barrier with a porosity of no more than 50% upwind of screen to the height of the drop point
Staging areas	13-1 Stabilize staging areas during use; and 13-2 Stabilize staging area soils at project completion.	✓ Limit size of staging area ✓ Limit vehicle speeds to 15 miles per hour ✓ Limit number and size of staging area entrances/exists
Stockpiles/ Bulk Material Handling	14-1 Stabilize stockpiled materials. 14-2 Stockpiles within 100 yards of off-site occupied buildings must not be greater than eight feet in height; or must have a road bladed to the top to allow water truck access or must have an operational water irrigation system that is capable of complete stockpile coverage.	 ✓ Add or remove material from the downwind portion of the storage pile ✓ Maintain storage piles to avoid steep sides or faces

Source Category	Control Measure	Guidance
Traffic areas for construction activities	 15-1 Stabilize all off-road traffic and parking areas; and 15-2 Stabilize all haul routes; and 15-3 Direct construction traffic over established haul routes. 	 ✓ Apply gravel/paving to all haul routes as soon as possible to all future roadway areas ✓ Barriers can be used to ensure vehicles are only used on established parking areas/haul routes
Trenching	 Stabilize surface soils where trencher or excavato and support equipment will operate; and Stabilize soils at the completion of trenching activities. 	 ✓ Pre-watering of soils prior to trenching is an effective preventive measure. For deep trenching activities, pre-trench to 18 inches soak soils via the pre-trench and resuming trenching ✓ Washing mud and soils from equipment at the conclusion of trenching activities can prevent crusting and drying of soil on equipment
Truck loading	17-1 Pre-water material prior to loading; and 17-2 Ensure that freeboard exceeds six inches (CVC 23114)	 ✓ Empty loader bucket such that no visible dust plumes are created ✓ Ensure that the loader bucket is close to the truck to minimize drop height while loading
Turf Overseeding	18-1 Apply sufficient water immediately prior to conducting turf vacuuming activities to meet opac and plume length standards; and	✓ Haul waste material immediately off-site
	18-2 Cover haul vehicles prior to exiting the site.	

Source Category	Control Measure	Guidance
Unpaved roads/parking lots	19-1 Stabilize soils to meet the applicable performance standards; and	✓ Restricting vehicular access to established unpaved travel paths and parking lots can
	19-2 Limit vehicular travel to established unpaved road (haul routes) and unpaved parking lots.	reduce stabilization requirements
Vacant land	20-1 In instances where vacant lots are 0.10 acre or larg and have a cumulative area of 500 square feet or more that are driven over and/or used by motor vehicles and/or off-road vehicles, prevent motor vehicle and/or off-road vehicle trespassing, parking and/or access by installing barriers, curbs, fences, gates, posts, signs, shrubs, trees or other effective control measures.	

Table 2
DUST CONTROL MEASURES FOR LARGE OPERATIONS

		UKES FOR LANGE OF EKATIONS
FUGITIVE DUST SOURCE CATEGORY		CONTROL ACTIONS
Earth-moving (except construction cutting and filling areas, and mining operations)	(1a)	Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the Executive Officer, the California Air Resources Board, and the U.S. EPA. Two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations each subsequent four-hour period of active operations; OR
	(1a-1)	For any earth-moving which is more than 100 feet from all property lines, conduct watering as necessary to prevent visible dust emissions from exceeding 100 feet in length in any direction.
Earth-moving: Construction fill areas:	(1b)	Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the Executive Officer, the California Air Resources Board, and the U.S. EPA. For areas which have an optimum moisture content for compaction of less than 12 percent, as determined by ASTM Method 1557 or other equivalent method approved by the Executive Officer and the California Air Resources Board and the U.S. EPA, complete the compaction process as expeditiously as possible after achieving at least 70 percent of the optimum soil moisture content. Two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations during each subsequent four-hour period of active operations.

Table 2 (Continued)

		able 2 (Continued)
FUGITIVE DUST SOURCE CATEGORY		CONTROL ACTIONS
Earth-moving: Construction cut areas and mining operations:	(1c)	Conduct watering as necessary to prevent visible emissions from extending more than 100 feet beyond the active cut or mining area unless the area is inaccessible to watering vehicles due to slope conditions or other safety factors.
Disturbed surface areas (except completed grading areas)	(2a/b)	Apply dust suppression in sufficient quantity and frequency to maintain a stabilized surface. Any areas which cannot be stabilized, as evidenced by wind driven fugitive dust must have an application of water at least twice per day to at least 80 percent of the unstabilized area.
Disturbed surface areas: Completed grading areas	(2c)	Apply chemical stabilizers within five working days of grading completion; OR Take actions (3a) or (3c) specified for inactive disturbed surface areas.
Inactive disturbed surface areas	(3a) (3b) (3c) (3d)	Apply water to at least 80 percent of all inactive disturbed surface areas on a daily basis when there is evidence of wind driven fugitive dust, excluding any areas which are inaccessible to watering vehicles due to excessive slope or other safety conditions; OR Apply dust suppressants in sufficient quantity and frequency to maintain a stabilized surface; OR Establish a vegetative ground cover within 21 days after active operations have ceased. Ground cover must be of sufficient density to expose less than 30 percent of unstabilized ground within 90 days of planting, and at all times thereafter; OR Utilize any combination of control actions (3a), (3b), and (3c) such that, in total, these actions apply to all

Table 2 (Continued)

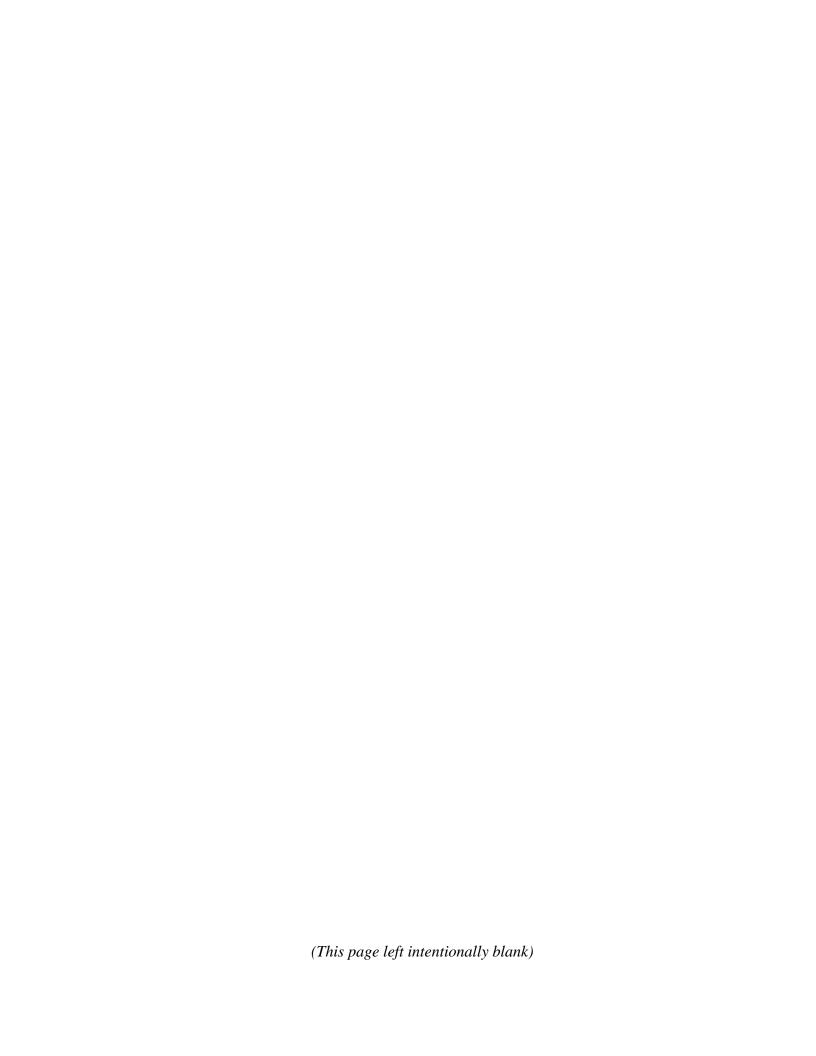
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FUGITIVE DUST SOURCE CATEGORY		CONTROL ACTIONS
Unpaved Roads	(4a)	Water all roads used for any vehicular traffic at least once per every two hours of active operations [3 times per normal 8 hour work day]; OR
	(4b)	Water all roads used for any vehicular traffic once daily and restrict vehicle speeds to 15 miles per hour; OR
	(4c)	Apply a chemical stabilizer to all unpaved road surfaces in sufficient quantity and frequency to maintain a stabilized surface.
Open storage piles	(5a)	Apply chemical stabilizers; OR
	(5b)	Apply water to at least 80 percent of the surface area of all open storage piles on a daily basis when there is evidence of wind driven fugitive dust; OR
	(F a)	
	(5c)	Install temporary coverings; OR
	(5d)	Install a three-sided enclosure with walls with no more than 50 percent porosity which extend, at a minimum, to the top of the pile. This option may only be used at aggregate-related plants or at cement manufacturing facilities.
All Categories	(6a)	Any other control measures approved by the
		Executive Officer and the U.S. EPA as
		equivalent to the methods specified in Table 2
		may be used.

TABLE 3
CONTINGENCY CONTROL MEASURES FOR LARGE OPERATIONS

FUGITIVE DUST SOURCE CATEGORY		CONTROL MEASURES
Earth-moving	(1A)	Cease all active operations; OR
	(2A)	Apply water to soil not more than 15 minutes prior to moving such soil.
Disturbed surface areas	(0B)	On the last day of active operations prior to a weekend, holiday, or any other period when active operations will not occur for not more than four consecutive days: apply water with a mixture of chemical stabilizer diluted to not less than 1/20 of the concentration required to maintain a stabilized surface for a period of six months; OR
	(1B)	Apply chemical stabilizers prior to wind event; OR
	(2B)	Apply water to all unstabilized disturbed areas 3 times per day. If there is any evidence of wind driven fugitive dust, watering frequency is increased to a minimum of four times per day; OR
	(3B)	Take the actions specified in Table 2, Item (3c); OR
	(4B)	Utilize any combination of control actions (1B), (2B), and (3B) such that, in total, these actions apply to all disturbed surface areas.
Unpaved roads	(1C)	Apply chemical stabilizers prior to wind event; OR
	(2C)	Apply water twice per hour during active operation; OR
	(3C)	Stop all vehicular traffic.
Open storage piles	(1D)	Apply water twice per hour; OR
	(2D)	Install temporary coverings.
Paved road track-out	(1E)	Cover all haul vehicles; OR
	(2E)	Comply with the vehicle freeboard requirements of Section 23114 of the California Vehicle Code for both public and private roads.
All Categories	(1F)	Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the methods specified in Table 3 may be used.

Table 4
(Conservation Management Practices for Confined Animal Facilities)

(Conscivation	IVIAII	agement Practices for Confined Animal Facilities)
SOURCE CATEGORY		CONSERVATION MANAGEMENT PRACTICES
Manure	(1a)	Cover manure prior to removing material off-site; AND
Handling	(1b)	Spread the manure before 11:00 AM and when wind conditions are less than 25 miles per hour; AND
(Only	(1c)	Utilize coning and drying manure management by removing
applicable to	(10)	manure at laying hen houses at least twice per year and maintain
Commercial		a base of no less than 6 inches of dry manure after clean out; or
Poultry		in lieu of complying with conservation management practice
Ranches)		(1c), comply with conservation management practice (1d).
Kanches)	(1d)	Utilize frequent manure removal by removing the manure from
	(14)	laying hen houses at least every seven days and immediately
		thin bed dry the material.
Feedstock	(2a)	Utilize a sock or boot on the feed truck auger when filling feed
Handling	(24)	storage bins.
Disturbed	(3a)	Maintain at least 70 percent vegetative cover on vacant portions
Surfaces	(34)	of the facility; OR
	(3b)	Utilize conservation tillage practices to manage the amount,
	(00)	orientation and distribution of crop and other plant residues on
		the soil surface year-round, while growing crops (if applicable)
		in narrow slots or tilled strips; OR
	(3c)	Apply dust suppressants in sufficient concentrations and
	, í	frequencies to maintain a stabilized surface.
Unpaved	(4a)	Restrict access to private unpaved roads either through signage
Roads		or physical access restrictions and control vehicular speeds to
		no more than 15 miles per hour through worker notifications,
		signage, or any other necessary means; OR
	(4b)	Cover frequently traveled unpaved roads with low silt content
		material (i.e., asphalt, concrete, recycled road base, or gravel to
	.	a minimum depth of four inches); OR
	(4c)	Treat unpaved roads with water, mulch, chemical dust
		suppressants or other cover to maintain a stabilized surface.
Equipment	(5a)	Apply dust suppressants in sufficient quantity and frequency to
Parking Areas		maintain a stabilized surface; OR
	(5b)	Apply material with low silt content (i.e., asphalt, concrete,
		recycled road base, or gravel to a depth of four inches).



RULE 403.1. SUPPLEMENTAL FUGITIVE DUST CONTROL REQUIREMENTS FOR COACHELLA VALLEY SOURCES

(a) Purpose

The purpose of this rule is to reduce or prevent the amount of fine particulate matter (PM_{10}) entrained in the ambient air from anthropogenic (man-made) fugitive dust sources.

(b) Applicability

The provisions of this rule are supplemental to Rule 403 requirements and shall apply only to fugitive dust sources in the Coachella Valley.

(c) Definitions

- (1) ACTIVE OPERATIONS shall mean any source capable of generating fugitive dust, including, but not limited to, earth-moving activities, construction/demolition activities, disturbed surface areas, or agricultural operations.
- (2) AGRICULTURAL OPERATIONS means any operation occurring on a ranch or farm directly related to the growing of crops, or raising of fowls or animals for the primary purpose of making a profit or for a livelihood.
- (3) ANEMOMETERS are devices used to measure wind speed in accordance with the performance standards, maintenance and calibration criteria specified in the Rule 403.1 Implementation Handbook.
- (4) BULK MATERIAL is sand, gravel, soil, aggregate material less than two inches in length or diameter and other organic and inorganic particulate matter.
- (5) CHEMICAL STABILIZERS are any non-toxic chemical dust suppressant which must not be used if prohibited for use by the Regional Water Quality Control Boards, the California Air Resources Board, the U.S. Environmental Protection Agency (U.S. EPA), or any applicable law, rule or regulation. The chemical stabilizers shall meet any specifications, criteria, or tests required by any federal, state, or local water agency. Unless otherwise indicated, the use of a non-toxic chemical stabilizer shall be of sufficient concentration and application frequency to maintain a stabilized surface.

- (6) COACHELLA VALLEY means that portion of Riverside County, as defined in Rule 103, subdivision (h).
- (7) COACHELLA VALLEY BLOWSAND ZONE means the corridor of land extending two miles to either side of the centerline of the I-10 Freeway beginning at the SR-111/I-10 junction and continuing southeast to the I-10/ Jefferson Street interchange in Indio.
- (8) CONSTRUCTION/DEMOLITION ACTIVITIES means any on-site mechanical activities conducted in preparation of or related to, the building, alteration, rehabilitation, demolition or improvement of property, including, but not limited to the following activities: grading, excavation, loading, crushing, cutting, planing, shaping or ground breaking.
- (9) DISTURBED SURFACE AREA means a portion of the earth's surface which has been physically moved, uncovered, destabilized, or otherwise modified from its undisturbed natural soil condition, thereby increasing the potential for emission of fugitive dust. This definition excludes those areas which have:
 - (A) been restored to a natural state, such that vegetative ground cover and soil characteristics are similar to adjacent or near-by natural conditions;
 - (B) been paved or otherwise covered by a permanent structure;
 - (C) sustained a vegetative ground cover of at least 70 percent of the average native cover for a particular area for at least 30 days.
- (10) DUST CONTROL SUPERVISOR means a person with the authority to expeditiously employ sufficient dust mitigation measures to ensure compliance with all Rule 403 and Rule 403.1 requirements at an active operation.
- (11) DUST SUPPRESSANTS are water, hygroscopic materials, or non-toxic chemical stabilizers used as a treatment material to reduce fugitive emissions.
- (12) EARTH-MOVING ACTIVITIES means the use of any equipment for any activity where soil is being moved or uncovered and shall include, but not be limited to the following: such operations as grading, loading or unloading of dirt or bulk materials, adding to or removing from open storage piles of bulk materials, landfill operations, weed abatement through disking, soil mulching and agricultural tilling.

- (13) FUGITIVE DUST means any solid particulate matter that becomes airborne, other than that emitted from an exhaust stack, directly or indirectly as a result of the activities of any person.
- (14) FUGITIVE DUST CONTROL PLAN means a plan to control fugitive dust plan as described in subdivision (e).
- (15) ON-SITE means within the property lines of a property, or as otherwise approved by the Executive Officer.
- (16) OPEN STORAGE PILE is any accumulation of bulk material which is not fully enclosed, covered or chemically stabilized, and which attains a height of three feet or more and a total surface area of 150 or more square feet.
- (17) PARTICULATE MATTER means any material, except uncombined water, which exists in a finely divided form as a liquid or solid at standard conditions.
- (18) PM_{10} means particulate matter with an aerodynamic diameter smaller than or equal to 10 microns as measured by the applicable state and federal reference test methods.
- (19) PROPERTY LINE means the boundaries of an area in which a person allowing the emission has the legal use or possession of the property. Where such property is divided into one or more sub-tenancies, the property line(s) shall refer to the boundaries dividing the areas of all sub-tenancies.
- (20) RULE 403.1 IMPLEMENTATION HANDBOOK means a guidance document that has been approved by the Governing Board on April 2, 2004 or hereafter approved by the Executive Officer and the U.S. EPA.
- (21) STABILIZED SURFACE means any previously disturbed surface area which, through the application of dust suppressants, shows visual or other evidence of surface crusting and is resistant to wind-driven fugitive dust and is demonstrated to be stabilized. Stabilization can be demonstrated by one or more of the applicable test methods contained in the Rule 403.1 Implementation Handbook.
- UNPAVED ROADS means any unsealed or unpaved roads, equipment paths, or travel ways that are not covered by one of the following: concrete, asphaltic concrete, recycled asphalt, asphalt or other materials with equivalent performance as determined by the Executive Officer, the California Air Resources Board, and the U.S. EPA. Public unpaved roads

- are any unpaved roadway owned by federal, state, county, municipal or other governmental or quasi-governmental agencies. Private unpaved roads are all other unpaved roadways not defined as public.
- (23) WIND-DRIVEN FUGITIVE DUST means visible emissions from any disturbed surface area which is generated by wind action alone.
- (24) WIND GUST is the maximum instantaneous wind speed as measured by an anemometer.

(d) General Requirements

- (1) Any person who is responsible for any active operation, open storage pile, or disturbed surface area, and who seeks an exemption pursuant to Rule 403, paragraph (g)(2) shall be required to determine when wind speed conditions exceed 25 miles per hour. The wind speed determination shall be based on either District forecasts or through use of an on-site anemometer as described in subdivision (g).
- (2) Any person involved in active operations in the Coachella Valley Blowsand Zone shall stabilize new man-made deposits of bulk material within 24 hours of making such bulk material deposits. Stabilization procedures shall include one or more of the following:
 - (A) Application of water to at least 70 percent of the surface area of any bulk material deposits at least 3 times for each day that there is evidence of wind driven fugitive dust; or
 - (B) Application of chemical stabilizers in sufficient concentration so as to maintain a stabilized surface for a period of at least 6 months; or
 - (C) Installation of wind breaks of such design so as to reduce maximum wind gusts to less than 25 miles per hour in the area of the bulk material deposits.
- (3) Any person involved in active operations in the Coachella Valley Blowsand Zone shall stabilize new deposits of bulk material originating from off-site undisturbed natural desert areas within 72 hours. Stabilization procedures shall include one or more of the following:
 - (A) Application of water to at least 70 percent of the surface area of any bulk material deposits at least 3 times for each day that there is evidence of wind driven fugitive dust; or
 - (B) Application of chemical stabilizers in sufficient concentration so as to maintain a stabilized surface for a period of at least six months.

- (4) A person who conducts or authorizes the conducting of an active operation shall implement at least one of the control actions specified in Rule 403, Table 2 for the source category "Inactive Disturbed Surface Areas" to minimize wind driven fugitive dust from disturbed surface areas at such time when active operations have ceased for a period of at least 20 days.
- (5) Any person involved in agricultural tilling or soil mulching activities shall cease such activities when wind speeds exceed 25 miles per hour. The wind speed determination shall be based on either District forecasts or through use of an on-site anemometer as described in subdivision (g).
- (e) Fugitive Dust Control Plan and Other Requirements for Construction Projects/Earth-Moving Activities
 - (1) Any person who conducts or authorizes the conducting of an active operation with a disturbed surface area of more than 5,000 square feet shall not initiate any earth-moving activities unless a fugitive dust control plan is prepared and approved by the Executive Officer in accordance with the requirements of subdivision (f) and the Rule 403.1 Implementation Handbook. These provisions shall not apply to active operations exempted by paragraph (i)(4).
 - (2) Any operator required to submit a fugitive dust control plan under paragraph (e)(1) shall maintain a complete copy of the approved fugitive dust control plan on site in a conspicuous place at all times and the fugitive dust control plan must be provided upon request.
 - (3) Any operator required to submit a fugitive dust control plan under paragraph (e)(1) shall install and maintain signage with project contact information that meets the minimum standards of the Rule 403.1 Implementation Handbook prior to initiating any type of earth-moving activities.
 - (4) Any operator required to submit a fugitive dust control plan under paragraph (e)(1) for a project with a disturbed surface area of 50 or more acres shall have an Dust Control Supervisor that:
 - (A) is employed by or contracted with the property owner or developer; and
 - (B) is on-site or is available to be on-site within 30 minutes of initial contact; and

- (C) has the authority to expeditiously employ sufficient dust mitigation measures to ensure compliance with all Rule 403 and 403.1 requirements; and
- (D) has completed the AQMD Coachella Valley Fugitive Dust Control Class and has been issued a valid Certificate of Completion for the class.
- (5) Failure to comply with any of the provisions of an approved fugitive dust control plan shall be a violation of this rule.
- (f) Fugitive Dust Control Plan Preparation, Submittal, and Approval Requirements
 - (1) A fugitive dust control plan prepared pursuant to paragraph (e)(1) must include the following information in a 8 ½ by 11 inch format:
 - (A) the name(s), address(es), and phone number(s) of the person(s) responsible for the preparation, submittal, and implementation of the fugitive dust control plan; and
 - (B) a description of the operation(s), including a map depicting the location of the site; and
 - (C) a listing of all sources of fugitive dust emissions within the property lines; and
 - (D) a description of the control measures as identified by the Rule 403.1 Implementation Handbook as applied to each of the sources identified in the fugitive dust control plan. The description of the control measures must be sufficiently detailed to demonstrate that the applicable best available control measures will be utilized and/or installed during all periods of active operations; and
 - (E) a description of the required contingency control measures (e.g., increased watering) for immediate implementation upon notice of visible dust crossing any property line.
 - (2) In the event that there are special technical (e.g., non-economic) circumstances, including safety, which prevent the use of at least one of the control measures as identified by the Rule 403.1 Implementation Handbook for any of the sources identified in the fugitive dust control plan, a justification statement must be provided in lieu of the description. The justification statement must explain the reason(s) why the required control measures cannot be implemented.
 - (3) Within 30 calendar days of the receipt of a fugitive dust control plan submitted pursuant to paragraph (e)(1), the Executive Officer will either

- approve or apply any necessary conditions to the fugitive dust control plan in writing. For a fugitive dust control plan to be approved, the requirements of paragraph (f)(1) must be satisfied.
- (4) The Executive Officer will apply conditions if the stated fugitive dust control plan measures do not satisfactorily conform to the best available control measures and guidance contained in the Rule 403.1 Implementation Handbook. The conditions necessary to modify the fugitive dust control plan will be provided in writing to the person(s) identified in subparagraph (f)(1)(A). A letter to the Executive Officer stating that such modifications will be incorporated into the fugitive dust control plan shall be deemed sufficient to result in approval of the fugitive dust control plan.
- (5) Any fugitive dust control plan approved by the Executive Officer shall be valid for a period of one year from the date of approval. Any approved fugitive dust control plan must be resubmitted annually, at least 30 days prior to the expiration date, or the fugitive dust control plan shall expire as of the expiration date. If all fugitive dust sources and corresponding control measures or special circumstances remain identical to those identified in the previously approved fugitive dust control plan, the submittal may contain a simple statement of no-change (Form 403NC). Otherwise, a resubmittal must contain all the items specified in subparagraphs (f)(1)(A) through (f)(1)(E).

(g) Wind Monitoring Implementation Requirements

- (1) The determination of wind speed conditions in excess of 25 miles per hour, as specified in paragraphs (d)(1) and (d)(5), shall be based on the following criteria:
 - (A) For facilities with an on-site anemometer:
 - (i) When the on-site anemometer registers at least two wind gusts in excess of 25 miles per hour within a consecutive 30-minute period. Wind speeds shall be deemed to be below 25 miles per hour if there is no recurring wind gust in excess of 25 miles per hour within a consecutive 30-minute period; or
 - (B) For facilities without an on-site anemometer:

- (i) When wind speeds in excess of 25 miles per hour are forecast to occur in the Coachella Valley for that day. This condition shall apply to the full calendar day for which the forecast is valid. (The Executive Officer shall determine meteorological conditions which will cause wind speeds in excess of 25 miles per hour, and shall issue daily forecasts of expected wind conditions. Such forecasts shall be available to the public); or
- (ii) When wind speeds in excess of 25 miles per hour are not forecast to occur by the District, and fugitive dust emissions are visible for a distance of at least 100 feet from the origin of such emissions, and there is visible evidence of wind driven fugitive dust.
- (2) Any person who elects to install an on-site anemometer shall:
 - (A) Notify the Executive Officer no more than 10 days after installing such equipment. The notification shall contain, at a minimum, the person's name, address, telephone number, description of the operation(s), and first day of operation, as specified in the District's Rule 403.1 Implementation Handbook.
 - (B) Be subject to the provisions of subparagraph (g)(1)(B) for wind speed determinations if equipment outages, malfunctions, or invalid data exceed one hour during active operations on a calendar day.

(h) Recordkeeping

- (1) A person subject to the provisions of this rule shall compile written daily records to document the specific actions taken to comply with this Rule. Such records shall be retained for not less than three years and shall be made available to the Executive Officer upon request.
- (2) In addition to the provisions of paragraph (h)(1), any person who elects to install an on-site anemometer shall also compile written records. Such records shall contain:
 - (A) Location, vendor, model, and serial number of the anemometer;
 - (B) The time of occurrence of any wind gust in excess of 25 miles per hour during hours of active operations;

(C) The actions taken to comply with the provisions of paragraphs (d)(5) and (i)(3), as applicable.

(i) Exemptions

- (1) The provisions of this rule shall not apply to ceased or inactive mining operations subject to the requirements of the Surface Mining and Recovery Act (SMARA) of 1975, provided that the provisions of the SMARA Reclamation Plan are implemented by the owner and are at least as stringent as those contained in this rule;
- (2) The provisions of paragraphs (d)(2), (d)(3), and (d)(4) shall not apply to:
 - (A) Any active operation, open storage pile, or disturbed surface area for which necessary fugitive dust preventive or mitigative actions are in conflict with the Endangered Species Act as determined in writing by the State or federal agency responsible for making such determinations;
 - (B) Any disturbed surface areas or bulk material deposits with a surface area less than 2,500 square feet;
 - (C) Non-routine or emergency maintenance of flood control channels and water spreading basins.
- (3) The provisions of paragraph (d)(5) shall not apply to agricultural tilling activities or soil mulching activities under the following conditions:
 - (A) If the prohibitory requirements of this Rule have occurred during six or more hours of active operations on each of two previous consecutive days, then a one-day exemption will be allowed. (These activities would again be subject to the prohibitory requirements of this Rule following this one day exemption.)
 - (B) If the prohibitory requirements of this Rule have occurred during sixty or more cumulative hours of active operations within a calendar month, then an exemption will be allowed for the remainder of the calendar month. (These activities would again be subject to the prohibitory requirements of this Rule at the start of the following month.)
 - (C) During periods of precipitation.

(4) The provisions of paragraph (e)(1) shall not apply to any active operation which is required to submit a dust control plan to any city or county government that has adopted a District-approved dust control ordinance.

(j) Fees

- (1) Any person subject to a fugitive dust control plan submittal pursuant to paragraph (e)(1) shall be assessed applicable filing and evaluation fees pursuant to Rule 306.
- (2) The submittal of an annual statement of no-change, pursuant to paragraph (f)(5), shall not be considered as an annual review, and therefore shall not be subject to annual review fees, pursuant to Rule 306.

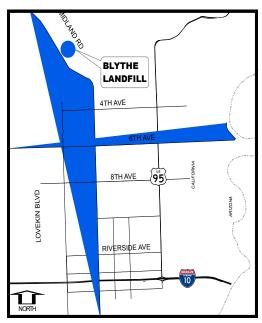
APPENDIX B: LANDFILL SITE RULES



Blythe Sanitary Landfill

NOTE: Landfill may be closed due to rain, snow or excessive winds or other hazardous conditions as determined by County.

Location: 1000 Midland Road Blythe, CA 92225



Directions:

From East: Proceed west on I-10, exit Lovekin Boulevard north. Veer west onto Midland road, the landfill is on the right side of the road.

From West, travel east on I-10, exit Lovekin Boulevard north. Veer west onto Midland road, the landfill is on the right side of the road.

- ✓ Obey County personnel and signs. It is for your safety.
- ✓ Anyone under 16 years of age and pets must remain in vehicle.
- ✓ High visibility safety vest must be worn at all times.
- ✓ Stay within 5 feet of your vehicle while unloading and 15 feet away from heavy equipment.
- ✓ No alcohol, drugs, weapons, salvaging, or loitering.
- ✓ The landfill closes promptly at 4:00, late customers will be turned away. Onsite customers unloading after 4:15 will be charged late fees.

Acceptable Items

- Solid Waste
- Household Refuse
- Yard Trimmings
- Furniture
- Tires
- Appliances (i.e. Microwaves, Refrigerators, Washers,
 Dryers, etc.)
- TV's and Computers
- Electronic Waste

Unacceptable Items

- Hazardous Waste
- Household Hazardous Waste (i.e. Cleaners, Chemicals, Pesticides, Pool Chemicals, Paints, Aerosol Cans, Propane Tanks, etc.)
- Explosives or Ammunition
- Untreated Medical/ Infectious Waste (including Sharps)
- Asbestos (including floor tile and roofing material containing asbestos)

Hours of Operation:

Monday through Friday and the first Saturday of the month 8:00 am to 4:00 pm

The landfill is closed the following holidays:
New Years Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Landfill Fees: http://www.rcwaste.org/opencms/landfill/fees.html

Payment Options: Cash, Riverside County Deferred Payment Business Accounts, or Rural Cards (see http://www.rcwaste.org/opencms/landfill/payment.html)

Household Hazardous Waste information: http://www.rcwaste.org/opencms/hhw/flyers/master.pdf
Business Hazardous Waste information: http://www.rcwaste.org/opencms/hw/business.html



Riverside County Department of Waste Resources 14310 Frederick Street, Moreno Valley, CA 92553 Ph 951-486-3200 <u>www.rcwaste.org</u>



OASIS LANDFILL FACILITY

ODEN: 9:00 am to 1:20 am an Wadnesdays

	OPEN. 6.00 alli to 4.5	ou pili oli weullesuays	
	NEXT HOLIDAY CLOSURE:		
_			

For services/complaints contact the Riverside County Waste Management Department at (951) 486-3200 or via website www.rivco.org

LANDFILL RULES

- Obey County personnel and signs. It is for your safety.
- Anyone under 16 years of age and pets must remain in vehicle.
- High visibility safety vest must be worn at all times.
- Stay within 5 feet of your vehicle while unloading and 15 feet away from heavy equipment.
- No alcohol, drugs, weapons, smoking, salvaging, or loitering.
- Commercial refuse vehicles must have an operational back-up alarm.

STAY ALERT – STAY ALIVE

County is not responsible for damage to customer's vehicle and/or equipment due to customer's negligence or failure to follow site rules and reserves the right to deny access to anyone violating said rules or creating a safety hazard. Landfills are dangerous construction zones. Disposal is at customer's own risk.

ALL LOADS SUBJECT TO INSPECTION

Disposal of hazardous, toxic, flammable, corrosive, explosive and radioactive waste/materials may be prosecuted under Health and Safety Code 25189.5 and Penal Code 374.8



APPENDIX C: PROJECT DRAWINGS FOR INFRASTRUCTURE IMPROVEMENTS PROJECT AT RIVERSIDE COUNTY DESERT LANDFILLS



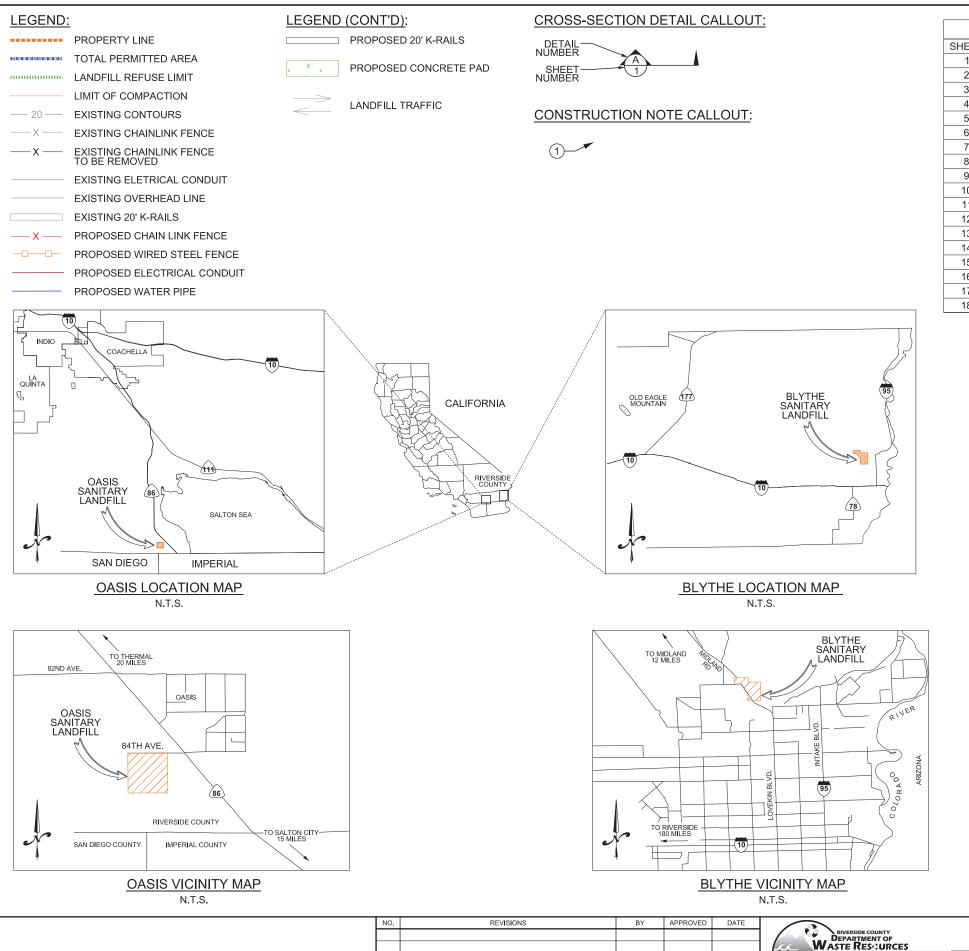
INFRASTRUCTURE IMPROVEMENTS PROJECT AT RIVERSIDE COUNTY DESERT LANDFILLS

AUGUST 2024

PREPARED BY:
DEPARTMENT OF WASTE RESOURCES
ANDY CORTEZ, GENERAL MANAGER/CHIEF ENGINEER
14310 FREDERICK STREET
MORENO VALLEY, CALIFORNIA 92553
TEL. (951) 486-3200 FAX (951) 486-3205







	INDEX OF	DRAWINGS	
SHEET	FILE NAME	TITLE	SCALE
1	BO_2024_S01_TITLE.DGN	TITLE SHEET	N.T.S.
2	BO_2024_S02_INDEX.DGN	INDEX, LEGEND AND VICINITY MAP	N.T.S.
3	BO_2024_S03_GENERAL_NOTES.DGN	GENERAL NOTES	N.T.S.
4	BO_2024_S04_BLYTHE_EX_SITE_PLAN.DGN	BLYTHE EXISITING SITE PLAN	1" = 300'
5	BO_2024_S05_BLYTHE_PROP_SITE_PLAN.DGN	BLYTHE PROPOSED IMPROVEMENTS SITE PLAN	1" = 40'
6	BO_2024_S06_BLYTHE_PROP_SITE_PLAN.DGN	BLYTHE PROPOSED IMPROVEMENTS SITE PLAN	1" = 40'
7	BO_2024_S07_BLYTHE_FENCE_DETAIL.DGN	BLYTHE FENCE DETAILS	N.T.S.
8	BO_2024_S08_BLYTHE_WELL_DIAGRAMS.DGN	BLYTHE WELL DIAGRAMS	N.T.S.
9	BO_2024_S09_TOWER_TRENCH_DETAILS.DGN	WATER TOWER & TRENCH DETAILS	N.T.S.
10	BO_2024_S10_BLY_SITE_PHOTOS.DGN	BLYTHE SITE PHOTOS	N.T.S.
11	BO_2024_S11_OASIS_EX_SITE_PLAN.DGN	OASIS EXISTING SITE PLAN	1"=150'
12	BO_2024_S12_OASIS_PROP_SITE_PLAN.DGN	OASIS PROPOSED IMPROVEMENTS SITE PLAN	1"=60'
13	BO_2024_S13_OASIS_FENCE_DETAILS.DGN	OASIS FENCE DETAILS	N.T.S.
14	BO_2024_S14_BLY_OAS_LAYOUT_PLAN.DGN	BLYTHE AND OASIS RECYCLE AREA LAOUT PLAN	1"=20'
15	BO_2024_S15_BLY_OAS_SECTION.DGN	BLYTHE AND OASIS RECYCLE AREA SECTION	N.T.S.
16	BO_2024_S16_OASIS_ELEC_DETAILS.DGN	OASIS ELECTRICAL SITE PLAN	N.T.S.
17	BO_2024_S17_OASIS_ELEC_PHOTOS.DGN	OASIS ELECTRICAL SITE PHOTOS	N.T.S.
18	BO_2024_S18_OASIS_ELEC_PHOTOS.DGN	OASIS ELECTRICAL SITE PHOTOS	N.T.S.

ABBREVIATIONS:

AC ASPHALT CONCRETE APPROXIMATE APPROX. AWG AMERICAN WIRE GAUGE BELOW GROUND SURFACE BGS

С CUT

CENTER LINE **Q** OR CL

CMB **CRUSHED MISCELLANEOUS**

BASE

CVWD COACHELLA VALLEY WATER

DISTRICT

DIA DIAMETER **EASTING** Ε

EL **ELEVATION** EXIST. **EXISTING**

FILL

FLOR FL FLOW LINE F & I FURNISH AND INSTALL

GALVANIZED STEEL GAL GB **GRADE BREAK**

HINGE POINT

IID IMPERIAL IRRIGATION DISTRICT LDPE LOW-DENSITY POLYETHYLENE

LF LINEAR FEET LENGTH MAXIMUM MAX. MINIMUM MIN.

MISC. MISCELLANEOUS NORTHING N

NAD NORTH AMERICAN DATUM NPS NOMINAL PIPE SIZE NTS NOT TO SCALE

PPM PROCESSED PALM MATERIAL

PATH:

PATH:

ABBREVIATIONS (CONT'D):

PROTECT IN PLACE PROPERTY LINE P OR PL REGISTERED CIVIL ENGINEER R.C.E.

RIVERSIDE COUNTY FLOOD

CONTROL

REINFORCED SHOTCRETE RS

SCH. SCHEDULE STA STATION TOE TOE OF SLOPE TOP OF SLOPE TS **TYPICAL** TYP

VERT. VERTICAL

WWF

WELDED WIRE FABRIC

DEPARTMENT OF WASTE RESOURCES

Andy Cortez Digitally signed by Andy Cortez Date: 2024.09.05 17:18:49

General Manager - Chief Engineer R.C.E. C-62528 Exp. 12/31/25



DESIGNED BY: RAWN BY: HECKED BY: RAWING DATE: August 2024 OPO DATE: T.\Sites\Blythe\Spec Proj

> 2024 Desert Landfill Infrastructur Improvements\Construction Plan

C73871

Infrastructure Improvements Project at Riverside County Desert Landfills

Index, Legend and Vicinity Map

SHEET: 2 OF 18

- 1. DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN IN THESE PROJECT DRAWINGS SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF ALL APPLICABLE CONTRACT DOCUMENTS OR AS DIRECTED BY THE COUNTY.
- 2. CONTRACTOR SHALL PROVIDE PROJECT MANAGEMENT, ADMINISTRATION AND COORDINATION SERVICES TO SUCCESSFULLY COMPLETE THE PROJECT IN ACCORDANCE WITH THE FOLLOWING DETAILED PROVISIONS SECTIONS: 01 2900: PAYMENT PROCEDURES, 01 3100: PROJECT MANAGEMENT AND COORDINATION, 01 3200: CONSTRUCTION PROGRESS DOCUMENTATION, 01 3300: SUBMITTAL PROCEDURES, AND 01 7700: CLOSEOUT PROCEDURES.
- 3. CONTRACTOR SHALL PROVIDE ALL TEMPORARY FACILITIES, UTILITIES (WATER, ELECTRICAL, SANITARY FACILITIES, WASTE COLLECTION, TELEPHONE SERVICE, ETC.) AND CONTROLS AS NECESSARY TO SUCCESSFULLY COMPLETE ANY AND ALL CONSTRUCTION ACTIVITIES. TEMPORARY ELECTRICAL SHALL BE INSPECTED AND APPROVED PRIOR TO ENERGIZING.
- CONTRACTOR SHALL PROVIDE AND PERFORM ALL ENVIRONMENTAL PROTECTION CONTROLS
 4. (EROSION CONTROL, HAZARDOUS WASTE MANAGEMENT, STORM WATER QUALITY PROTECTION, AIR QUALITY, ETC.) AS REQUIRED TO SUCCESSFULLY COMPLETE ANY AND ALL CONSTRUCTION ACTIVITIES
- 5. CONTRACTOR SHALL PREPARE AND IMPLEMENT A PROJECT-SPECIFIC HEALTH AND SAFETY PLAN (HASP) IN ACCORDANCE WITH DETAILED PROVISION SECTION 01 3500: HEALTH AND SAFETY.
- 6. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING STRUCTURES AND UTILITIES (INCLUDING BUT NOT LIMITED TO ELECTRICAL CONDUIT AND CABLE, POWER POLES, GAS LINES, FENCES, MONITORING WELLS, TELEPHONE/DATA LINES, ETC.) UNLESS NOTED OTHERWISE. ANY DAMAGED ITEM SHALL BE RESTORED TO ITS ORIGINAL CONDITION, TO THE SATISFACTION OF THE COUNTY OR REPLACED AT THE CONTRACTOR'S EXPENSE. IN THE EVENT ANY EXISTING UTILITIES ARE DAMAGED; IT SHALL REMAIN EXPOSED UNTIL THE REPAIR PLAN IS ACCEPTED BY THE COUNTY AND THE AFFECTED UTILITY.
- 7. ALL EXISTING AND PROPOSED DIMENSIONS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO STARTING WORK. THE COUNTY SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES.
- 8. GROUND TOPOGRAPHY CONTOURS WERE DEVELOPED BY AERIAL FLIGHT SURVEY DATED MARCH 2021 (OASIS) AND JUNE 2021 (BLYTHE) AND GROUND SURVEY DATED JULY 2024 FOR BOTH SITES. ELEVATIONS ARE IN FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). GRID TICKS ARE BASED ON NORTH AMERICAN DATUM OF 1983 (NAD83), EPOCH 2007.00. NAVD 88 AND NAD83 DATUMS ARE TO BE USED FOR ALL SURVEY WORK.
- 9. MATERIAL REMOVED FROM THE PROJECT SITE SHALL BE DISCARDED AT A FACILITY THAT ACCEPTS THE ASSOCIATED CLASSIFICATION OF WASTE. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ASSOCIATED DISPOSAL FEES.
- 10. CONTRACTOR SHALL COMPLY WITH ALL SITE SAFETY RULES AND REGULATIONS WHILE PERFORMING CONSTRUCTION ACTIVITIES. REFER TO APPENDIX A LANDFILL SITE SAFETY RULES AND DETAILED PROVISIONS SECTION 02 4100: DEMOLITION.
- 11. CHAIN LINK FENCING AND SWING GATES SHALL BE INSTALLED IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 32 3113: FENCES AND GATES.
- 12. ALL CONCRETE SHALLED BE PLACED IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 03 3100: CAST-IN-PLACE STRUCTURAL CONCRETE.
- 13. FINAL LOCATION OF THE GROUNDWATER PRODUCTION WELL AND PORTABLE WATER TOWER SHALL BE CONFIRMED BY THE COUNTY IN THE FIELD.
- 14. FINAL LOCATION OF THE GROUNDWATER MONITORING WELL SHALL BE CONFIRMED BY THE COUNTY IN THE FIELD.
- 15. CHAIN LINK HARDWARE DESIGN MAY VARY FROM THE DETAILS SHOWN; HOWEVER, ALL HARDWARE AND APPURTENANCES USED IN A SINGLE INSTALLATION SHALL BE UNIFORM AND COMPATIBLE.
- 16. GATE, END, AND CORNER POSTS SHALL BE 2-7/8 INCH O.D.
- 17. LINE POSTS SHALL BE 2-3/8 INCH O.D.
- 18. THE PORTABLE WATER TOWER SHALL, AT A MINIMUM, INCLUDE: STEEL FITTED HEADS, A 10-INCH DIAMETER DISCHARGE TUBE (MIN. 12-FEET FROM GRADE), DUAL 3-INCH FILL PIPE WITH APPROVED AIR GAPS, VALVES, FLOAT ASSEMBLIES AND CAMLOCK ON END OF PIPE, A MECHANICAL FLOAT SYSTEM (FILL CONTROLLED BY WATER DEPTH), AN AUTOMATIC SHUT OFF VALVE, A TANK ACCESS HATCH, AND AN OSHA-APPROVED ACCESS LADDER. OPTIONAL ITEMS THAT CAN BE REMOVED BEFORE OR AFTER DELIVERY AND INSTALLATION FOR A COST CREDIT TO THE COUNTY SHALL INCLUDE BUT NOT BE LIMITED TO: A FIFTH WHEEL HITCH, A REMOVEABLE HYDRAULIC PUMP AND MOTOR, A HEAVY-DUTY LONG-LIFE AXLE, SUSPENSION, AND AIR BRAKE SYSTEM, AND DUAL WHEELS AND TIRES.
- 19. EXTERIOR OF PORTABLE WATER TOWER TANK SHALL BE COATED WITH PRIMER AND WHITE EPOXY PAINT.
- 20. INTERIOR OF PORTABLE WATER TOWER TANK SHALL BE COATED WITH A RUST-RESISTANT THREE-COAT EPOXY COATING SYSTEM TO PREVENT CORROSION.
- 21. THE COUNTY SHALL PERFORM ROUGH GRADING OF SUBGRADE PRIOR TO PLACEMENT OF THE PORTABLE WATER TOWER.
- 22. THE CONTRACTOR SHALL SECURE THE PORTABLE WATER TOWER IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION.
- 23. NEW WELDED STEEL FENCING AND GATES SHALL COMPLY WITH DETAILED PROVISIONS SECTION 32 3119: DECORATIVE METAL FENCES AND GATES.
- 24. CONTRACTOR SHALL SUBMIT DOCUMENTATION VERIFYING THE SWITCH SIZE IS CAPABLE OF HANDLING THE ELECTRICAL LOADS OF THE EXISTING LANDFILL FIELD OFFICE CONTAINER.

GENERAL NOTES (CONT'D):

- 25. CONTRACTOR SHALL VERIFY THE SIZE OF CONDUIT AND WIRE IS CAPABLE OF HANDLING THE ELECTRICAL LOADS OF THE EXISTING LANDFILL FIELD OFFICE CONTAINER. ELECTRICAL CABLE SIZING CALCULATIONS SHALL BE SUBMITTED TO THE DEPARTMENT FOR REVIEW AND ACCEPTANCE. NEW CONDUIT SHALL BE FURNISHED AND INSTALLED PER DETAILED PROVISIONS SECTIONS 26 0533: RACEWAYS AND BOXES AND 31 2133: TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES.
- 26. CONTRACTOR SHALL INSTALL GROUNDING ROD PER DETAILED PROVISIONS SECTION 26 0526: GROUNDING AND BONDING.
- 27. PRECAST PULL BOX SHALL BE ARMORCAST, CHRISTY, OLDCASTLE, OR APPROVED EQUAL. COVER SHALL BE ENGRAVED "COMMUNICATIONS" PER DETAILED PROVISIONS SECTION 26 0533: RACEWAY AND BOXES.
- 28. WELDED STEEL END POSTS SHALL BE 4 INCH SQUARE (12 GAUGE), LINE POSTS SHALL BE 3 INCH SQUARE (12 GAUGE), VERTICAL FRAME TUBE SHALL BE 2 INCH SQUARE (12 GAUGE), AND HORIZONTAL RAIL TUBE SHALL BE 1-1/2 INCH SQUARE (14 GAUGE).
- 29. WELDED STEEL FENCING AND SWING GATES SHALL BE POWDER COATED IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 32 3119: DECORATIVE METAL FENCES AND GATES.
- 30. HORIZONTAL WELDED STEEL RAIL TUBE SHALL BE CONFIGURED WITH TWO (2) RAILS ALONG THE TOP OF THE FENCE AND ONE (1) RAIL ALONG THE BOTTOM OF THE FENCE.
- 31. NYLON POST CAPS SHALL BE FLUSH WITH THE TOP OF THE END POST.
- 32. FILL MATERIAL SHALL BE PLACED IN UNIFORM LAYERS WHICH, WHEN LOOSE, SHALL NOT EXCEED 6 INCHES FOR HAND OPERATED MECHANICAL COMPACTORS AND NOT EXCEED 8 INCHES PER LAYER FOR HEAVY EQUIPMENT COMPACTORS.
- 33. FILL MATERIALS SHALL BE MOISTURE CONDITIONED TO A MOISTURE CONTENT BETWEEN OPTIMUM MOISTURE CONTENT AND 3% ABOVE THE OPTIMIUM MOISTURE CONTENT.
- 34. ALL NEW CONDUIT SHALL SLOPE TOWADS PULL BOX.
- 35. ALL NEW EQUIPMENT SHALL BE UL LISTED.

CONSTRUCTION NOTES:

- (1) PROTECT IN PLACE, AS NOTED.
- (2) REMOVE AND DISPOSE OF EXISTING CHAIN LINK FENCE AND FENCE POSTS ADJACENT TO THE LANDFILL ACCESS ROAD.
- (3) REMOVE AND DISPOSE OF TWO (2) EXISTING CHAIN LINK DOUBLE SWING GATES (TOTAL GATE WIDTH 24' EACH) AND ONE (1) EXISTING CHAIN LINK SINGLE SWING GATE (TOTAL GATE WIDTH 5').
- 4 FURNISH AND INSTALL NEW CHAIN LINK FENCE, FENCE POSTS, AND ALL APPURTENANCES TO REPLACE FENCING ADJACENT TO THE LANDFILL ACCESS ROAD. REFER TO GENERAL NOTE 11 AND DETAIL A ON PLAN SHEET 7 FOR FENCE DETAILS.
- (5) FURNISH AND INSTALL TWO (2) NEW DOUBLE SWING GATES (24' WIDE AND 28' WIDE) AND ONE (1) NEW SINGLE SWING GATE (5' WIDE). REFER TO GENERAL NOTE 11 AND DETAIL A3 ON PLAN SHEET
- 6 FURNISH AND INSTALL ONE (1) 120' X 45' X 6" REINFORCED CONCRETE PAD IN ACCORDANCE WITH DETAILED PROVISIONS DIVISION 03: CONCRETE. REFER TO DETAIL J ON PLAN SHEET 14.
- (7) DECOMMISSION, REMOVE, AND SALVAGE ALL EXISTING WELL ELECTRICAL CONNECTIONS AND APPURTENANCES (PUMP CONTROL PANEL, WELLHEAD FITTING, GATE VALVE, WELL VENT, ELECTRICAL JUNCTION BOX, RUN TIMER SWITCH, ETC.) IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. REFER TO PHOTOS 1 AND 2 ON PLAN SHEET 10.
- (8) CONTRACTOR SHALL CONNECT THE NEW GROUNDWATER PRODUCTION WELL TO EXISTING ELECTRICAL PANEL IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. REFER TO PHOTOS 3 AND 4 ON PLAN SHEET 10.
- (9) INSTALL CONCRETE ENCASED ELECTRICAL CONDUIT PER DETAIL F ON PLAN SHEET 9.
- (10) INSTALL GROUNDWATER PRODUCTION WELL PER DETAIL B ON PLAN SHEET 8. SEE GENERAL NOTE 13.
- (11) INSTALL 3" PVC WATER PIPE. REFER TO DETAIL E ON PLAN SHEET 9 FOR TRENCHING DETAILS
- $\ensuremath{\textcircled{12}}$ INSTALL ONE (1) 12,000-GALLON PORTABLE WATER TOWER. REFER TO GENERAL NOTE 13 AND DETAIL D ON PLAN SHEET 9.
- (13) INSTALL GROUNDWATER MONITORING WELL AND CONCRETE PAD PER DETAIL C ON PLAN SHEET 8. SEE GENERAL NOTE 14.
- (4) ADJUST THE POST TOP ELEVATIONS TO PROVIDE A SMOOTH VISUAL FENCE PROFILE. INSTALL CORNER POSTS AT HORIZONTAL BREAKS IN THE FENCE LINE OF 30 DEGREES OR MORE.

CONSTRUCTION NOTES (CONT'D):

- (15) REINFORCE GATE FRAME CORNERS WITH A MALLEABLE IRON OR PRESSED STEEL FITTING DESIGNED FOR THE PURPOSE OF SHOP WELDING THE CORNERS. GRIND SMOOTH ALL WELDS AND FURNISH EACH GATE WITH THE NECESSARY HINGES, LATCH, AND DROP ROD LOCKING DEVICE DESIGNED FOR THE TYPE OF GATE POSTS USED.
- (16) FURNISH AND INSTALL POSITIVE TYPE LATCHING DEVICES WITH PROVISIONS FOR PAD LOCKING
- 17 FURNISH AND INSTALL KEEPERS TO RETAIN THE GATE IN THE OPEN POSITION. REFER TO DETAIL AT ON THIS SHEET.
- (1) FURNISH AND INSTALL ONE (1) 12,000-GALLON PORTABLE WATER TOWER AT THE LOCATION IDENTIFIED IN THE FIELD BY THE COUNTY IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 33 1600: WATER UTILITY STORAGE TANKS. SEE GENERAL NOTE 18.
- (9) REMOVE AND RELOCATE FIVE (5) EXISTING K-RAILS TO NEW CONCRETE PAD OR AN AREA IDENTIFIED BY A COUNTY REPRESENTATIVE.
- (20) REMOVE AND DISPOSE OF EXISTING LINER AT WASTE RECYCLE AREA.
- (21) REMOVE AND DISPOSE OF EXISTING CHAIN LINK FENCE AND FENCE POSTS AROUND THE FUEL STORAGE YARD
- (22) REMOVE AND DISPOSE OF TWO (2) EXISTING 16' X 16' SWING GATES.
- (23) FURNISH AND INSTALL NEW WELDED STEEL SECURITY FENCE, FENCE POSTS AND ALL APPURTENANCES NEEDED TO REPLACE EXISTING CHAIN LINK FENCE AROUND THE FUEL STORAGE YARD. REFER TO DETAIL G ON PLAN SHEET 13 FOR FENCING DETAILS.
- (24) FURNISH AND INSTALL ONE (1) NEW WELDED STEEL, DOUBLE SWING GATE (16' WIDE). REFER TO DETAIL H ON PLAN SHEET 13 FOR GATE DETAILS.
- (25) FURNISH AND INSTALL ONE (1) 75' X 45' X 6" REINFORCED CONCRETE PAD IN ACCORDANCE WITH DETAILED PROVISIONS DIVISION 03: CONCRETE. REFER TO DETAIL I ON PLAN SHEET 14.
- (26) FURNISH AND INSTALL NEW FUSIBLE 100A NEMA 3 SAFETY SWITCH. CONNECT TO EXISTING SITE SERVICE DISTRIBUTION PANEL PER DETAILED PROVISIONS SECTION 26 0500: BASIC ELECTRICAL REQUIREMENTS AND SECTION 26 2816: SAFETY SWITCHES. SEE GENERAL NOTE 24.
- (27) FURNISH AND INSTALL ONE (1) 2 INCH SCH. 80 PVC CONDUIT WITH THREE (3) #4/0 CABLES. REFER TO DETAILED PROVISIONS SECTION 26 0519: WIRE AND CABLE AND DETAIL M ON PLAN SHEET 16 FOR TRENCHING DETAILS.
- (28) FURNISH AND INSTALL ELECTRICAL STUB-UP WITH A STEEL RISER AND CONNECT CONDUIT AND CABLES TO EXISTING JUNCTION BOX (EXT.). CONNECT WIRE CABLES TO EXISTING PANEL (INT.). SEE PHOTOS 18 & 19 ON PLAN SHEET 18
- (29) FURNISH AND INSTALL ONE (1) 8 INCH GROUNDING ROD PER DETAIL L ON PLAN SHEET 16. SEE GENERAL NOTE 26.
- (30) FURNISH AND INSTALL ONE (1) BLANK 1 INCH SCH. 80 PVC CONDUIT WITH PULL ROPE FOR FUTURE INSTALL OF DATA CABLE BY OTHERS. REFER TO DETAIL N ON PLAN SHEET 16 FOR TRENCHING DETAILS.
- (3) FURNISH AND INSTALL ONE (1) 11" X 17" COMMUNICATION PULL BOX WITH TRAFFIC RATED COVER. SEE GENERAL NOTE 27.
- $\ensuremath{\mathfrak{A}}$ ADJUST THE POST TOP ELEVATIONS TO PROVIDE A SMOOTH VISUAL FENCE PROFILE. THERE SHALL BE FOUR (4) HORIZONTAL BREAKS WHICH SHALL BE INSTALLED AT 90 DEGREES.
- 33 INSTALL AN 8" X 6" CONCRETE MOW STRIP UNDER WELDED STEEL FENCE ALIGNMENT FOR ADDITIONAL SECURITY.
- 34 BACKFILL THE EXISTING GROUND SURROUNDING THE CONCRETE MOW STRIP AFTER CONCRETE FORMS ARE REMOVED. BACKFILL SHALL BE FLUSH WITH THE TOP OF THE CONCRETE MOW STRIP.
- (35) SCARIFY AND RECOMPACT THE UPPER ONE (1) FOOT OF SUBGRADE TO ACHIEVE 90% RELATIVE COMPACTION WITHIN THE LIMITS OF THE REINFORCED CONCRETE SLAB-ON-GRADE IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 31 2300: EARTHWORK.
- (36) CONSTRUCT 6-INCH THICK REINFORCED CONCRETE SLAB WITH NO. 4 REBAR SPACED AT 18 INCHES ON CENTER IN BOTH DIRECTIONS.
- (37) SAWCUT CONTROL JOINTS IN ACCORDANCE WITH THE PROJECT PLANS AND DETAILED PROVISIONS DIVISION 03: CONCRETE. REFER TO PLAN SHEET 15 FOR TYPICAL CROSS-SECTIONS.
- (38) FURNISH AND INSTALL 10" DIAMETER LOCKING WELLHEAD CAP.

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DEPARTMENT OF WASTE RES∹URCES					
Andy Cortez, General Manager-Chief Engineer					



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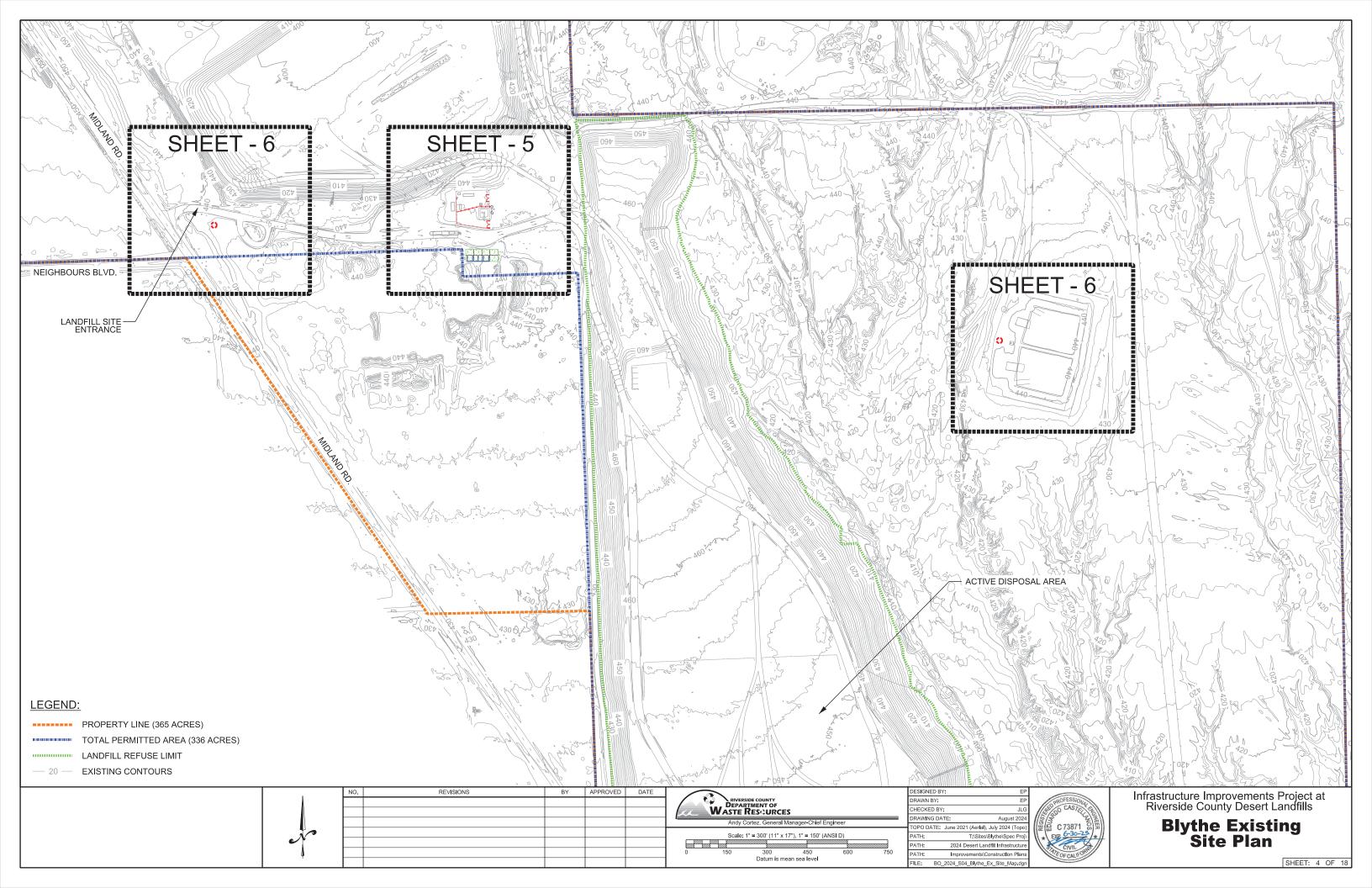
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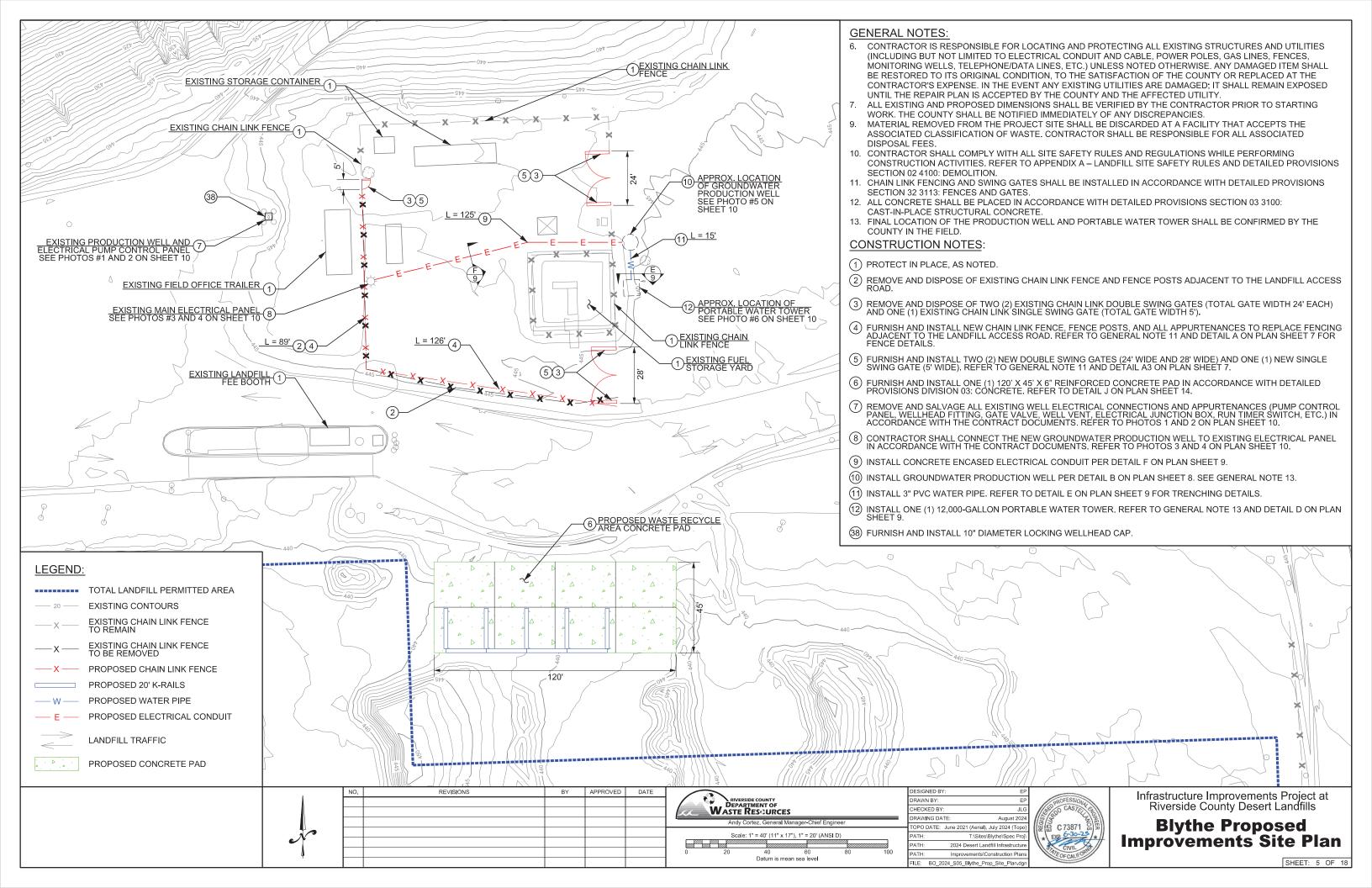
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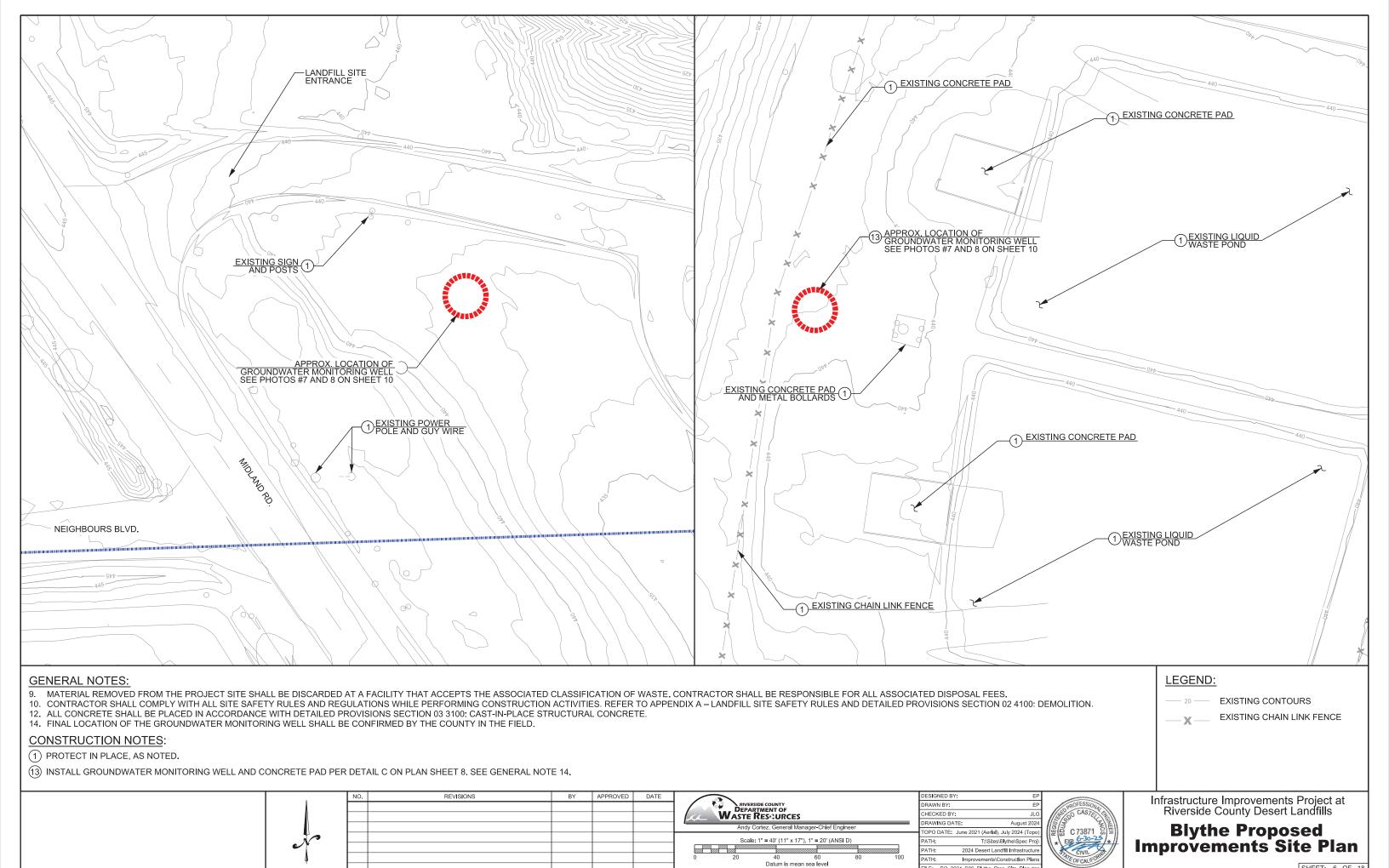
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Infrastructure Improvements Project at Riverside County Desert Landfills







CONVEX SURFACE TO ALLOW DRAINAGE

11. CHAIN LINK FENCING AND SWING GATES SHALL BE INSTALLED IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 32 3113; FENCES AND GATES

SEE GENERAL NOTE 12.

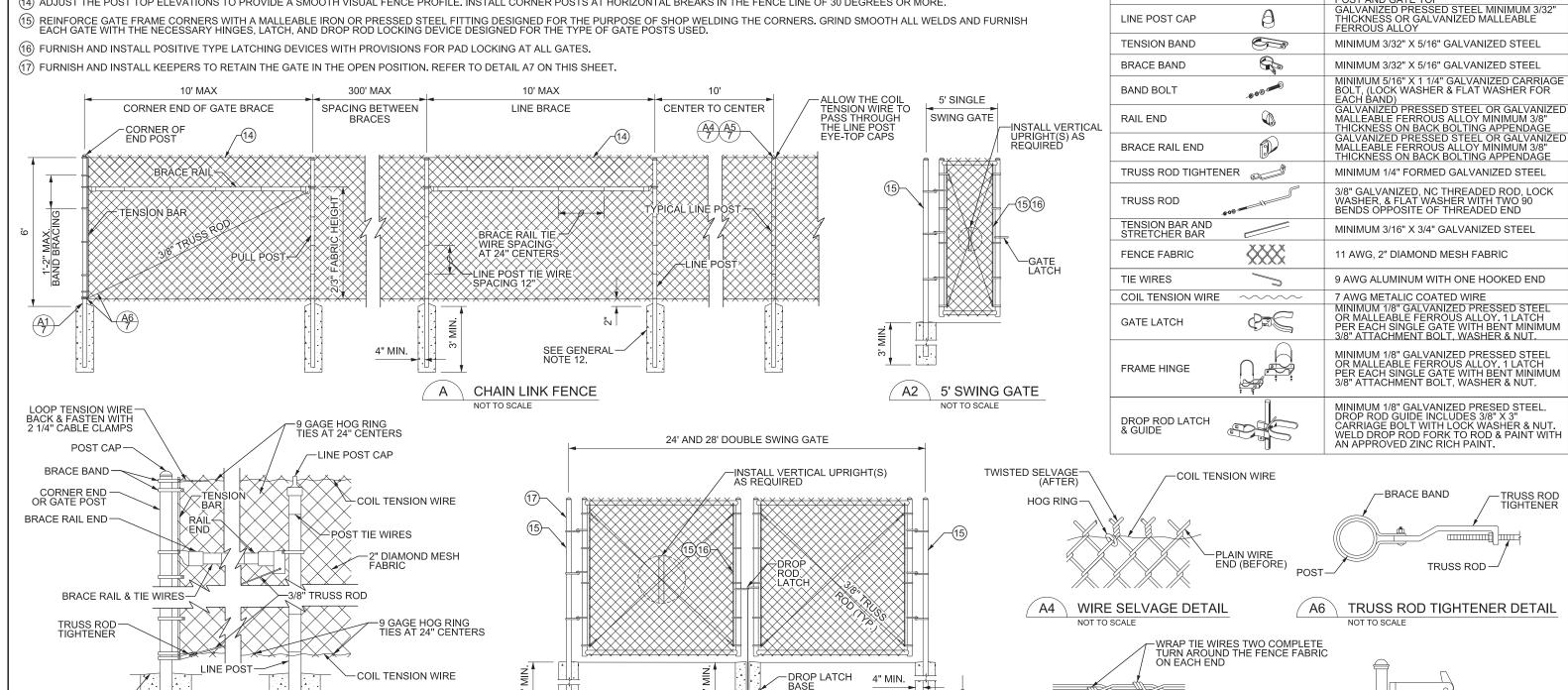
CHAIN LINK DETAIL

NOT TO SCALE

- 12. ALL CONCRETE SHALL BE PLACED IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 03 3100: CAST-IN-PLACE STRUCTURAL CONCRETE.
- 15. CHAIN LINK HARDWARE DESIGN MAY VARY FROM THE DETAILS SHOWN; HOWEVER, ALL HARDWARE AND APPURTENANCES USED IN A SINGLE INSTALLATION SHALL BE UNIFORM AND COMPATIBLE.
- 16. GATE, END, AND CORNER POSTS SHALL BE 2-7/8 INCH O.D.
- 17. LINE POSTS SHALL BE 2-3/8 INCH O.D.

CONSTRUCTION NOTES:

(4) ADJUST THE POST TOP ELEVATIONS TO PROVIDE A SMOOTH VISUAL FENCE PROFILE. INSTALL CORNER POSTS AT HORIZONTAL BREAKS IN THE FENCE LINE OF 30 DEGREES OR MORE



24' AND 28' DOUBLE SWING GATE A5 NOT TO SCALE NOT TO SCALE



CHAIN LINK FENCE TIE DETAIL Α7

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HARDWARE ITEM DESCRIPTION

BRACE RAIL AND

CORNER, END AND PULL POSTS

TOP RAIL

LINE POST

POST CAP

GATE KEEPER NOT TO SCALE

BRACE BAND

TRUSS ROD

STANDARD REQUIREMENTS

CAST NON-FERROUS ALLOY OR GALVANIZED PRESSED STEEL CAP MUST FIT SNUGLY ON

1-1/4" NPS (O.D. 1.660 INCH)

2-1/2" NPS (O.D. 2.875 INCH)

2 NPS (O.D. 2.375 INCH)

POST AND GATE TOP

REVISIONS BY APPROVED DEPARTMENT OF WASTE RESCURCES

4" MIN.

CAST C73871

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2024 Desert Landfill Infrastructur

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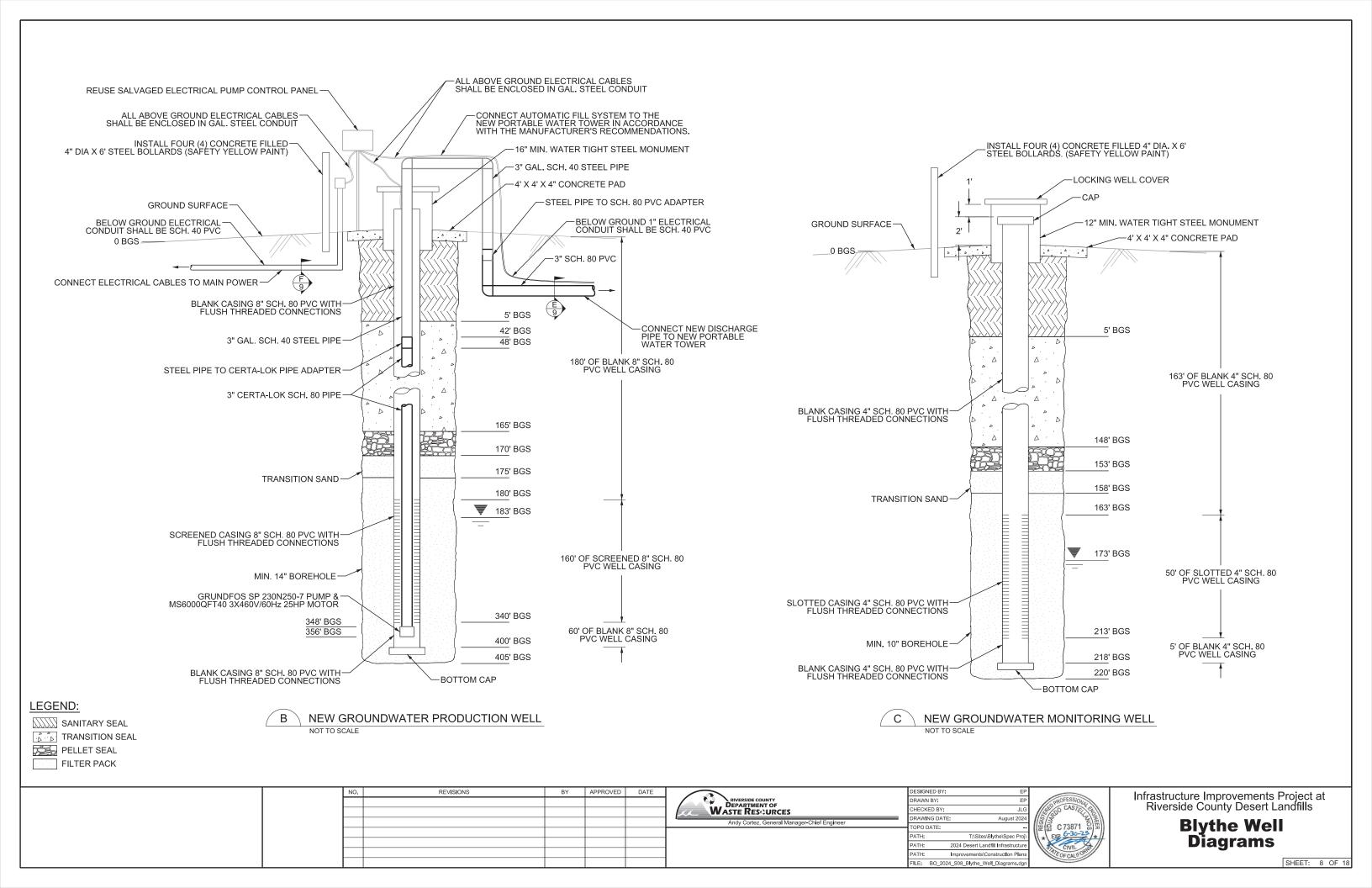
Infrastructure Improvements Project at Riverside County Desert Landfills

Blythe Fence Details

SHEET: 7 OF 18

TRUSS ROD

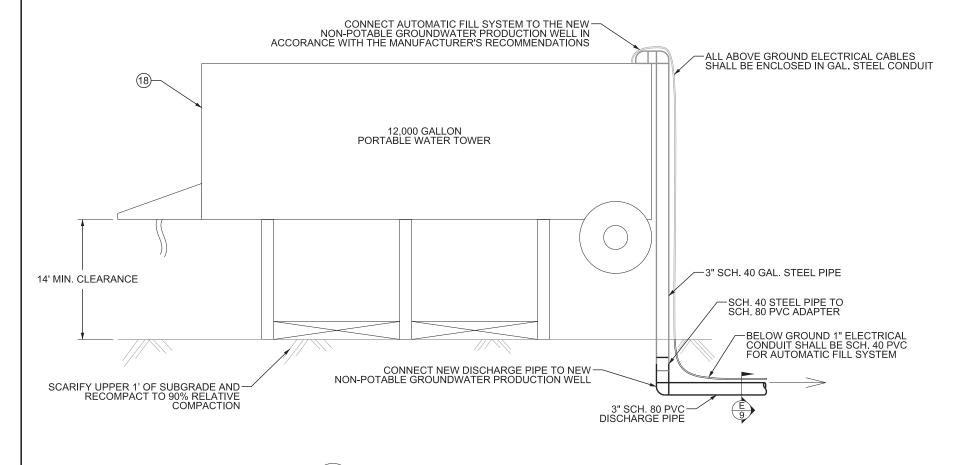
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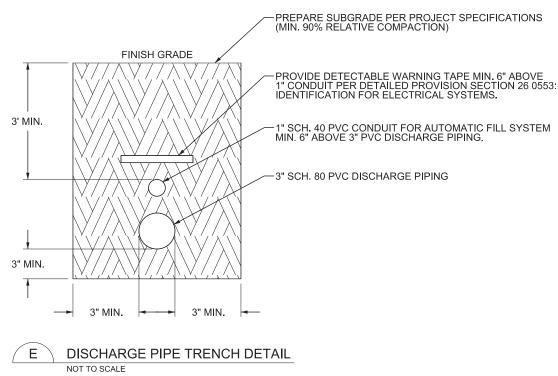


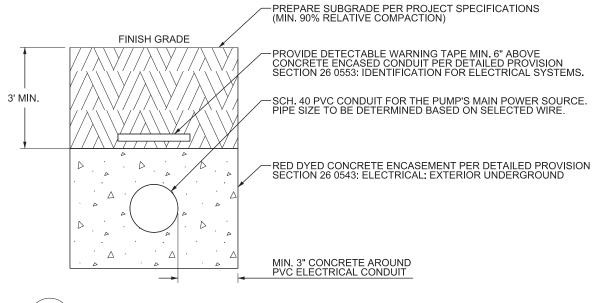
- 18. THE PORTABLE WATER TOWER SHALL, AT A MINIMUM, INCLUDE: STEEL FITTED HEADS, A 10-INCH DIAMETER DISCHARGE TUBE (MIN. 12-FEET FROM GRADE), DUAL 3-INCH FILL PIPE WITH APPROVED AIR GAPS, VALVES, FLOAT ASSEMBLIES AND CAMLOCK ON END OF PIPE, A MECHANICAL FLOAT SYSTEM (FILL CONTROLLED BY WATER DEPTH), AN AUTOMATIC SHUT OFF VALVE, A TANK ACCESS HATCH, AND AN OSHA-APPROVED ACCESS LADDER. OPTIONAL ITEMS THAT CAN BE REMOVED BEFORE OR AFTER DELIVERY AND INSTALLATION FOR A COST CREDIT TO THE COUNTY SHALL INCLUDE BUT NOT BE LIMITED TO: A FIFTH WHEEL HITCH, A REMOVEABLE HYDRAULIC PUMP AND MOTOR, A HEAVY-DUTY LONG-LIFE AXLE, SUSPENSION, AND AIR BRAKE SYSTEM, AND DUAL WHEELS AND TIRES.
- 19. EXTERIOR OF PORTABLE WATER TOWER TANK SHALL BE COATED WITH PRIMER AND WHITE EPOXY PAINT.
- 20. INTERIOR OF PORTABLE WATER TOWER TANK SHALL BE COATED WITH A RUST-RESISTANT THREE-COAT EPOXY COATING SYSTEM TO PREVENT CORROSION.
- 21. THE COUNTY SHALL PERFORM ROUGH GRADING OF SUBGRADE PRIOR TO PLACEMENT OF THE PORTABLE WATER TOWER.
- 22. THE CONTRACTOR SHALL SECURE THE PORTABLE WATER TOWER IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION.

CONSTRUCTION NOTES:

(8) FURNISH AND INSTALL ONE (1) 12,000-GALLON PORTABLE WATER TOWER AT THE LOCATION IDENTIFIED IN THE FIELD BY THE COUNTY IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 33 1600; WATER UTILITY STORAGE TANKS, SEE GENERAL NOTE 18.









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NEW PORTABLE WATER TOWER

NOT TO SCALE





Infrastructure Improvements Project at Riverside County Desert Landfills

Water Tower & Trench Details

SHEET: 9 OF 18



PHOTO #1
EXISTING ELECTRICAL PUMP CONTROL PANEL



PHOTO #2
EXISTING ELECTRICAL PUMP CONTROL PANEL



PHOTO #3
EXISTING MAIN ELECTRICAL PANEL



PHOTO #4
EXISTING MAIN ELECTRICAL PANEL



PHOTO #5
PROPOSED GROUNDWATER PRODUCTION WELL LOCATION



PHOTO #6
PROPOSED PORTABLE WATER TOWER LOCATION



PHOTO #7
PROPOSED GROUNDWATER MONITORING WELL LOCATION



PHOTO #8
PROPOSED GROUNDWATER MONITORING WELL LOCATION

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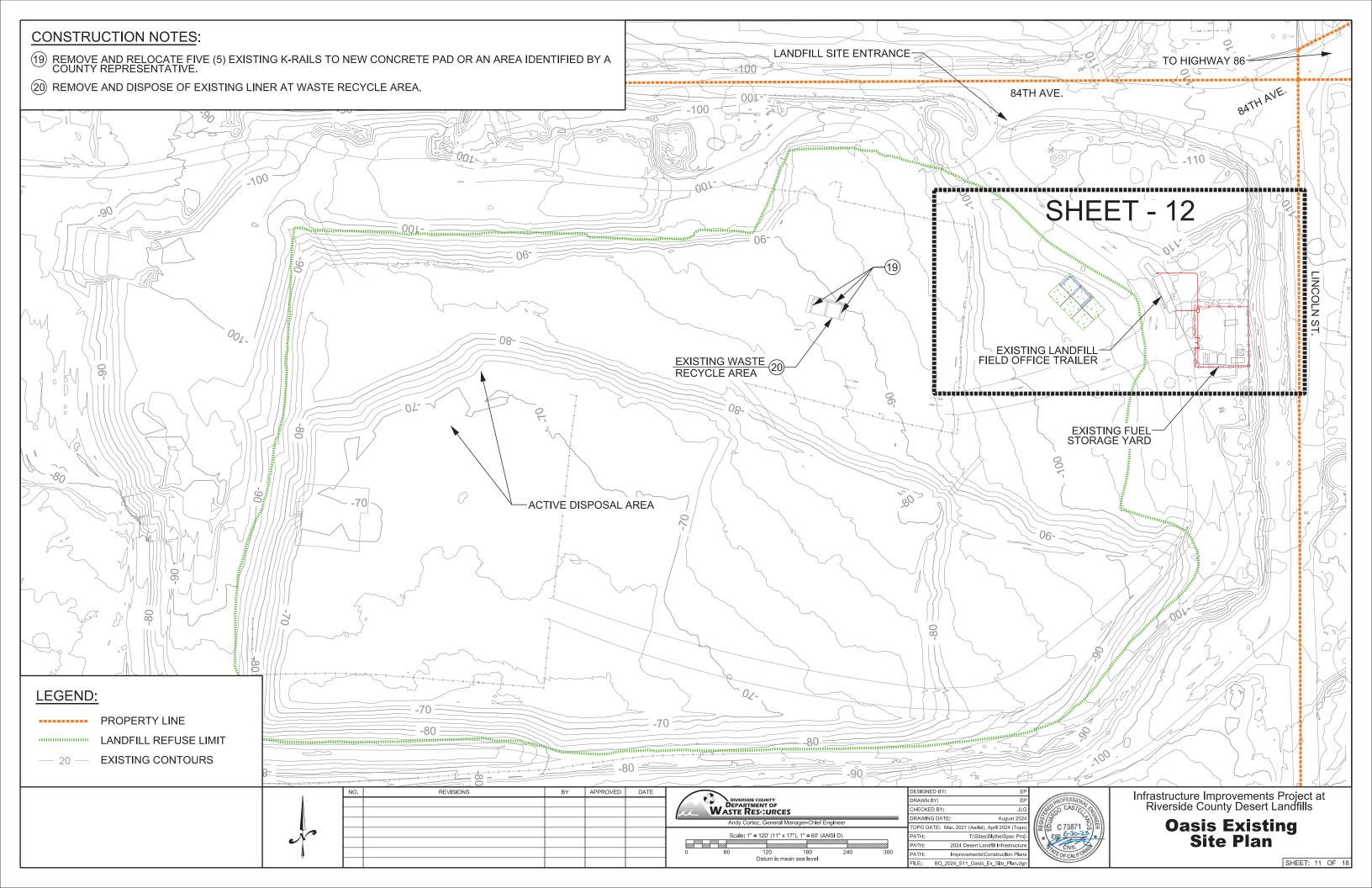
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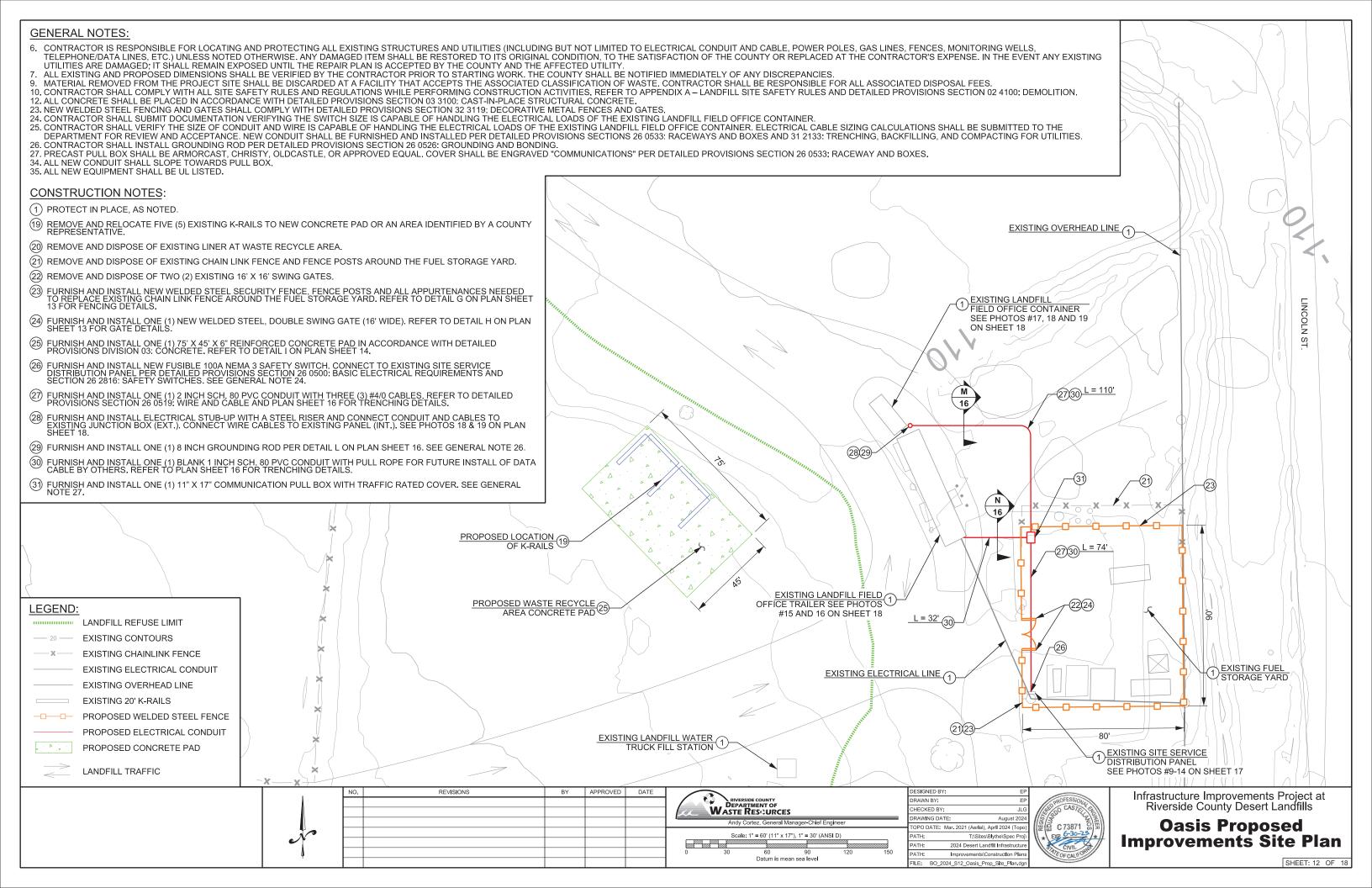
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Infrastructure Improvements Project at Riverside County Desert Landfills

Blythe Site Photos

SHEET: 10 OF 18



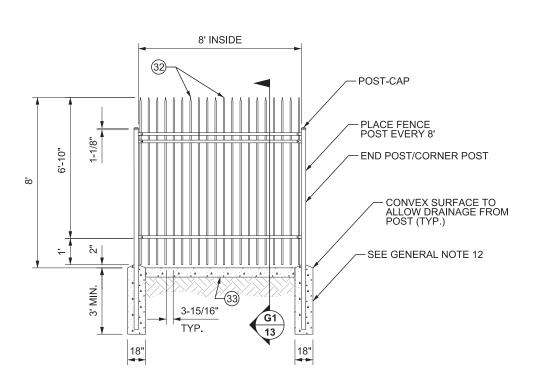


- 12. ALL CONCRETE SHALLED BE PLACED IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 03 3100: CAST-IN-PLACE STRUCTURAL CONCRETE.
- 23. NEW WELDED STEEL FENCING AND GATES SHALL COMPLY WITH DETAILED PROVISIONS SECTION 32 3119: DECORATIVE METAL FENCES AND
- 28. WELDED STEEL END POSTS SHALL BE 4 INCH SQUARE (12 GAUGE), LINE POSTS SHALL BE 3 INCH SQUARE (12 GAUGE), VERTICAL FRAME TUBE
- SHALL BE 2 INCH SQUARE (12 GAUGE), AND HORIZONTAL RAIL TUBE SHALL BE 1-1/2 INCH SQUARE (14 GAUGE).

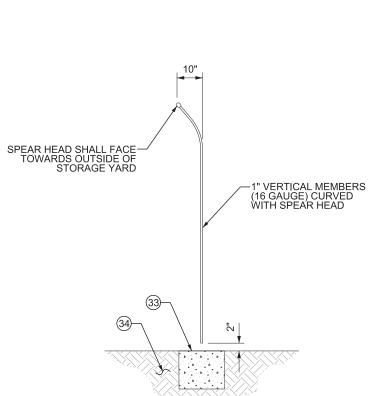
 29. WELDED STEEL FENCING AND SWING GATES SHALL BE POWDER COATED IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 32 3119: DECORATIVE METAL FENCES AND GATES.
- 30. HORIZONTAL WELDED STEEL RAIL TUBE SHALL BE CONFIGURED WITH TWO (2) RAILS ALONG THE TOP OF THE FENCE AND ONE (1) RAIL ALONG THE BOTTOM OF THE FENCE.
- 31. NYLON POST CAPS SHALL BE FLUSH WITH THE TOP OF THE END POST.

CONSTRUCTION NOTES:

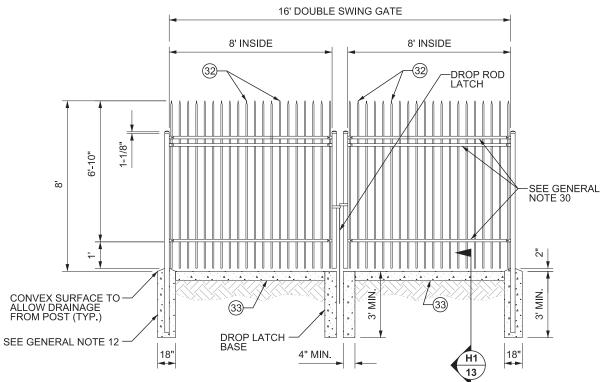
- 32) ADJUST THE POST TOP ELEVATIONS TO PROVIDE A SMOOTH VISUAL FENCE PROFILE. THERE SHALL BE FOUR (4) HORIZONTAL BREAKS WHICH SHALL BE INSTALLED AT 90 DEGREES.
- (33) INSTALL AN 8" X 6" CONCRETE MOW STRIP UNDER WELDED STEEL FENCE ALIGNMENT FOR ADDITIONAL SECURITY.
- 34 BACKFILL THE EXISTING GROUND SURROUNDING THE CONCRETE MOW STRIP AFTER CONCRETE FORMS ARE REMOVED. BACKFILL SHALL BE FLUSH WITH THE TOP OF THE CONCRETE MOW STRIP.



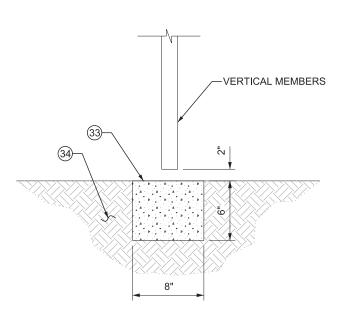








WELDED STEEL DOUBLE SWING GATE DETAIL NOT TO SCALE



´H1 CONCRETE MOW STRIP - SECTION B NOT TO SCALE

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Infrastructure Improvements Project at Riverside County Desert Landfills

Oasis Fence Details

SHEET: 13 OF 18

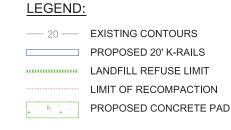
- 32. FILL MATERIAL SHALL BE PLACED IN UNIFORM LAYERS WHICH, WHEN LOOSE, SHALL NOT EXCEED 6 INCHES FOR HAND OPERATED
- MECHANICAL COMPACTORS AND NOT EXCEED 8 INCHES PER LAYER FOR HEAVY EQUIPMENT COMPACTORS.

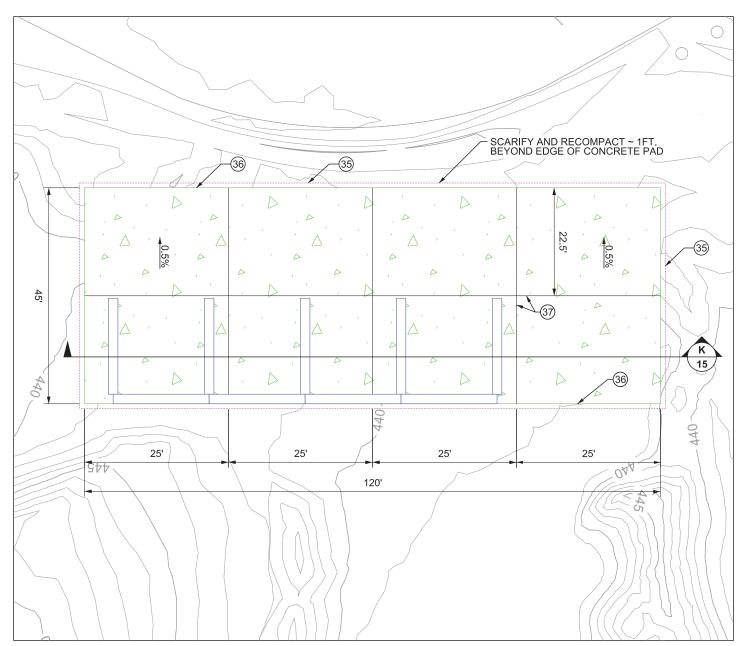
 33. FILL MATERIALS SHALL BE MOISTURE CONDITIONED TO A MOISTURE CONTENT BETWEEN OPTIMUM MOISTURE CONTENT AND 3% ABOVE THE OPTIMUM MOISTURE CONTENT.

CONSTRUCTION NOTES:

- 35 SCARIFY AND RECOMPACT THE UPPER 1 FOOT OF SUBGRADE TO ACHIEVE 90% RELATIVE COMPACTION WITHIN THE LIMITS OF THE REINFORCED CONCRETE SLAB-ON-GRADE IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 31 2300: EARTHWORK.
- (36) CONSTRUCT 6-INCH THICK REINFORCED CONCRETE SLAB WITH NO. 4 REBAR SPACED AT 18 INCHES ON CENTER IN BOTH DIRECTIONS.
- (37) SAWCUT CONTROL JOINTS IN ACCORDANCE WITH THE PROJECT PLANS AND DETAILED PROVISIONS DIVISION 03: CONCRETE. REFER TO PLAN SHEET 15 FOR TYPICAL CROSS SECTIONS.



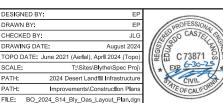




OASIS CONCRETE PAD LAYOUT

BLYTHE CONCRETE PAD LAYOUT

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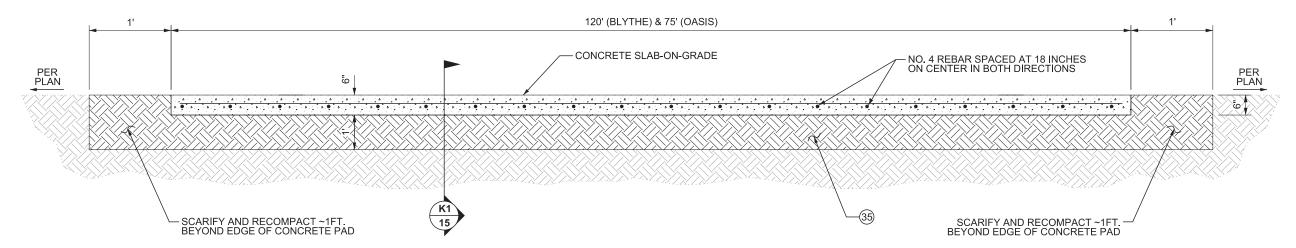
Infrastructure Improvements Project at Riverside County Desert Landfills

Blythe and Oasis Recycle Area Layout Plan

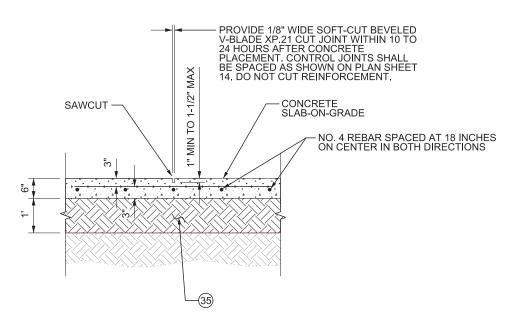
- 32. FILL MATERIAL SHALL BE PLACED IN UNIFORM LAYERS WHICH, WHEN LOOSE, SHALL NOT EXCEED 6 INCHES FOR HAND OPERATED MECHANICAL COMPACTORS AND NOT EXCEED 8 INCHES PER LAYER FOR HEAVY EQUIPMENT COMPACTORS.
- 33. FILL MATERIALS SHALL BE MOISTURE CONDITIONED TO A MOISTURE CONTENT BETWEEN OPTIMUM MOISTURE CONTENT AND 3% ABOVE THE OPTIMUM MOISTURE CONTENT.

CONSTRUCTION NOTES:

35 SCARIFY AND RECOMPACT THE UPPER 1 FOOT OF SUBGRADE TO ACHIEVE 90% RELATIVE COMPACTION WITHIN THE LIMITS OF THE REINFORCED CONCRETE SLAB-ON-GRADE IN ACCORDANCE WITH DETAILED PROVISIONS SECTION 31 2300; EARTHWORK.



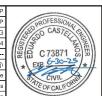




K1 TYPICAL CONTROL JOINT AT SLAB ON GRADE

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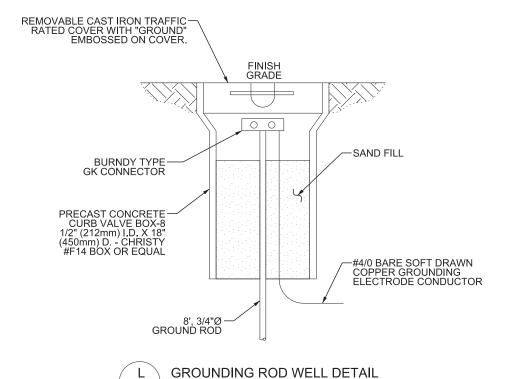


Infrastructure Improvements Project at Riverside County Desert Landfills

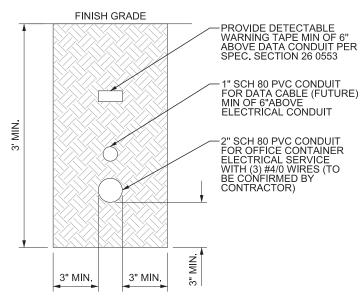
Blythe and Oasis Recycle Area Section

SHEET: 15 OF 18

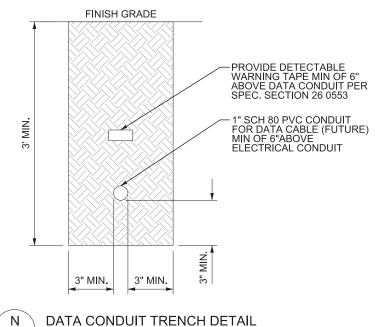
- 25. CONTRACTOR SHALL VERIFY THE SIZE OF CONDUIT AND WIRE IS CAPABLE OF HANDLING THE ELECTRICAL LOADS OF THE EXISTING LANDFILL FIELD OFFICE CONTAINER. ELECTRICAL CABLE SIZING CALCULATIONS SHALL BE SUBMITTED TO THE DEPARTMENT FOR REVIEW AND ACCEPTANCE. NEW CONDUIT SHALL BE FURNISHED AND INSTALLED PER DETAILED PROVISIONS SECTIONS 26 0533: RACEWAYS AND BOXES AND 31 2133: TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES.
- 26. CONTRACTOR SHALL INSTALL GROUNDING ROD PER DETAILED PROVISIONS SECTION 26 0526: GROUNDING AND BONDING.
- 38. ALL NEW CONDUIT SHALL SLOPE TOWARDS PULL BOX.

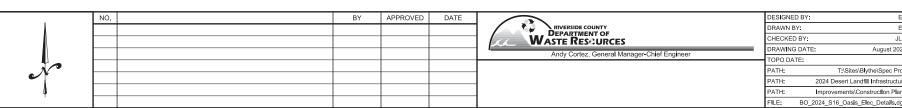


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M ELECTRICAL & DATA CONDUIT TRENCH DETAIL





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Infrastructure Improvements Project at Riverside County Desert Landfills

Oasis Electrical Site Plan

SHEET: 16 OF 18



PHOTO #9
MAIN ELECTRICAL SERVICE



PHOTO #10
SITE SERVICE DISTRIBUTION PANEL (OPEN)



PHOTO #11
SITE SERVICE DISTRIBUTION PANEL (OPEN)



PHOTO #12 SITE STORAGE YARD ELECTRICAL PANEL

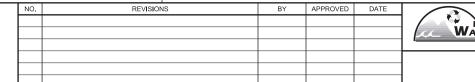


PHOTO #13
SOUTHEAST VIEW OF MAIN ELECTRICAL SERVICE FROM EXISTING OFFICE TRAILER



PHOTO #14

NORTHWEST VIEW OF EXISTING OFFICE TRAILER FROM MAIN ELECTRICAL SERVICE



RIVERSIDE COUNTY DEPARTMENT OF WASTE RESURCES
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Infrastructure Improvements Project at Riverside County Desert Landfills

Oasis Electrical Site Photos

SHEET: 17 OF 18



PHOTO #15

NORTH VIEW LOOKING TOWARD OFFICE TRAILER



PHOTO #16
EXISTING OFFICE TRAILER PANEL (OPEN)



PHOTO #17
EAST VIEW LOOKING TOWARD EXISTING OFFICE CONTAINER



PHOTO #18
JUNCTION BOX ON EXISTING OFFICE CONTAINER (EXTERIOR EAST WALL)



PHOTO #19
EXISTING OFFICE CONTAINER PANEL (INTERIOR EAST WALL)

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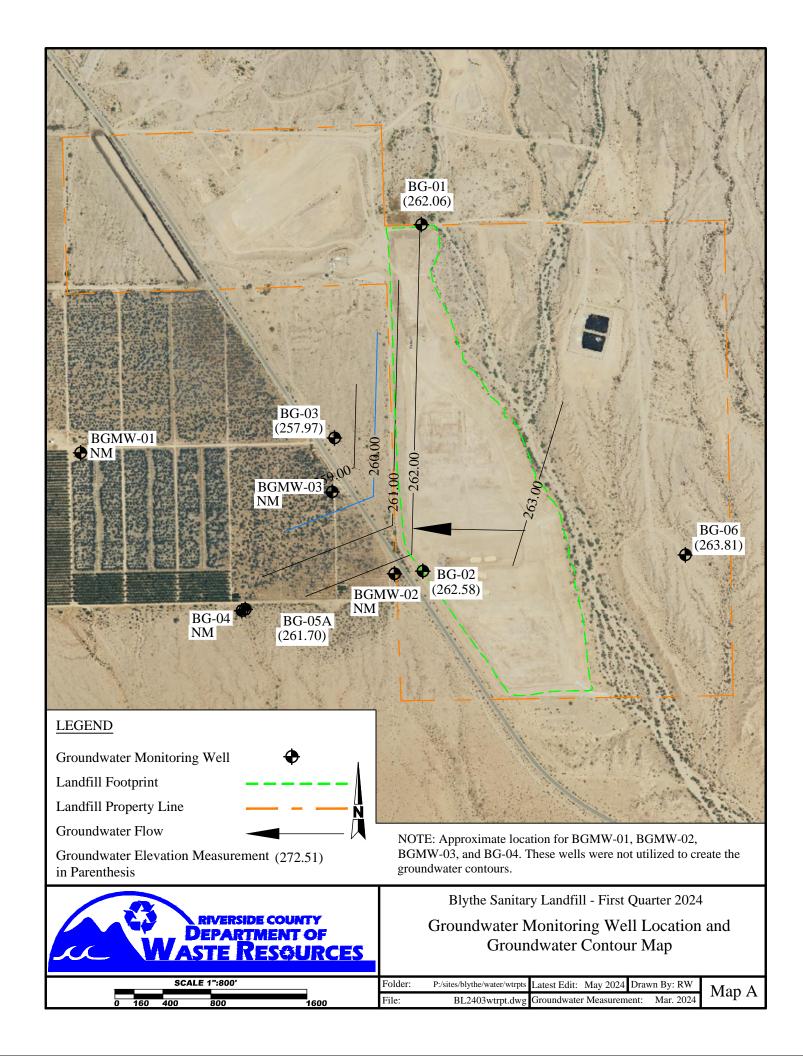
Infrastructure Improvements Project at Riverside County Desert Landfills

Oasis Electrical Site Photos

SHEET: 18 OF 18

APPENDIX D: EXISTING SITE GROUNDWATER DATA









FIELD LOG OF BORING NO. BG-1 SHEET NO. 1 or 7

PROJE	CT NO	86	5-41-415-01	L-04				DATE(S) _10/22/87		ELEVATION		
PROJE	CT NA	ME Ri	verside Co	ounty SW	AT - B	lythe		REFERENCE				
FIELD	ENGIN	EER	Scott Heul	Le				LOCATION North end	of landf	i11		
ASSIS	TANT							WATER LEVEL AFTER				
DAILL	ING CO	oD	atum Explo	oration				TIME0730		1103		
								SETUP			STOP	
DAILE	ino mi	40	¢					DANNING WEIGHT		ATENAGE DROP		
	ye s	PAOL SELL	15.2	H. R	4	exc*						
0 * . &	Tug t	CORE OF	Lin Politica	H. HOETUR	COMSES	COTO		DESCRIPTION	GROUP SYMBOL	LEL/0 ₂ /H ₂ S	REMARKS	
Ţ	\prod	T		Ī		Tan		fine grained, gravel	SP/ GP		injecting wtr., from irrigation	
2		-	-			-	-		+ +		_canal.	
4]]					1	_		1 1			
	Ш								SP/		-	
6	H	-				-	-		GP _		-	
8	11	_	ļ				-		1 1		<u>Į</u>	
	10,					-		graval to 1/2# dia	† †		†	
10			—	1 1		Tan	_Sand, Silty W/	gravel to 1/2" dia.			<u> </u>	
12	 	-				-	-		+ +		-	
1	П					-			+ +	•	†	
14	1			1		Tan -	- Sand, slightly	silty w/ gravel to 1/2*	SP		Ī	
16	11	-				-	-	dia.	+ +		+	
18	$\ \ $						-0 18', gravel		1 1	- 0/22.2/0 -	Ĺ	
10 1	20.]]	-0 10 , graver		Ţ]		Ţ	
20	BG-1	\vdash				-	Gravel, fine some silt.	to med. grained, sandy,	GP -		injecting wtr.	
22	1 [L		l l			Joine Sire.		1 1		<u>†</u>	
	П		1				-		+ +		1	
24	11	\vdash		1		Tan -	Craval fina	to med. to 1/2" dia.	GP -		†	
26	11	-				Tan -	sandy.	20 mga: 20 2/2 and	1 -		Ţ	
1	П					.			+ +		†	
28	اءا			1 I		[]	Ţ		† 7		Ţ	
30	BG-1 30	-		{		Tan 🕳	Sand & gravel gravel to 1/2	, sand, fine to crs.,	SP/_ GP	-	+	
,, [BG]		_	L graver to 1/1		1 :		1	
32	11			}					↓ .		ļ	
34	$\{ \}$	-		{		-	+		† -	-	†	
36	П	L		↓			1		1 1		Ī.	
-						-	+		+ -		+	
38	$\ \ $	-		1 l		, -	†		† :	-1/22.0/0	†	
40 1						<u> </u>	I				L	



FIELD LOG OF BORING NO. _RG-1

SHEET NO. 2 of 7

PROJECT NO. 86-41-415-01-04		DATE(S) 10/22/87	ELEVATION	
PROJECT NAME Riverside County SWAT	- Blythe	REFERENCE		
FIELD ENGINEER Scott Heule		LOCATION North side	of landfill	
ASSISTANT		WATER LEYEL	MIN/HOURS	
DRILLING CO. Datum Exploration		TIME		
ORILLING METHOD & DIAM. SS-16 w/10" cas		SETUP	START	STOP
0:				
10 W. S. P. C. P. P. C. P. P. C. P. P. C. P. C. P. P.	Sterre Or			
10 H. S. L.	COLOR D	ESCRIPTION	SYMBOL LEL/02/H2	REMARKS
42	Tan . Gravel, sandy, c	lasts to 1/2" dia.	† †	injecting wtr. during drilling.
- BG-1	Ţ	-	Į Į	Ţ
14	†	_	+ +	+
16 .	Tan Sand & gravel.	J	SP/ GP	Ī
	†		† †	†
18 -	T	-	<u> </u>	†
60	Tan Sand & gravel, s	ilty, med. to crs. sand-	SP/ GP	+
52 T 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 1		<u>t</u> " <u>t</u>	İ
1111 1 1	1 1	-	ł	Ţ
4 1 1	†	-	t t	†
66	+	_	0/22.2/0	+
	l <u>†</u>		t t	土
0 0		-	F T	Ţ
	Tan Gravel, w/sand,	to 1/2" dia	GP 🛨	Injecting wtr.
2 4 1	 	-	I I	Ţ
4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	l <u>t</u>	-	<u>t</u> t	<u>†</u>
	T		F Ŧ	Ţ
66	1 †	-	† †	†
8 1 1	1 4	_	ļ ļ	Ţ
0 17 19	Tan - Sand, fine grain	ned w/ fine gravel	SP/	t
	(to 3/8" dia.)		GP T	Ţ
	†	_	† †	†
4	l I	-	Į Į	Ŧ
	Ιİ	-	† †	10/22/97
6	l Ţ	-	ŢŢ	10/22/87 10/23/87
8	+	-	† †	+
	<u> </u>		<u>† † </u>	<u> </u>



FIELD LOG OF BORING NO. BG-1 SHEET NO. 3 or 7

PROJECT NAME	PROJECT NO.	86-41-415-01-04		DATE(S)	ELEVATION	
DRILLING CO Datum Exploration TIME SETUP DRILLING METHOD & DIAM. SS-16 W/ 10" casing hammer DRIVING WEIGHT DESCRIPTION THE SETUP START STOP AVERAGE DROP PERCENT TRAN SAND FINES REMARKS injecting wtr. from irrigation canal.	PROJECT NAM	AE . Riverside County SWAT	- Blythe	REFERENCE		
DRILLING CO Datum Exploration TIME SETUP DRILLING METHOD & DIAM. SS-16 W/ 10" casing hammer DRIVING WEIGHT DESCRIPTION THE SETUP START STOP AVERAGE DROP PERCENT TRAN SAND FINES REMARKS injecting wtr. from irrigation canal.	FIELD ENGINE	Scott Heule		LOCATION		
DRILLING CO Datum Exploration TIME SETUP START STOP DRIVING WEIGHT AVERAGE DROP REMARKS REMARKS Tan Sand, silty W/ gravel to 1/2" dia. max. SM injecting wtr. from irrigation canal.				WATER LEVEL	AFTER	MIN/HOURS
DRILLING METHOD A DIAM SS-16 W/ 10" casing hammer DRIVING WEIGHT AVERAGE DROP RO						
RO Sand, silty w/ gravel to 1/2" dia. max. SM injecting wtr. from irrigation canal.				SETUP		
Sand, silty w/ gravel to 1/2" dia. max. SM injecting wtr. from irrigation canal.	DRILLING MET	THOD & DIAM SS-16 W/ 10" ca	sing hammer	DRIVING WEIGHT	AVERAGE DRO	·
Sand, silty w/ gravel to 1/2" dia. max. SM injecting wtr. from irrigation canal.		Service Far.	act.			5.0
Sand, silty w/ gravel to 1/2" dia. max. SM injecting wtr. from irrigation canal.	1811 + 56	TO STA ONETA STURE AS	Je Or			
82 So From irrigation canal.	80 A 6 60 C		, pi			T
	143		Tan Sand, silty w/ gr	cavel to 1/2" dia. max.	₽SM ₽	from irrigation
			1 1		† †	canal.
	84				+ + -	+
	111	1	+		† †	†
	86		1 1		† †	Ť
	88		1 1		+ +	+
	• 06		I +	-	t	†
Tan —Sand, silty & fine gravel.	90 7 3		Tan —Sand, silty & fir	ne gravel.	† ⁵ †	İ
			1 1		I I .	Ţ
1	1 1		1 +		+ +	+
94 Tan Sand, silty w/ fine gravel	94		Tan Sand, silty W/ f	ine gravel	T _{SM} T	†
96 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	96		1 1	Control of the Control of Control	1 1	1
	1		l +	54	† †	†
			1 +		† †	†
	1079-1071	<u></u>				injecting wtr.
Tan Sand & graver, sitty, graver to 3/8 dia., sand fine to crs.	124 k		dia., sand fine	to crs.	† ^{GM} † .	†
	102		1 †		† †	Ť
	104		1 1		I I	1
Tan - Sand & gravel, silty, gravel to 3/8" - SM/ -	1		Tan - Sand & gravel, s	ilty, gravel to 3/8"		+
106 dia., sand fine to crs.	106		dia., sand fine	to crs.	† † †	†
Gravel & cbls., sandy	108		Gravel & cbls.,	sandy	IGM/ I	1
	100,		1 1		† †	†
110 drawer, saint w/ cbrs.	110		Gravel, sand w/	cbis.	† †	Ť
112 to 113', sandier			112' to 113', s	sandier	1 1	4
@ 113' gravel & cbls.	111		0 113' gravel 8	cbls.	† †	t
114 +	114		1 +		† †	
10/23/87 to check for H ₂ 0. None apparent	116		1 1			None apparent
10/28/87 Injecting with	1				10/28/87	from City
118 + + + + + + + + +	118		+		† †	Tayaranc.
120	120				<u> </u>	<u> </u>



FIELD LOG OF BORING NO. BG-1 SHEET NO. 4 of 7

	PROJE	CTN	0	86-4	1-415-	01-04				DATE(S)10/28/87		ELEVATION		
	PROJE	CTN	AME .	Rive	rside (County	SWAT -	Blythe	2	REFERENCE				
	FIELD	ENG	NEER	Scot	t Heule	e				LOCATION				
	ASSIS	TANT								WATER LEVEL		AFTER	MIN/HOURS	
	DRILLI	NG C	o	_Datu	m_Explo	oration	ı			TIME				
	ORILL	NG N	ETHOD	& DIAS	ss-	-16 w/1	0° cas	ing han	nmer	SETUP DRIVING WEIGHT		START AVERAGE DROP	STOP	
			4	O.W	.9			c \						
	70	30	OR OR	14	P) CHOCK	A HOST	OHSE COMSE	JEME OF			GROUP	PERCENT		
120 .	¥ &	*2°	'Q'	OEPTY	8) E. F.	40,	· %	, ₀₀		SCRIPTION	SYMBOL	GRAV SAND FINES	REMARKS	
	\leftarrow	120		-				Gry. Grn.	Sand & gravel w/ s	silt	SP .		injecting wtr.	
122 .		BG-1		\top		. 1		to Dk_ Brn.	† .		† †	-	<u> </u>	
124 -		125'	\vdash	_				-	-		1 1		L	
126									Sand & gravel, med		SP/		 	
126 -		BG-1		十			. •	to Dk.	sand w/some silt/	clay.	T ^{GP}		Ţ	
128 -	-	30,	-					Brn.	+		+ -		 -	
130 -	1_	1							54 5 6		†			
130 -	\mathbb{Z}	BG-							Sand & Gravel.		GP GP		Hole making wtr? No wtr. injected.	
132 •	+	135,	\vdash	+				-	+		+ -		-	
134 -	1_	BG-1 1	L	\perp							1 1	_ :	Ĺ	
	1	-							@ about 135' sand	dstone, fine grnd.,	sm -		-	
136 -		137	\vdash	_	-			-	tan, w/ crs. sand mostly v. fine sa	andstone.	† -		@ 1120 stopped to let hole recover	
138.	\mathbb{Z}	BG-1	-	_				Tan -	Sandstone, fine of gravel, mostly v.	grained, w/ occ. fine grnd.`sandsto	ne SM/		wtr. Tried to chk. static w/ probe	
	┨	П	1						+		+ +		but too much mud on casing, stone	
140 .		П		_	$\neg \uparrow$			~	No recovery.		1 1	-	dropped did show water.	
142.	-	П	\vdash	-				-	-		1 -			
	1	145'						•	†		† •		f	
144 -		-		Wash				Tan .		. siltstone , & some	SP -		Ţ	
146 -	14	BG-	\vdash					-	gravel, mostly v	v. fine grained SS.	+ -	-	 -	
148 -	1_	П	L	\perp				_	<u>L</u>		1 1		<u>t</u>	
	-	150			_ [ł		+ -		ļ	
150.	1/2	BG-1	\cdot	Wash				-		grnd. & crs. grnd. s ,crs. sand is black,		-	drillers stopped	
152 •	1_	m	L	4				-	grn,white, red-br grained sandstone	rn., mostly v. fine	1 -		to get more wtr. for injection.	
	1								†		+ -		L TITLE COOK	
154 •	1			\top	$\neg \neg$				Ţ		1 1		Ţ	
156 -	\vdash		\vdash	+				-	+ .		+ -	-	+	
	1							Tan .	Sandstone, v. fir v. crs. sand.	ne grained w/crs. &	† †		@ 156' drill open hole.	
158	\top			1] .	Ţ		1 :	[.	Ţ	
160		Ш	\perp				<u> </u>	L	1			L	L	



FIELD LOG OF BORING NO. _BG-1

SHEET NO. _5__ or _7__

	ROSE	CTA	10	86-41-415	-01-04			DATE(S)10/28/87		ELEVATION	
	NORG	CT N	AME	Riverside	County SWA	T - Blyt	ne	REFERENCE			
	FIELD	ENG	NE E	Scott Heu	1e						
	ASSIS	TANT	_					WATER LEVEL		_ AFTER	MIN./HOURS
								SETUP DRIVING WEIGHT		START	STOP
	DHILL	NG N	ME 1P	.0:				DRIVING WEIGHT		AVERAGE DROP	
		5	SAT.	Seath Sec	It. Ist	CTENCY	_				
60 .	,4 69 10	BUL	SO.	E GAT BOHOLA	A POSTURE	DESTRECT COLO	۶.	DESCRIPTION	GROUP SYMBOL	PERCENT GRAV-SAND-FINES	REMARKS
.00		160	\Box	Washed		Tan	Sandstone fine	to v. fine grained w/ colored sand grains	SP		open hole, in- jecting city wtr.
162	┼	3-1	1	Sample		-	included.		+ +		-
L64	1_	B				1.	‡		1 1		_
	1						+		+ +		-
.66	1		1		ļ <u>ļ</u> ,	'	<u>†</u>		† †	- 	-
.68	┼		1		} }		+		+ +		_
170 -	1	1 170				١.	1		1 1		-
.,.	\mathbb{Z}	BG-		Slightly Washed		Tan		to v. fine grained, rs. colored sand.	T ^{sp} 7		-
172	╫			Sample		'	+		+ +	-	-
74	1				()		1		1 1		_
76	}						†		1 1		stop for day
.76	T					'	Ţ		7 7		10/29/87
78	+				1 1	1	†		+ +		-
80	1_						1		1 1		
	1						No recovery.		+ +		injecting city wtr., drilling
82	1	П			1	'	Ţ		† †		-open hole.
84	┼						+		+ +		-
86	1_						No recovery		1 1		
	1				 	1	†		1 1		ł
188	7						Ţ		17		Ţ
90	十					Tan -	Sandstone, v. f	fine to fine grained ers. colored sand.	SP		+
192	1					,	1		11		Ļ
	1						+		+ +		t
94	\top						Ţ		7 1		Ţ
196	+-						+		+ +		driller having hard time
198	1_						‡		11		cleaning hole.
	1					1	+		+ +		}
009		L	<u>J</u>	LL							<u> </u>



FIELD LOG OF BORING NO. BG-1

SHEET NO. __6_ of __7_

	PROJE	ECTN	Ю	8	6-41-415	-01-04				DATE(S)10/29/87	<u>'</u>	ELEVATION		
	PROJE	ECT N	AMI	<u>R</u>	iverside	County	SWAT -	Blyth	e	REFERENCE				
	FIELD	ENG	NEE	R S	cott Heu	le				LOCATION				
	ASSIS	TANT								WATER LEVEL		AFTER	MIN./HOURS	
	DRILL	ING C	О.	D	atum Exp	loratio	n			TIME				
										SETUP DRIVING WEIGHT		START	STOP	
				40 E								Avenue enor		
		ys.	SAN	AP.	, 45.4 , 45.4	. H.	ge s	EHC.					•	
200 .	14 69 14 69	But	6	o' our'	y of freeze	H HOET	ge consis	COLOR	DE	SCRIPTION	GROUP SYMBOL	PERCENT GRAV SAND FINES	REMARKS	
	\top	П						Tan j	Sandstone, v. fir w/ crs. to v. crs	ne to fine grained, colored sand.	SP		Drilling open hole, injecting	
202	十	H						-	-		+ -		City water.	
204	1_							_	_		1 1		Ĺ	
	-	Н							-		+ +		+	
206	 	П					,	_	-		† †		<u> </u>	
208	-							<u>-</u>	-		1 -	_	<u> </u>	
	1	210			l			- -		fine grained, w/ cr	†		†	
210 •	Z	BG-1			ashed ple]		ran -	colored sand.	line grained, w/ Cr	. T 5F -		Ţ	
212	+-				<u> </u>			-	-		+ -	-	-	
214	1_								- Difficult cutting	15	1 1		<u> </u>	
	1	Ш						_	recovery.	,	+ -		 -	
216	1							_			† †		†	
218	┿	H						-	-		+ -		-	
	1	Ш						Tan	Sand, v. fine to	fine grained, w/	† :		Drilling open	
220	-]		1011 -	crs. colored sand		Ţ		hole, injecting city wtr.	
222	╁	Н						-	-		+ -	-	-	
224	1							_	Occ. thin gravel	lens/layer.	1 1		Ĺ	
	-	Ш						_	-		+ -		-	
226	╁	l						-	<u> </u>		† 7		t	
228	1							_	-		1 -		1	
230	1	П						Tan	Sand, v. fine to	fine grained. w/	† ·	·	t	
23.7	1					1		1 an -	course colored s		7 7		Ţ	
232	+	Н						-	-		+ -	-	†	
234	1_							_		long/lower	1 1		‡	
	1							-	Occ. thin gravel	tens/tayer.	+ -		†	
236	_	1						-	[† :		Ī	
238	1							_	-		ļ -		+	
	1							-	ł		† .		†	
240			_						•					



FIELD LOG OF BORING NO. .BG-1

SHEET NO. _7_ OF _7_

	PROJECT	86	-41-415-	01-04				DATE(S)	10/29/87		ELEVATION	
	PROJECT	AME RI	verside	County	SWAT -	Blyth	e	REFERENCE _				
	FIELO ENGI	NEERSC	ott Heul	e				LOCATION				
	ASSISTANT			 -		-		WATER LEVEL	188.5 0 06 10/31/87	45	_ AFTER	MIN./HOURS
	DRILLING C	oDa	tum Expl	oration				TIME	SETUP		START	STOP
	DRILLING A	AETHOD & DIA	м					DRIVING WEIG			AVERAGE DROP	
		PLATOE	49.	۶.		_a c ⁴						14
	14 69 6U	CORE DEPTH	oler of	, HOSTURE	COMSES	e coro	N	ESCRIPTION		GROUP	PERCENT GRAV SAND FINES	REMARKS
240		ı,	<u> </u>	4		Tan	Sand, v. fine to	fine, w/ c				[
242	+					-	sand. Sand slig	nciy cement	ea.	+ +	-	+
244	111						-			1		<u>t</u>
	1				l	-				+ +		ł
246	\Box					_			**	‡ 7		Ţ
248	H					-	-			† †	-	t
250	11					_	- @ 250-251, sand			Į		
252	1					Tan -	Sand, v. fine gr	ained, w/ C	rs. grains.	‡ :		‡
	1					1	•			+ -		+
254	\Box			-		-	-			† 7	•	Ţ
256	+-		-							<u> </u>		1
258	H				86	_	-	TD = 256'	47 13.	├ -		About 12' of hole caved while
260	11			- 1		_	_		19	1 :		driller added water to help
	1			1		-	• 5			ł ·		clean hole.
262	\Box					-	.		7.5	Τ.	[Ţ
264	+			1		-			•	† :		‡
266	H	-				-	-			+ -	·	†
268	11	-				-] -	Ţ.,	-
270				1						<u> </u>	1	<u> </u>
	-									+	-	+
272	\forall					-				‡ 7	Ţ	Ţ
274	H					-	-			† -	†	t
276	1					-	-			Į :		+
270	1						_			‡ :	1	‡
278	17						+			+ .	+	+



WELL COMPLETION LOG OF BORING NO. BG-1 SHEET NO. _1_ OF 3_

PROJECT	NO. 86-41-415-01-04			DATE(S)10/31-1	1/3/87 ELEVATION					
PROJECT	NAME Riverside County	SWAT - Blythe		REFERENCE						
FIELD EN	GINEER Scott Heule			LOCATION						
ASSISTAN	и			WATER LEVEL 188.5 @ 0645 10/31 AFTER MIN/HOURS 180.3 @ 0750 11/3						
DRILLING	co <u>Datum Exploratio</u>	on		TIME SETUP START SI						
DRILLING	METHOD & DIAM SS-16_10				AVERAGE DRO	STOP				
	Repair Car	ore corestruct								
14. 6. 97.	Total Cart Collect to	ORGER COLOR			GROUP PERCENT					
0 1 1 1 0		, 	DE:	SCRIPTION	SYMBOL GRAV. SAND FINES	REMARKS				
10						1				
15		‡			‡ ‡	‡				
20		1 1 +	7	5	+ +	1				
25		‡			‡ ‡	‡				
30		1 1			1 1	Ţ				
~		1 1 7		10" dia.	ŦŦ	Ţ.				
35		1 1 🕇			† †	t				
40		1 1 7			1 1	Į				
45	}			Volclay grow	+ +	‡				
50		±			1 1	<u>†</u>				
		}]		+ +	+				
55		†		 pug	† †	†				
60	\ - - 	+	(-	Pyc Centralizer	+ +	+				
65		‡			1 1	‡				
70		‡			‡ ‡	‡				
75		‡			‡ ‡	†				
		1 1 †			† †	†				
80		1 1 7			ŢŢ	Ţ				
85]			+ +	†				
90-		‡			+ + +	Ī				
95		‡			1 1	1				
7		1 1 7			+ +	†				
100										



WELL COMPLETION LOG OF BORING NO. BG-1 SHEET NO. 2 OF 3

	PROJECT NO 86-41-415-01-04					DATE(S) 10/31-11/3/87 ELEVATION					
	PROJECT NAME Riverside County SWAT - Blythe					REFERENCE					
	FIELD ENGINEER Scott Heule					LOCATION					
	ASSISTANT						ver		AFTER MHN/HQURS		
	DRILLING CO.	Datum Explo	oration			TIME	SETUP		START	STOP	
	DRILLING METHOD & DIAM 10"					DRIVING WEIGHT					
	4 20	e Hick		uc*							
	4 69 804 0 P	e gern o chart.	W. Magnage Co.	rest that color	DE	SCRIPTION		GROUP SYMBOL	PERCENT GRAV. SAND FINES	REMARKS .	
100	ŤŤŤ		Ť	TŤ	V-1						
105	111			I	-	1	Centralizer		. I		
	1 1 1 1		1	1 1				1	1		
110	+		- 1	-		[~-]	-	- 4	. 4		
	1 1 1 1	1 1		1 +				ŀ ∤	. +		
115	+].	1 +			-	┝╶┪	• +		
	1 1 1 1	- 1 - 1	1	1 †	-~	[]	1	t t			
120	†		- 1	1 7			Volclay Grout -	1	. †		
125	111			1 1		_	10" dia.	[]			
123	1 1 1 1	([l	1 1			borehole _	- 1			
130	 		}	1 +]		-				
	111	1 1	1	1 +	[]		-	ŀ ∮	. +		
135	╂═┦╏╏		ĺ	1 +		=	4" dia	┝╶┤	- +		
1.40	1 1 1 1) }	- 1	1 †		k-1	blank PVC - casing	† †	†		
140	+		- 1	1 🕇	(-	[-3]	_	r 1	- +		
145			1	II	1	54					
	$T \cap I$		- 1]]				1			
150	4-11		l i	1 +		[]	m- 1561	- 4			
	1 1 1	1 1	ı	1 +			To 156' drilled	}			
155	╅┤╿╏		1.	1 +			w/ casing. Below 156'	- 1	• . +		
160	1 [- 1	1 f			drilled	t t	· •		
160	 		1	1 +			w/o casing then added	† †	• †		
165	111		1	l I	[]		after drill- ing		. 1		
	1 1 1 1		- 1	1 1				1	Ţ		
170	4-11		- }	1 +	[]		-	├ - ┤	- 4		
	1 1 1 1	- 1 1	1	1 +			173' top of	} {			
175	 		ĺ	1 +		168	sand pack	+ +	- +		
	1 1 1 1) }		1 †			#2/12 Lonest	hr 1	• †		
180	111		l	1 +			sand -	† †	• •		
1	1 1 1 1		ł	1 1							
185]] [[\neg	1	1 T				[]	. T		
190	4-11			1 1	· · · ·		187' top of perfs.	ļ]	. 1 .		
	1 1 1		ł	1 1			4" dia. sch.	ļ ļ			
195	4-11		- 1	1 +			90, .02 slot perf. PVC	├ ┤	. 4		
	1		1	1 +			casing .	† †	• †		
200	السلسلسل				1111	3					



WELL COMPLETION LOG OF BORING NO. BG-1 SHEET NO. 3 or 3

	PROJECT NO	86-41-415-01-04			DATE(S)	10/31 - 11/3/	87	ELEVATION	
	PROJECT NAME	Riverside County	SWAT - Blythe		REFERENCE				
	FIELD ENGINEER	Scott Heule			LOCATION_				
	ASSISTANT				WATER LEVE			AFTER	MIN/HOURS
	DRILLING CO	Datum Exploration			TIME	SETUP		START	STOP
	DRILLING METHO	•			DRIVING WE	IGHT		AVERAGE DROP	
	14 5 9 9 1 0 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Set of the policy	A COMPREHIC				GROUP	PERCENT	*
200	T 1		~~~	DES	ERIPTION		SYMBOL	GRAV. SAND FINES	REMARKS
205	H = H		1 ‡		80, PVC	dia sch02 slot per casing ' PVC TD.			
210] -	+ 1	1 +			12 Lonestar -	F		
215	+ +	+	. +		San		+	-	[
220	╂		1 +		_	10" dia	-		_
225 .	}- -		1 1			-		·)	
230	+ +	+	1 7			-	F	-	-
235	+ +		1 1			_			-
240	1-11-		1 1			Temp. 10'			10 sacks #2/12
245	+ +		1 ‡			driven to	F #	-	sand to backfill rathole below casing (Lonestar)
250	HIF		1 1				-		19 sacks #2/12 Lonestar to
255] 	+	1 +			Hole T.D. =	-		bring sand up to 173'.
260	╂┤┟		1 7			-	- 1		
265] -		1 7			-	F		
270] 		1 +			•	+ +	_	
275	1111		1 ‡			-	-		-
280	+ +		1 +			-	1		
285	$H \Vdash$		1 1			-	F 🕴	-	-
290	1		1 1			-	1		<u>-</u>
295	1-11-		‡			:	† †		F
300	1111						\Box	10 y	I



FIELD LOG OF BORING NO. BG-2 SHEET NO. 1 OF 6

PROJECT NO. 86-41-415-01-04	DATE(S) 10/20/87 &	11/6-7/87	ELEVATION	
PROJECT NAME Riverside County SWAT - Blythe	REFERENCE			
FIELD ENGINEER Scott Heule	LOCATION Sout	hwest cor	ner of landfil	1
ASSISTANT	WATER LEVEL		AFTER	MIN./HOUF
DRILLING CO. Datum Exploration	TIME 0930	1	.224	STOP
DRILLING METHOD & DIAM. SS-16 w/10" casing hammer				
A State of the Sta		SHOU"	hNu Le1/0 ₂ /H ₂ 5	REMARKS
Dry Soft Tan Sand, fine	DESCRIPTION grained	SP	2/12	BERNANG
		1 1		· -
		+ +	-	
1 		† †	·	- . injecting wtr.
		1 1		_
1 1 1 1 1 1 1		† †	-	-
		1 1	` -	-
Tan Sand, fine	grained, some med.	SP		-
Tan Sand, fine		+ +	-	-
		1 1		-
14 — 1		+ +	-	-
Tan Sand, fine	grained.	SP	-	•
		T T	0/22.0/0	Stop
18 —		+ +		10/20/87
Tan Sand, fin	e to med. grained, occ.	_sp _		move to BG-1
scattered		+ +		11/6/87
22		+ +		-
24		1 1		
Stiff Tan - Sand, fine	to med. grained & clay,	SP/		-
26 silty		† †		t
		+ 4		-
TanSand, silt	ry, fine to med. grained.	SP/		t
30 77 N	y, tile to mode granie-i	SM		stop for the day 11/7/87
32		+ +	-	-
		1 1	_	Ţ
	ghtly silty, fine to	T _{SM/}]		1
36 med. grain	ned.	SP -	-	
		1 1		1
38		Ţ]		-
40			<u></u>	<u></u>



FIELD LOG OF BORING NO. BG-2

SHEET NO. 2 of 6

	PROJE	CT N	۰. ۵	8	6-41-415	-01-04				DATE(\$)	11/7/87		ELEVATION	
	PROJE	CTN	IAM	R	iverside	County	SWAT -	Blyth	e	_ REFERENCE				
	FIELD	ENG	NEE	RS	cott Heu	le				_ LOCATION				
	ASSIS	TANT								_ WATER LEVEL .			AFTER	MIN./HOURS
	DRILL	NG C	О.	n	atum Exp	loratio	n			TIME				
									mer	:	SETUP		START AVERAGE DROP	STOP
				4406										
	,4' &	34	SAY	Q .	y PORCY	NOSTI	Set CONSIS	ENC OF					DEDGENT	
40.	* 69	\$N/	[₀	ke oto	8) ET	# ₀₁₂	Or Or			DESCRIPTION		GROUP SYMBOL	PERCENT GRAV SAND FINES	REMARKS
42.	1								No returns.			t t		injecting city wtr.
42.	1							7	-			1 1		Ţ
44	╀							-	-			+ +		
46	1_						Soft	Tan -	Sand, fine to m			SP 1		Ţ
								-	no sample)			┨		ł
48	1]	•			‡]	• •	r
50.	+			_			Soft	Tan -	Sand, fine gra	ained, slightly	y silty. •	∤ ∴-		-
52	1_								(poor return)			1 1		<u>L</u>
	-							-				1		}
54	1								Sand, fine to n	nod grained	•	SP -		Ţ
56	╀							Tan —	- cemented in this silty. (poor	in layers, sli		+ " -		-
58	1	П							_			1 1		<u>L</u>
	1						0.55	m	Sand, fine to	u fino graino	3 w/	SP/		ł
60	1					1	Soft	Tan _	silt, occ. pbls			SM	-	†
62	+-	Н				{		-	-			╁ ┤	- , -	+
64									- -			1 1	_	<u>†</u>
	1	١.										+ -		+
66 -		-2 67				[1	- - @ 67' gravel, s	w/ v. crs. san	d.	GP		‡
68	1//	BG				}		-	-			+ -	-	t
70	1_	2 70						Tan-	- Gravel to 1/2"	and v. cr	s. sand,	GP_		‡
	14	BG-)		to Red	w/ occ. clay,	silty - clay l	enses.	CL CL		†
72	1							Brn.			•	† 7	-	Ţ
74	+									Fine gand con	notime:	GP &		
76 -	1_							Tan -	Gravel, w/ v. cemented, silt	: & clay lense	ecimes es.	ML =		‡
	{							.Tan -	_ 0 77' sand &gr mostly fine gr		sand	SM/-		+
78	†							-	-			‡ :	-	11/8/87
	1	1 1			I	1	1	, ,	I			1	1	I .



FIELD LOG OF BORING NO. BG-2

SHEET NO. 3 of 6

PROJECT NO. 86-41-415-01-04	DATE(S)11/8/87		ELEVATION	
PROJECT NAME Riverside County SWAT -	Blythe REFERENCE			
FIELD ENGINEER Scott Heule	LOCATION			
ASSISTANT			AFTER	MIN./HOURS
DRILLING CO. Datum Exploration	TIME			
DRILLING METHOD & DIAM SS-16 W/ 10" Cas	setup sing hammer DRIVING WEIGHT		START AVERAGE DROP	STOP
e see	۵			
80	er of			
80 The state of th		GROUP SYMBOL	PERCENT GRAV-SAND-FINES	REMARKS
1	No returns, drills like sand, little to no gravel, possibly cemented sand.	┨		injecting city wate
82	†	† †	-	t
84				_
86	Sand w/ gravel, little to no returns, probably cemented, casing drives hard	† †		t
		ŢŢ	[Ţ.
88	†	+ -	-	 -
90 - 27 2	Tan Sand/clay, and gravel, sand is v.	BC/_	_	_
90 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	fine grained, clay stiff.	GP -		}
92		† 7		ţ.
94 - - -	-	╄ -		-
96	Tan Sand, cemented occ., sandy clay & gravel.	1 1		<u>t</u>
1 1 1 1 1 1	 	} -		
98	†	† :		<u>r</u>
100	Tan Sand, slightly silty, fine grained w/ crs. grained colored sand & light	SM/ SP	-	-
102	gravel.	1 :		easy drilling,
	+	Γ.		difficult driving pipe.
104	Tan Poor returns, appears to be sand, fine	SM -	-	<u> </u>
106	grained w/ clay lenses & crs. grained colored sand & small gravel, & silty	I		-
108	- sand/sandy silt.	† -		t
	Ţ	Ţ :		Ţ
110	Tan Sand, fine grained w/ some silt & . colored crs. grained sand.	SM/_ SP	-	
112		1 -		Į.
1	 	┧ -		+
114	Ţ	‡]		Ţ
116	+	+ -	-	+
118	1	1 1		<u>t</u>
	Tan @ 120' sand, fine grained, slightly silty, occ. cemented, occ. silty sand		v lenses	Ī
120	silty, occ. cemented, occ. silty said	or cra	, renses.	I



FIELD LOG OF BORING NO. _BG-2

SHEET NO 4 OF 6

PROJECTIVO B6-41-415-01-04 PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROJECTIVO MATERIANCE PROCESTIVO MATERIANCE PROJECTIVO MATERIANCE PROPROMETRICAL PRO								FIL	ED LOG OF BORING NO.	6	SHE	ET NO.
ASSETANT WATERLEYS. MITE WORMOURS Description Tame Strup Start Stop Description Graph of Strup		PAOJE	CT NO	86	5-41-415-	01-04			DATE(S)11/9/87		ELEVATION	
DRILING CO Datum Exploration Time SITUP SIART STOP CORLING METHOD & COAM SS-16 W/ CWRINTY hommer DRIVING METHOD & COAM SS-16 W/ CWRINTY hommer DESCRIPTION THROO ONLY AMERICAN ANY AMERICAN ANY AMERICAN STOP Tan Sand, slightly sity, v. fine grained SF/ SH SH SH SH SH SH SH SH SH SH SH SH SH		PROJE	CT NA	MER	iverside	County	SWAT -	Blythe	MEFERENCE			
DRILING CO DATE NO. 100M SS-16 V/ CRESTOR DARMET DRIVING WITHOU LOW SS-16 V/ CRESTOR DARMET DRIVING WITHOU LOW SS-16 V/ CRESTOR DARMET DRIVING WITHOUT ANY ANY FAME ORDER OF STATE OF S		FIELD	ENGIN	EERS	Scott Heu	le			LOCATION	-		
DESCRIPTION STATE STOP AVERAGE DROP AVERAG		ASSIS1	TANT						WATER LEYEL		_ AFTER	MIN/HOURS
DRIVING METHOD LOUM. SS-15 W/ Casing hammer DRIVING WEIGHT AVERAGE DROP 120 DESCRIPTION STREET REMARKS 121 Tan Sand, slightly silty, v. fine grained SN SN SNO SNO SNO SNO SNO SNO SNO SNO S		DRILLI	NG CO	Da	atum Expl	oration			TIME		START	STOP
injecting city water Sand, slightly silty, v. fine grained SF/ with fine sandy clay. Tan Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Sand, crs. grained a fine gravel, ser. Colored sand w/ pbls. Sand, crs. grained a fine gravel, ser. GP Sand, crs. a fine to med. gravel. Sand, v. crs. a fine to med. gravel. Sand, v. crs. a fine to med. gravel.		DRILL	NG ME	THOD & C	SSSS	-16 w/	casing	hammer				
injecting city water Sand, slightly silty, v. fine grained SF/ with fine sandy clay. Tan Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Sand, crs. grained a fine gravel, ser. Colored sand w/ pbls. Sand, crs. grained a fine gravel, ser. GP Sand, crs. a fine to med. gravel. Sand, v. crs. a fine to med. gravel. Sand, v. crs. a fine to med. gravel.				SE TOE	.0	٠		ď				9.50
injecting city water Sand, slightly silty, v. fine grained SF/ with fine sandy clay. Tan Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Sand, crs. grained a fine gravel, ser. Colored sand w/ pbls. Sand, crs. grained a fine gravel, ser. GP Sand, crs. a fine to med. gravel. Sand, v. crs. a fine to med. gravel. Sand, v. crs. a fine to med. gravel.	120	4 5	to st	CORE DEP	A STATE	W MOSTO	AF COUSE	JEHE COLOR	DESCRIPTION	GROUP SYMBOL	PERCENT GRAV SAND FINES	REMARKS
Tan Sand, slightly silty, v. fine grained SP/SN with fine sandy clay. Tan Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand. Sand, fine grained, silty, & crs. colored sand. Sand, fine grained, silty, & crs. colored sand. Sand, crs. grained & fine gravel, sep. GP Sand, crs. grained & fine gravel, sep. GP Sand, crs. grained & fine gravel, sep. GP Sand, crs. & fine to med. gravel. SP/GP Sand, v. crs. & fine to med. gravel.	120	\Box						ΠŢ		Ι.		injecting city water
Tan Sand, slightly sity, v. fine grained SF/ with fine sandy clay. Tan Sand, v. fine grained, sity, and Sandy clay w/ crs. colored sand. Tan Sand, v. fine grained, sity, and Sandy clay w/ crs. colored sand. Tan Sand, fine grained, sity, and Sandy clay w/ crs. colored sand. Tan Sand, fine grained, sity, and Sandy clay w/ crs. colored sand. Sand, crs. grained a fine gravel, SF/ Some minor sitt/clay. Sand, crs. grained a fine gravel, SF/ Some minor sitt/clay. Sand, crs. grained a fine gravel, SF/ Some minor sitt/clay. Sand, crs. a fine to med. gravel.	122	+		-	\vdash			1		+ -		+
with fine sandy clay. SM SM Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, GP Sand, crs. grained & fine gravel, GP Sand, crs. sand, crs. & fine to med. gravel. SF/ GP Sand, v. crs. & fine to med. gravel.	124	\perp		-					· •:	Į -		Ļ
Tan Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, GP Sand, crs. grained & fine gravel, GP Sand, crs. & fine to med. gravel.	126	11						Tan _				t
Tan Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, SF/ GP Sand, v. crs. & fine to med. gravel. Sand, v. crs. & fine to med. gravel. Sp/ GP	120	\Box						1 7	- 2 	Ţ		Ţ
Tan Sand, v. fine grained, silty, and sandy clay w/ crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand. Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, GP Sand, crs. grained & fine gravel, GP Sand, crs. grained & fine gravel, GP Sand, crs. grained & fine gravel, GP Sand, crs. grained & fine gravel, GP Sand, crs. & fine to med. gravel, GP	128	\forall	, 01	-				1 1	•	† -		t
Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, SP/GP Sand, crs. grained & fine gravel, SP/GP Sand, v. crs. & fine to med. gravel. SP/GP	130		?	-	-			Tan -		SM _	-	+
Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, SP/ GP Sand, crs. grained & fine gravel, SP/ GP Sand, crs. grained & fine gravel, SP/ GP Sand, crs. grained & fine gravel, SP/ GP	132		BG					1 1	sandy clay w/ cls. colored sand.	İ :		<u>t</u> .
Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, spr GP Sand, crs. grained & fine gravel, some minor silt/clay. Sand, crs. spr GP Sand, crs. spr GP Sand, crs. spr GP Sand, crs. spr GP Sand, crs. spr GP			Н					} }		ļ .		+
Tan Sand, fine grained, silty, & crs. colored sand w/ pbls. Sand, crs. grained & fine gravel, SP/ GP Sand, v. crs. & fine to med. gravel. SP/ GP Sand, v. crs. & fine to med. gravel.	134	†	П							† :	•	‡
Sand, crs. grained & fine gravel, SP/ Some minor silt/clay. SP/ GP Sand, crs. grained & fine gravel, GP Some minor silt/clay. Sand, crs. grained & fine gravel, GP Some minor silt/clay. SP/ GP Sand, v. crs. & fine to med. gravel. SP/ GP	136	\vdash	П	-	-			1 +		+ -		+
colored sand w/ pbls. Sand, crs. grained & fine gravel, some minor silt/clay. Sp/ GP Sand, crs. grained & fine gravel, some minor silt/clay. Sp/ GP Sand, v. crs. & fine to med. gravel. Sp/ GP	138	L						1 1	_	1 :	Ι.	1
Sand, crs. grained & fine gravel, SP/GP Some minor silt/clay. Sand, v. crs. & fine to med. gravel. SP/GP Sand, v. crs. & fine to med. gravel.		-	П					Tan	Sand, fine grained, silty, & crs. colored sand w/ pbls.	ł ·	+	†
Sand, crs. grained & fine gravel, SP/GP Some minor silt/clay. Sand, crs. grained & fine gravel, SP/GP Some minor silt/clay. Sand, v. crs. & fine to med. gravel. SP/GP Sand, v. crs. & fine to med. gravel.	140							1 7	■1666 177 •	‡ :	Ϊ.	Ţ
Sand, crs. grained & fine gravel, sp/ GP Some minor silt/clay. SP/ GP Some minor silt/clay. SP/ GP Some minor silt/clay. SP/ GP Some minor silt/clay.	142	+	Н	\vdash	-			+	- 1	+ -	-	+
Some minor silt/clay. GP	144	1		_				1 4	• · · · · · · · · · · · · · · · · · · ·	1 -	Ι.	‡
150		1						1			Ł.	t
150	146	\top					1	1 7		Ţ		T .
150	148	+	20.					1 1	-	† -	† ·	†
154 Sand, v. crs. & fine to med. gravel. SP/ GP	150	1	-2 1		-			-	-	+ -	 	+
Sand, v. crs. & fine to med. gravel.	152		B _S					1	-	1.	<u> </u>	1
Sand, v. crs. & fine to med. gravel. SP/-GP		-						-		+	+	†
156 - 1	154	+	11						Sand. v. crs. & fine to med. gravel.	SP/	<u> </u>	‡
	150	+	$\ \ $	-				-	-		· ·	+
17517// J	158	,1_		_						1 -	1 .	Į



FIELD LOG OF BORING NO. BG-2 SHEET NO. 5 of 6

	PROJECT NO.	86-41-41	5-01-04			DATE(5)11/10/87	7	ELEVATION	
	PROJECT NAM	Riverside	e County SWAT	r - Blyt	he	REFERENCE			
	FIELD ENGINE	Scott He	ule			LOCATION			
	ASSISTANT _					. WATER LEVEL		_ AFTER	MIN./HOURS
	DRILLING CO.	Datum Ex	ploration			TIMESETUP		START	\$TOP -
	DRILLING METH	HOD & DIAM			mmer	DRIVING WEIGHT			
		L'APIGE	- TA	"c ^t					
140	4 6 90 0	A Seri Politica	n postifit one	Ster COLOR		DESCRIPTION	GROUP SYMBOL	PERCENT GRAV-SAND-FINES	REMARKS
160.	III			Τ.			T		injecting city water
162	 			-	Gravel		+ +		_
164	165		-	-	-		† †		ł
164 -	∾			7	Ī.,		1 1		Ţ.
166 •			.	-	Gravel, probab	ly some cobbles, roun	d. GP		-
160	1_				_		† †		t
168	$\Box \Box \Box$			-			ŢŢ		Ţ.
170 -	+	<u>-</u>		-	Sand & some fi	ne gravel, sand is	+sm -	-	}
172 •	1_				mostly fine gr	ained, silty w/ crs.	1 1		Ĺ
	·			-	Į.		+ +		-
174	 			-	-		+ +		-
176.	111				_		1 1		
	1 1			-			+ +		ł
178	180,			7			1 1		T
180	 			-	Sand, crs. & f	ine grained w/ sandy	SM/		Begin drilling V
				-	clay/silt.		+ ML +		open hole.
182 -	, 			Tan -		silty/clayey, v. d or sandy silt/clay.	TML T		Ţ
184	├ -┤┃│			-	-		+ +		-
186-	1_			1	_		1 1		<u>t</u>
100-	111			7	- -		7 7		Ţ.
188 .	+			-	-		+ +		+
190 .	<u> </u>				_		1 1		Ţ
	1			-			+ +		}
192	 			-	-		† †		+
194	111			_	-		1 1		<u> </u>
	┤ 			-	L.		+ +		+
196	 			-	<u> </u>		† †	-	t
198	 ↓				-		1 1		-
	1			-	-		+ +		}
200									



FIELD LOG OF BORING NO. BG-2 SHEET NO. 6 OF 6

	PROJ	ECTN	0	8	6-4 <u>1-41</u>	5-01-04				DATE(S)11/10/87		ELEVATION	
	PROJ	CT N	AME	R	iversid	e Count	y SWAT	- Blyth	e	REFERENCE			
	FIELD	ENGI	NEE	R S	cott He	ule				LOCATION			
	ASSI\$	TANT				 				WATER LEVEL		AFTER	MIN/HOURS
	DRILL	ING C	ο.	D	atum_Ex	plorati	on			TIME	_		
										SETUP DRIVING WEIGHT		START	STOP
				40 je									
	ے	st .	PAR	APE	, ,,5	4. 80,4.	Jak.	STERE					•
200	,¥ 6	But	ď	o 601	4 9/ Exc	A. MOL	, ₍₀ 1	ssienci colos		ESCRIPTION	GROUP SYMBOL	PERCENT GRAV. SAND FINES	REMARKS
	JA G					1	1	Tan	Sand/silt, v. fi silt, silty san	ne to med. sand, sandy	SM/		Open hole
202	+	200	ł			┪	1	-	t		+ -	-	-
204 -	1	BG-2				1	1	-	ļ		1 :		Ţ
	1	$ \ $	1			1	1		†		+		}
206 •	1	П	ı			7	1.	1 7	Ī		† 7		Ţ
208	-	1	-			-	1	-	+		+ -	-	-
210.	1	П	١						<u>.</u>		† .		t
	Ţ	Н	-			7	1	Tan -	Sand, silty, firgrained.	ne w/ med. to crs.	T SM		Ţ
212	+-		ŀ			-		-	+		+ -	-	-
214	1_	$ \ $	- (_	1	-	1_		1.		<u> </u>
	1	ÍΙ					1	.	ł		+		t
216	十	11	Ì			7	1	7	T		† 7		Ţ
218	+-	Н	\dashv			+	┼─	+			+	 	Let hole set for 12 min, then blew,
220	1_	$ \ $	1						TD = 218 feet		1 .		appears to be making water.
	-	ĺ					1		Ţ.		Ŧ.		
222	+-		ı			┨		-	†		+ -	-	
224]_	H					1	-	1		1.] .	ļ
	1	П	Ì			1	1		ł		+ -	· ·	†
226	1	il	ı			7	1	-	Ţ		† 7	Ţ :	Ţ
228	╀	П	ı			+	1	-	+		+ -	-	+
20	1_	Н			ļ		1		1		1.	<u> </u>	İ
230	7	П							ł		Ţ		Ī
232	 	Ιl	ł			1	İ	-	†		† -	† •	t
234	-					_		-	1		Į .	Į	Į.
3.5	1							} .	†		+ :	 	t
236	1		Ì			7			Ţ		1	Ţ	Ţ
238	+-	11				-		-	+		+ -	-	+
240	1_	Ш			L				<u> </u>			t	<u> </u>



WELL COMPLETION LOG OF BORING NO. BG-2

SHEET NO. 1 OF 3

	PROJECT NO	86-41-415-0	01-04	DAT	E(S)11/11-23/87	ELEVATION _	
	PROJECT NA	Riverside (County SWAT - Blythe	REFE	RENCE		
	FIELD ENGIN	Scott Heule	е	LOC	ATION west side of	f landfill	
				WAT	161' 0745 161' 0715	11/11 AFTER	WIN./HOU
	DRILLING CO	Datum Explo	oration	TIME			
	DRILLING ME	ETHOD & DIAM		ORIV	SETUP	START AVERAGE D	STOP
		*O.					
	, st .	PLO KATE SOES	A. See Aller				•
0 -	# 50 BULL	Program Christian	MOSTURE CORPOSERECT	DESCRIPT	TION	GROUP PERCENT SYMBOL GRAV. SAND FINE	S REMARKS
		1 1				+ +	+
5 🕳			+		-	† †	+
10 -		1 1 . 1				† †	†
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15 -	L	\square			_	1 1	1
-		\perp	 		-	+ +	ł
20 🖚	-11		1 1 +		-	+ +	+
1			1 1 1			1 1	1
25 -	\Box		1 T		Volclay	Į. Ţ	Ţ
30 -			1 1 +	[-] [-]	Grout	+ +	+
	111	1 1 1	1 1 1		-	† †	†
35 -	$H \mid I$		1 1 1			† †	†
40 -					4" PVC	I I	I
40	11]	Blank	1 1	+
45 🕳	[<u> </u>	+		.] .	+ +	+
- 1	111	1 1 1	1 1 †]	† †	†
50 _					-) ·	T T	Ţ
55 -			1 1 4		10" dia.	1 1	
	111	1 1 1			borehole	+ +	ł
60 -	$\vdash \vdash \vdash \vdash$		+		-	† †	†
65 _			1]	1 1	I
					:	Ţ Ţ	1
70 🕳	 ├┤ │		+	[PVC	+ +	+
•	111	1	†	[-4] [-7]	centralizer	† †	t
75 -	 				-	† †	†
80 -			1		_	1 1	1
au -					-	1 1	+
85 =	H		+	[22] [23	-[+ +	+
		1 1				† †	†
90 -			†	== =-	-	† †	T
95 •			1	-	-	1 I	+
				[==]	-	+ +	ł



WELL COMPLETION LOG OF BORING NO. BG-2 SHEET NO. 2 OF 3

	PROJE	CT NO	8	6-41-415-	-01-04				DATE	(5)11/11-23/87		ELEVATION	
	PROJE	CT NA	MER	iverside	County	SWAT -	Blythe		REFER	RENCE			
	FIELD I	ENGIN	EEAS	cott Heu	le				LOCA	TIONWest side o	of land	Rfill	
	ASSIST	ANT .							WATE	RLEVEL		AFTER	MIN./HOURS
	DRILLI	NG CO	D	atum Exp	loration	n			TIME .				
	DRILLI	NG ME	THOD & D	IAM					DRIVI	SETUP		START AVERAGE DROP	STOP
			NE MOE	.9	٠		ð						
	. # & P	St 50	W S	A SOURCH	NO STO	at consts	e _{tro}				GROUP	PERCENT	
.00	*68	8 ₂₀ , C	OPE DEPT	0),EW	* _{O1}			DES	CRIPTI	ON .	SYMBOL	GRAVSAND-FINES	REMARKS
105 .	1						t				1		
.05	П						Ţ]	[]		- -
110 .	\vdash		-				+	<u>[E</u>]	 -)	-	- 1		-
115 .	1_		<u></u>				1			▼ Volclay Grout ■ The state of the st	[<u>-</u>
	1	ı				.	†				+ +		-
120 •	П						Ţ			~ 10" dia	[]		<u>-</u>
125 -	Н		-				+			borehole			-
130 •	Ш						‡						_
	1						+				ŀ ┤		
135 •	H						†			_	1		[
140 4	\vdash	-	<u> </u>				+	100	.:4	139'			-
	1]						1			▼ 31 Sacks	<u> </u>		_
145 •	П						Ŧ			Lonestar #2/12 -	F 7		-
150	H		-				+					-	- !
155•	Ш						Ŧ			156' -	[]		-
	1						†		-	4" dia.Sch.80			
160*	П						Ţ			PVC .02 slot -	Γ]		-
165 .	Н		-				+			-	┝╶┤	-	-
170 .	11		<u></u>				‡			Centralizer	1 1		-
	1						ł				}		<u>-</u>
175.	\Box	ľ					†	F.	3-	176'	† 7		
180 -	\vdash						+			-	-		Drilled Open
185	Ш						‡				1 1		Hole
2.75	1]						+						ŀ
190-	╁┤						†			-	† †	-	<u>t</u> .
195	Ш		<u></u>				1] .	[]		-
	1 I						†				-		



WELL COMPLETION LOG OF BORING NO. BG-2 SHEET NO. 3 OF 3

	PROJECT ND	86-41-415	-01-04		DATE(S)11/11-23	3/87	ELEVATION	
	PROJECT NAME	Riverside	County SWAT	- Blythe	REFERENCE		131-31	
	FIELD ENGINEER	Scott Heu	ile		LOCATION West s	side of land	fill	
	ASSISTANT				WATER LEVEL		_ AFTER	MIN/HOURS
		Datum Exp			SETUP		START	STOP
	DRILLING METH	OD & DIAM.			DRIVING WEIGHT		AVERAGE DROP	
	14 6 8 8 1 CO	Clerk & Cherk	A ROSURE CORSE	EHCT OF				12.7
200	H & BUL COR	DEATH OUTETH	*Op COM	000	DESCRIPTION	GROUP SYMBOL	PERCENT GRAV. SAND FINES	REMARKS
205	4-11			‡		‡‡		-
210	1		4	1		+ +	. :	•
215				1		Ŧ 1		-
220	·H			1	Boreho			_
225	╅┪╟		h 5	+		1 1		•
230	╅╢┼			+		7 1		•
235	+	-		1	*	+ +		•
240	╺┋			 		+ +		-
245	╺┋			 	*	+ +		<u>.</u>
250	· } 	-		1		+ +		-
255	; - -			1		+ +		-
260	› ╂┨╽┟			1		+ +		•
265	; } 	-		1		Ŧ 1		
270	+			+		+ +		-
275	$+ \cdot $			1		1 1		-
280	11			1		+ +	1	
285	$H \parallel$			1		+ +		
290	1-11-			+		‡‡		- (- ()
295	HH			‡		+ +	. 1	•
200	1							

LOG OF BORING BG-3
GROUNDWATER CHARACTERIZATION **BLYTHE LANDFILL** BLYTHE, CALIFORNIA ANALYTICAL DATA SOIL For County of Riverside Waste Management Department Depth in Foet SAMPLE DATA TYPE P.I.D. (ppm) WELL NOREL HOLE CUTTINGS BLOWS PER FOOT SAMPLE SAMPLE SAMPLE PVC Cap SYMBOL SAMPLE nscs Locking Steel Protective DESCRIPTION Casing SP Neat Cement Surface Seal 5 Yellowish red Silty very fine to fine SAND with little X coarse Sand and fine Gravel, dry, no odor ere ar Neat Cement 0' - 10' 10' Light brown fine SAND, trace fine Gravel, damp, X 10 2 no odor 15 Light brown fine SAND, damp, no odor 0 15 M Cement Bentonite Grout 10' - 150' 20' As above 0 20 25 As above M 0 25' 5" Diameter Schedule 80 PVC Blank Casing 0' - 159' 30' As above X 0 30' 6 35' As above X 0 35' 40" 0 M As above 40' CONTINUED ON NEXT PAGE 1 1 Dames & Moore

Feel	Al	NALYT DAT.	ICAL A	-	SAMPL	E DAT	A		DIL PE	LOG OF GROUNDY	B	O ER	CH	ING BG-3 ARACTERIZATION BLYTHE LANDFILL
Depth in Feet	BOREHOLE	SAMPLE	CUTTINGS	BLG/WS PER FCOT	SAMPLE	SAMPLE	SAMPLE	SYMBOL	SCSN	For County of Riverside Was		Mar	3L\ nag	THE, CALIFORNIA
- 40'	- E	+	10	<u>a</u>	1	0, 2	0,	0)		DESCRIPTION	(0	VEL	ed)	
									SP	As above				
45'									GP	No retrieval				
50'	,		0		50'	10	×			Light brown Sandy fine GRAVEL, damp, no odor				/ Cement/ Bentonite Grout
వ చ్ '			0		55'	<u> † 1</u>	×	<i>\$2</i> 0	SP	Light brown fine SAND, damp, no odor				10' - 150'
6 0 '			0		60'	12	M		3	Light brown Gravelly very fine to fine SAND, damp, no odor				
65'		0			65'	13	×	0,	sw	Light brown fine to coarse SAND, some Gravel, damp, no odor				/ 5" Diameter Schedule 80 PVC Blank Casing
70'					70'	14		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Grades to orange brown		1		0' - 159'
75'			-	·	75'	15	×	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		As above				
80'	CC		0 NUED	ON	80' NEXT	16 PAGE				As above		٨		
								٧			1			Dames & Moore

18	AN	DATA	CAL		SAMPL	E DAT	A	SOIL TYPE		LOG OF GROUND	WATEF	CH	IARACTERIZATI BLYTHE LANDE
Deptif in Freet	3OPEHONE	SAMPLE	CUTTINGS	BLOWS PER FOCT	SAMPLE	SAMPLE	SAMPLE	SYMBOL	For	County of Riverside Wa	ste Ma	BI Y	THE CALLED
80 국	AOR!	- SS	150	PER	SA S	S S	AS L		1	SCRIPTION	WE (conti	LL nued)	- open.
85'					85'	17	×	0,000 SW 0,000 SW 0,000 0 0,000 0 0,000 0 0,000 0 0,000 0 0,000 0 0,000 0 0,000 0 0,000 0	Trace Silt				
30,					90'	18	×		As above				/ Cement/ Bentonite Grout 10' - 150'
95'	0				95'	19	×		As above				10 - 150
co.	-	·			100'	20	×	0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000	No Silt				
05'					105'	21	×	လိုလိုင် လိုလိုင် လိုလိုင် ဝနိုင် လိုလိုင် ဝနိုင် လိုလိုင် ဝနိုင် လိုလိုင် လိုလိုင် လိုလိုင် လိုလိုင် လိုလိုင် လိုလိုင် လိုလိုင် လိုလိုင်	As above				/ 5" Diameter Schedule 80 PV
10'		-	v		110'	22	×		As above				Blank Casing 0' - 159'
15'		٠	×		115'	23	×		As above				
20'	CC				120' NEXT	24 PAG			As above				

a

## 130	Foet		ALYTIC DATA T.D. (po			SAMPL	E DAT	A	SC		LOG OF GROUNDW	/ATEI	R CH	ARACTERIZATIO BLYTHE LANDFIL
120	Septh In			1	ILOWS R FOOT	AMPLE	AMPLE	AMPLE TYPE	YMBOL	nscs	For County of Riverside Was		BL\ anag	THE, CALIFORN
130		-	S	3	B H	S	o Z	N,			DESCRIPTION	(con	ELL inued)	
130' As above	125'		P To the state of		ï	125	25	Ø		<i></i>	As above			
135	130'					130'	26	×	1					
As above As above As above As above As above As above As above As above As above As above As above As above As above As above As above As above As above As above As above	135'	C				135'	27				As above		,	Bentonite Grout
Brown to orange Gravelly fine SAND with some medium to œarse Sand, no odor 150' 0	140'		de la companya de la											Schedule 80 PVC Blank Casing
55' 155' 31	45'		And the control of th			145'	29	×			Increasing coarse Sand and Gravel			
60' 0 160' 32 🖾 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	50'	0	*			150'	30	×	\$0,00,00,00 0,00,00,00 0,00,00,00	sw	Brown to orange Gravelly fine SAND with some medium to coarse Sand, no odor			
60' 0 160' 32 🖾 000 0.20 inch Slotted Screen 159' - 2091/2'	55'					155'	31	M			As above			#2/16 Sand 155' - 210'
	60'		ІТИС	NUEI						۸				Schedule 80 PVC 0.20 inch Slotted Screen

165'	SAMPLI SA	DESCRIPTION	BLYTHE LANDFIL BLYTHE, CALIFORNI. aste Management Departmen WELL (continued)
165	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		1201 = 1204
175 0 1 183' 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
65' 0 1	000		Lonestar
83.	170 34 Ø 000 000 000 000 000 000 000 000 000	As above	#2/16 Sand
90'	175' 35 🗵 0,000	Water encountered at 174' As above	Lonestar #2/16 Sand 155' - 210'
90'	180' 36 X 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000 0,000	As above	
	185' 37 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Brown Silty fine SAND with some Gravel, medium and coarse Sand	5" Diameter Schedule 80 PVC 0.020 inch Slotted Screen 159' - 2091/2'
25'	190' 38 🗵 [6]	As above	159' - 2091/2'
	195' 39 🖾 (1976) (1976)	As above	
CONTINUED ON NE		As above	

** vaa.000011au oollost .010 01t

-				,						LOG OF BORING	G BG-3
Feet		DATA		S	SAMPL	E DAT	Ά		DIL PE	GROUNDWATER CHARAC	CTERIZATION THE LANDFILL
Սերin 'ո	BODURALE	SAMPLE	CUTTINGS	SLOWS PER FOOT	SAMPLE IX.PTH	SAMPLE	SAMPLE	SYMBOL	nscs	BLYTHE, For County of Riverside Waste Managemen	CALIFORNIA
1200.4	BC.	100	ರ	11 11	0) –	(C) Z		လ		DESCRIPTION WELL (continued)	
The second of the second secon	0		0			41	M		SP	#2/1 155' 5" D Sch Slot 159	ll Cap
1										Borehole 210'	

SAMPLING METHOD: Sprague & Henwood DRILLING METHOD: Air Rotary Casing Hammer DATE STARTED: 2/19/92 DATE COMPLETED: 3/6/92 Boring completed at a depth of 210 feet below ground surface on March 3, 1992. Ground water encountered at 174 feet below ground surface. Logged by: JJM/PAM; Reviewed by: SAS Monitoring well installed in boring to a depth of 209-1/2 feet below ground surface.

Dames & Moore

											LOG OF BORING BG-4 GROUNDWATER CHARACTERIZATION BLYTHE LANDFILL
ends story (c)	æt		DATA		9	AMPL	E DAT	A	SC	DIL PE	BLYTHE, CALIFORNIA For County of Riverside Waste Management Department
Part of the state	Dopth In Feet		1.D. (ppr		WS TOO	7.E	ole Ber	H H	-		WELL PVC Cap
		BOREHOLE	SAMPLE	CUTTINGS	BLOWS PER FOOT	SAMPLE DEPTH	SAMPLE	SAMPLE	SYMBOL	nscs	Locking Steel Protective Casing
	— a'									SP	Neat Cement Surface Seal
	อี'							M			Light brown fine SAND, dry, no odor
E .				6		5'	1	×			Neat Cement 0' - 10'
*	10'			7		10'	2	M			As above
				,		10	٤				
									154		
	15			0		15'	3	M			Light brown medium SAND, damp, no odor
1											Bentonite Grout 10' - 137'
										CL	
	20'			0		20'	4	×			Brown CLAY, some Silt, damp
										SP	
	25'			0		25'	5	M			Light brown fine SAND, damp, no odor
									-		5" Diameter Schedule 80 PVC Blank Casing
											0'-143'
	30'		0			30,	6	×			Light brown medium SAND, moist, no odor
	35'			0	,	35'	7	×			As above
L											
	10'										
	.,0			0		40'	8	_ ⊠			Light brown fine SAND, damp, no odor
	1	C(ארד מכ ו	VUEC	ON	VEXT		E I	Ĺ,	Λ	
1									٧		V Dames & Moore

Foet	AN	DATA DATA	ICAL A pm)		SAMP	LE DAT	Ά	SC)IL PE	GROUNI	OWA	ATE	ER	CH	ING BG-
Depth in Feet	BOREHOLE	SAMPLE	CUTTINGS	BLOWS	SAMPLE	SAMPLE	SAMPLE	SYMBOL	nscs	For County of Riverside W			lar	BL' iag	BLYTHE LANDF YTHE, CALIFORN Sement Departm
40'	<u> </u>		10	d	0 -	00 2	(V)	S		DESCRIPTION		(co)	/EL	LL Led)	
45'	4	0			50*	9	X		SP	Light brown medium SAND , damp, no odor					
50'			0		50'	10	×			As above				,	/ Cement/ Bentonite Grout 10' - 137'
క5 ' -			0		55'	11	×			As above					-
s o ·		5.7			60'	12				Light brown medium SAND with little fine Gravel, Silt, and Clay, damp, no odor					
65' -		·	8.7		65'	13	M			Brown medium SAND, damp, no odor					/ 5" Diameter
70'	,		5.1		70'	14	M			Increasing trace Gravel, 1/2" in size		and the second of the second of	¥		Schedule 80 PVC Blank Casing 0' - 143'
75'		0	·	·	75'	15	220		GW	Brown Sandy fine to coarse GRAVEL, damp, dense, no odor					
יסי	CC	NTIN				16 PAGE				As above			^		
								A				٧			Dames & Moo

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Feet	AN	ALYTIC DATA I.D. (pp	CAL m)		SAMPL	E DATA	4	SC		LOG OF GROUNDW	ATE	RC	HARACTERIZAT BLYTHE LANDI
Depth in Feet	E. 75,E.HOLL	SAMPLE	CUTTINGS	BLOWS PER FOOT	SAMPLE	SAMPLF NUMBER	SAMPLE	SYMBOL	nscs	For County of Riverside Was		ana	
80 '	i üi	" 	0	1 2	107	0, 2	<u> </u>		GW	DESCRIPTION	(con	ELL	i) .]
3 5'			0		85'	17	M		GΨ	As above			
90'		0			90'	18	I M			As above			Cement/ Bentonite Grou 10' - 137'
95'			0		95'	19	M			As above			
100′			0		100'	20	×	nmr	SP	Brown Gravelly medium SAND, damp, no odor			
105'		0			105'	21	250			Brown SILT, some Clay and Sand, damp, no odor			/5" Diameter
110'		-	0		110'	22	M		SP	Brown fine SAND , damp, no odor			Schedule 80 P\ Blank Casing 0' - 143'
15'		,	0		115	23	×			As above			
20′			NUE		120' NEXT		iE		٨	Brown fine SAND , damp, no odor		٨	

Feet	AN	DATA	CAL m		SAMPL	E DATA	١	SO		LOG OF GROUNDY	VATER	CHA	NG BG-4 ARACTERIZATION BLYTHE LANDFILI
Depth In	BOREHOLE	SAMPLE	CUTTINES	BLOWS PER FOCT	SAMPLF DEPTH	SAMPLL	SAMPLE	SYMBOL	USCS	For County of Riverside Wa	ste Ma	BLY nage	THE, CALIFORNI
120	8	S	ಠ	E B	S	ωZ	S	S		DESCRIPTION	(contin	LL Lued)	
125'			0		125'	25	×		SP GP	Brown Sandy fino GRAVEL , damp, no odor			Cement/ Bentonite Grout 10' - 137'
130′			0		130'	26	×		GW	Brown Sandy fine to coarse GRAVEL, damp, no odor			/ 5" Diameter Schedule 80 PVC Blank Casing 0' - 143'
135'		0			135'	27	20		(30,000)	Light brown fine SAND, trace Gravel, damp, no odor			l I I Bentonite Seal
140'	,	And the state of t	0		140'	28	- M		GW	Brown fine to coarse GRAVEL, some Sand, damp, no odor			137' - 140' Steel Casing (9" Diameter) Surrounds
145'			0	÷	145'	29	×	-	SP	Light brown fine SAND, some Gravel, damp, no odor			Bottom 60' of Well Well L L L L L L L L L L L L L L L L L L
150'		0		,	150'	30	×		GP	Brown coarse GRAVEL, some Sand, damp, no odor		*	#2/16 Sand 140' - 195'
55'		-	0	-	155'	31	×		GW	Brown fine to coarse GRAVEL , some Sand, damp, no odor			y 5" Diameter I Schedule 80 PVC 0,020 inch Slotted Screen 143' - 193'
60'	C	IITNC	O NUE[ON	160' NEXT	32 PAG			Λ	As above			

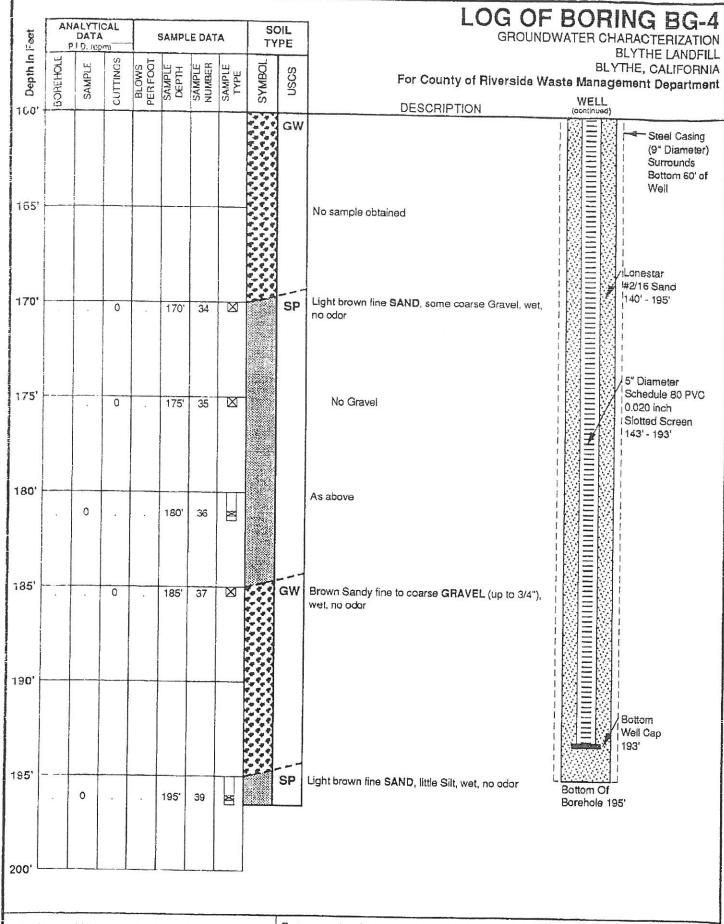
Sall features of the recommendation

To the same of the same of

Barrell Company

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SAMPLING METHOD: Sprague & Henwood DRILLING METHOD: Air Rotary Casing Hammer

DATE STARTED: 2/14/92 DATE COMPLETED: 2/16/92 Boring completed at a depth of 195 feet below ground surface on February 16, 1992. Ground water encountered at 158 feet below ground surface.

Logged by: JJM; Reviewed by: SAS

Monitoring well installed in boring to a depth of 193 feet below ground surface.

Dames & Moore

LOG OF BORING BG-5A GROUNDWATER CHARACTERIZATION **BLYTHE LANDFILL** ANALYTICAL DATA P.I.D. (rpm) BLYTHE, CALIFORNIA SOIL For County of Riverside Waste Management Department Depth In Feet SAMPLE DATA TYPE WELL BOREHOLE - PVC Cap BLOWS PER FOOT SAMPLE DEPTH SAMPLE SAMPLE SAMPLE SYMBOL USCS Locking Steel Protective DESCRIPTION 0' Casina SP Neat Cement Surface Seal 5 M Light brown fine SAND, dry, no odor Neat Cement 0'-10' 10' M As above 10' 2 15' Light brown medium SAND, damp, no odor M 15' 3 Cement/ Bentonite Grout 10' - 142' CL 20' Brown CLAY, some Silt, damp X 20' SP 25 X Light brown fine SAND, damp, no odor 25' 5 4.5" Diameter Schedule 80 PVC Blank Casing 0' - 148' 30, Light brown medium SAND, moist, no odor X 30' 6 35' As above X 35' 7 40' Light brown fine SAND, damp, no odor X CONTINUED ON NEXT PAGE 1 1 1 Dames & Moore

38	AN.	DATA	CAL.		SAME	LE	DATA		SC		LOG OF B GROUNDW	ATE	R	CH	ARACTERIZATIO BLYTHE LANDFIL
Depth in Feet	BOREHON E	SAMPLE	CUTTINGS	BLOWS PER FOUT	SAMPLE	J Idra	NUMBER	SAMPLE	SYMBOL	nscs	For County of Riverside Was		an	3LY ag	THE, CALIFORN
÷0, -	BO	S	13	8 9	3 C	G	δź	<u>.</u>	Ś		DESCRIPTION	(cor	EL	L ed)	
45'					45		9	×		SP	Light brown medium SAND, damp, no odor				
50'			-		50	ř	10	M	- T		As above			,	/ Cement/ Bentonite Grout 10' - 142'
55'					55	5'	11	M			As above				-
60'					60)'	12	×			Light brown medium SAND with little fine Gravel, Silt, and Clay, damp, no odor				
65'		,			65	5'	13	M			Brown medium SAND, damp, no odor				/ 4.5" Diameter Schedule 80 PV0 Blank Casing 0' - 148'
70'					70	r	14	×			As above, with trace 1/2"Gravel		¥		0 - 145
75՝					75	5'	15	M		GW	Brown Sandy fine to coarse GRAVEL, damp, no odor				
80'		ONTI	NUE	D ON	80 I NEX		16 PAG		\\	Λ	As above		^		
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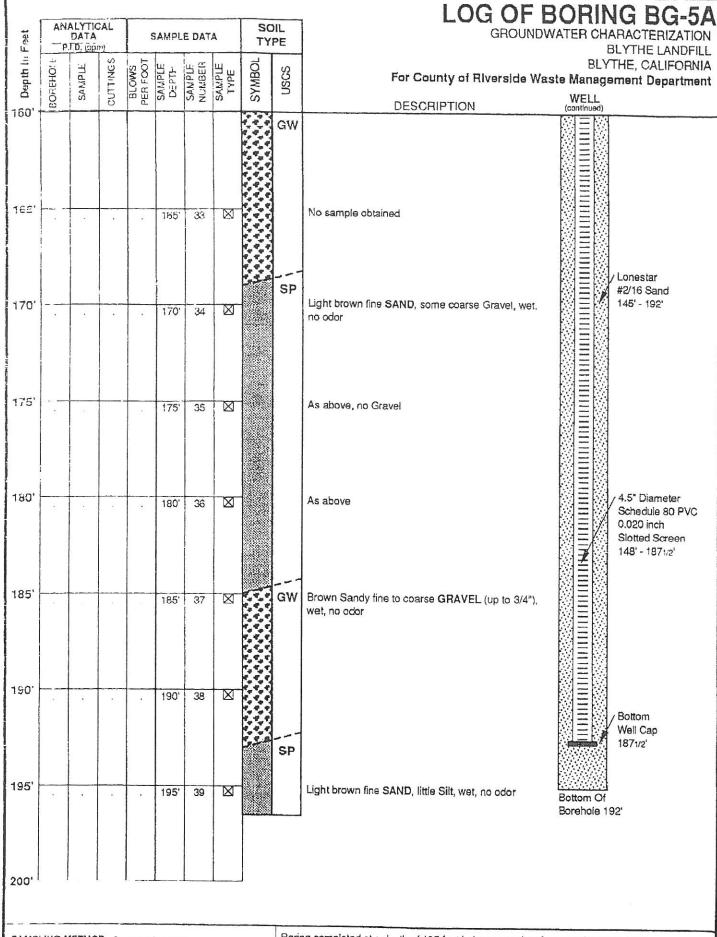
.T	- 7	DATA P.I.D. (p.c	CAL (m)		SAMPL	E DAT	A	SC)IL PE	LOG OF GROUND	TAW	ER	CH	ARACTERIZATION BLYTHE LANDFIL
Depth In Foot	603eHQCF	SAIMPLE	CUTTINGS	BLOWS PER FOOT	SAMPLE	SAMPLE	SAMPLE	SYMBOL	nscs	For County of Riverside W		Mar	BLY	THE, CALIFORNI
- 8 0 ' -									GW	DESCRIPTION	(0	WEI	ued)	
35'					95'	17	M			As above				-
8 0 ,					20,	18	×			As above, dense				/ Cement/ Bentonite Grout
95'					95'	19	×			As above				10' - 142'
100'					100'	20	×	2222 11111	SP	Brown Gravelly medium SAND, damp, no odor				
105'		-			105'	21	×			Brown SILT, some Clay and Sand, damp, very stiff, no odor			Ž	/ 4.5" Diameter Schedule 80 PVC
110'	-		v	-	110'	22	×		SP	Brown fine SAND, damp, no odor		×		Blank Casing 0' - 148'
15'				1.	115'	23	×			Brown fine SAND, damp, no odor				
20'	CC	ONTIN			120' NEXT	24 PAG	⊠ E	/		Brown fine SAND, damp, dense, no odor		_		

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190	1	DATA	4		SAMPI	E DAT	'A		OIL 'PE	GROUND	WAT	ER C	NG BG-5
Depth In Foet	BURCHOLE	SAMPLE	CUTTINGS	BLOWS PER FOOT	SAMPLE	SAMPLE	SAMPLE	SYMBOL	nscs	For County of Riverside W		BI	BLYTHE LANDFI
త 1201	B.H	Iks	CUT	PER	SAP	SA	SAL	SY	Š	DESCRIPTION		WELL	
120								- X	SP GP		10		
725	- Comment		-	ļ. <u>-</u>	125'	25	×			Brown Sandy fine GRAVEL, damp, no odor			Cement/ Bentonite Grout 10' - 142'
130'					130'	26	×		GW	Brown Sandy fine to coarse GRAVEL, damp, no odor			
13 5 ′ }	,			,	135	27	×	33	SP	Light brown fine SAND, trace Gravel, damp, no odor		*	4.5" Diameter Schedule 80 PVC Blank Casing 0' - 148'
: 30'	•				140'	28	×		GW	Brown fine to coarse GRAVEL, some Sand, damp, no oder			
145'					145'	29	×	***	SP	Light brown fine SAND , some Gravel, damp, no odor			Bentonite Seal 142' - 145'
150' -				,	150°	30	×		GP	Brown coarse GRAVEL, some Sand, damp, no odor			/ Lonestar #2/16 Sand 145' - 192'
155'			*	·	155'	31	M		GW	Brown fine to coarse GRAVEL, some Sand, damp, no odor	1.		4.5" Diameter Schedule 80 PVC 0.020 Inch Slotted Screen 148' - 1871/2'
60'	cc	NTINC	JUED	ON	160'	32 PAGI	<u> </u>			As above		₹	<u> </u>



SAMPLING METHOD: Sprague & Henwood DRILLING METHOD: Air Rotary Casing Hammer

DATE STARTED: 2/14/92 DATE COMPLETED: 3/25/92 Boring completed at a depth of 195 feet below ground surface on March 25, 1992. Ground water encountered at 158 feet below ground surface.

Logged by: JJM; Reviewed by: SAS

Monitoring well installed in boring to a depth of 187-1/2 feet below ground surface.

Dames & Moore

				-	CASSIFICATION
	MAJOR DIVIS	SIONS	SYN	BOLS	TYPICAL NAMES
	GRAVELS	Clean gravels with little or	gw	를	Weil graded gravels, gravel-sand mixtures
200 seve	More than	no fines	GP	금	Poorly graded gravels, gravel-sand mixtures
S than No. 20	fraction is larger than No. 4 sieve	Gravels with	GM	-	Silty gravels, poorly graded gravel-sand-silt maxtures
OILS ler than	140. 4 51646	over 12% fines	GC		Clayey gravels, poorly graded gravel-sand-clay mixtures
COARSE GRAINED SOILS More than half is larger th	SANDS	Clean sands with little or	sw	-	Well graded sands, gravelly sands
SE GRAIN	More than	na fines	SP		Poorly graded sands, gravelly sands
COARS More t	fraction is smaller than No. 4 sieve	Sands with	SM		Silty sands, poorly graded sand-silt mixtures
	140. 4 3646	over 12% fines	sc		Clayey sands, poorly graded sand-clay mixtures
9.00	CII TO ANI		ML	\prod	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
. 200 sieve	SILTS AN	F74 /545)	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, sity clays, lean clays
OILS than No.			OL	11:	Organic clays and organic silty clays of low plasticity
GRAINED SOILS f is smaller than	SILTS AN	D CLAYS	МН		Inorganic silts, micaceous of diatomaceous fine, sandy or silty soils, elastic silts
FINE GRAI >half is si	Liquid limit gre		СН		Inorganic clays of high plasticity, fat clays
E 4			он		Organic clays of medium to high plasticity, organic silts
ŀ	IIGHLY ORGANIC	SOILS	Р		Peat and other highly organic soils

BORING LOG SYMBOLS OTHER TEST TYPE SAMPLE TYPE (Results shown in Appendix 8) SAMPLE DISTURBED STANDARD PENETRATION TEST, CLASSIFICATION Split barrel sampler in accordance with Plasticity pi ASTM D1587-84 Standard Test Method Grain Size Analysis ma Sand Equivalent se DRIVE SAMPLE, 2.42" ID sampler, Specific Gravity sg driven with 140 lb. weight, 30 in. drop Expansion Index ei Compaction Curve max STRENGTH DRIVE SAMPLE, No Recovery Pocket Penetrometer P Direct Shear ds Unconfined Compression uc Triaxial Compression DISTURBED BULK SAMPLE tx Vane Shear VS CONSOLIDATION C COLLAPSE TEST ct RESISTANCE (R) VALUE r CHEMICAL ANALYSIS ca ELECTRICAL RESISTIVITY

UNIFIED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

BLYTHE MONITORING WELL

Project No.

93-16-141-03



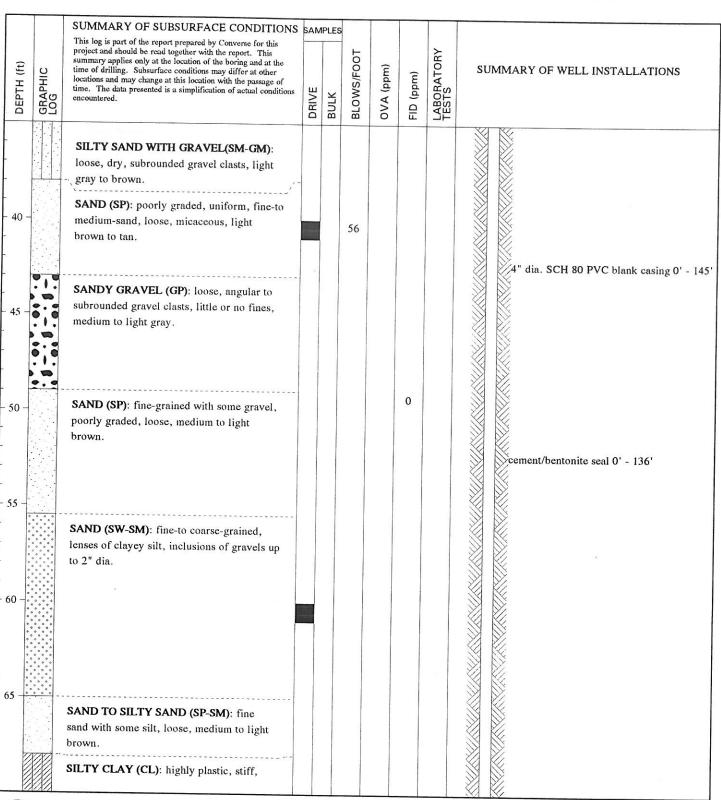
Converse Consultants Inland Empire

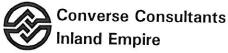
Drawing No.

Dates Drilled: 3/16/94 -	Logged by: <u>Jason L. Holcomb</u> Checked by: <u>Richard F. Escandon</u>
Equipment:10" Dia. Hammer Rig	Driving Weight and Drop: 140 lb / 30 in
Ground Surface Elevation(ft): 410	Depth to Water(ft): 154 8 Feet

	T		_					1 1	
		SUMMARY OF SUBSURFACE CONDITIONS This loss part of the speed purposed by Company for this	SAM	PLES					
DEPTH (ft)	GRAPHIC LOG	This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	DRIVE	BULK	BLOWS/FOOT	OVA (ppm)	FID (ppm)	LABORATORY TESTS	SUMMARY OF WELL INSTALLATIONS
		SILTY SAND (SM): fine-to							PVC casing extends to 2' above ground
-		medium-grained, inclusions of gravel clasts up to 1" dia., light brown to gray.				3	0		surface
- 5 - -			4						4" dia. SCH 80 PVC blank casing 0' - 145'
- 10 -		GRAVELLY SAND (GP): loose, subrounded gravel clasts.							
- - 15 - -		SILTY SAND (SM): fine-to medium-grained, micaceous, light gray to tan.							
- 20 -									cement/bentonite seal 0' - 136'
- 25 -		,							
- 30 -							0		
		CLAYEY SILT (CL-ML): soft, dark gray.							

Dates Drilled: 3/16/94 -	Logged by: Jason L. Holcomb Checked by: Richard F. Escando
Equipment:10" Dia. Hammer Rig	Driving Weight and Drop:140 lb / 30 in
Ground Surface Elevation(ft): 410	Depth to Water(ft): 154 8 Feet





Project Name. Blythe Monitoring Well

Project No. 93-16-141-03

Drawing No. A-2b

Dates Drilled:	3/16/94 -	Logged by: <u>Jason L. Holcomb</u>	Checked by: Richard F. Escandor
Equipment:	10" Dia. Hammer Rig	Driving Weight and Drop:	140 lb / 30 in
Ground Surface	Elevation(ft): 410	Depth to Water(ft):	54.8 Feet

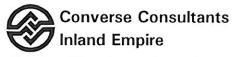
						,			
		SUMMARY OF SUBSURFACE CONDITIONS	SAM	PLES					
DEPTH (ft)	GRAPHIC LOG	This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	DRIVE	BULK	BLOWS/FOOT	OVA (ppm)	FID (ppm)	LABORATORY TESTS	SUMMARY OF WELL INSTALLATIONS
		medium brown to gray.							X X
- - 75 -		GRAVELLY SAND (SW): fine-to medium-grained sand, gravel clasts up to 2" dia					0		4" dia. SCH 80 PVC blank casing 0' - 145'
- 80 -									
- - - 85 -		SAND (SP): fine sand, uniform, micaceous, loose, medium brown.							
- - - 90 - -		GRAVELLY SAND (SW): fine-to coarse-grained sand, subangular to subrounded gravel clasts up to 2 1/2" dia							cement/bentonite seal 0' - 136'
- - - 95 - - -							0		
- -100- - - -		SAND (SP): fine-to medium-grained, occassional gravel, loose, light brown to gray.							

Dates Drilled:	3/16/94		Logged by:	Jason L. Holcom	b Checked by:	Richard F. Escandon
Equipment:	10" Dia. Hamm	ner Rig	Driving We	ight and Drop: _	140 lb / 30 in	
Ground Surface	Elevation(ft):	410	Depth to W	ater(ft):	154.8 Feet	

		SUMMARY OF SUBSURFACE CONDITIONS	SAM	PLES					
DEPTH (ft)	GRAPHIC LOG	This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subtract conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	DRIVE	BULK	BLOWS/FOOT	OVA (ppm)	FID (ppm)	LABORATORY TESTS	SUMMARY OF WELL INSTALLATIONS
-	OVA.	SAND (SP): fine-to medium-grained, occassional gravel, loose, light brown to gray.					0		
-110-		SILTY CLAY (CL) : stiff, medium brown to gray.							
-115-	0.00.00.00.00.00.00.00.00.00.00.00.00.0	SANDY GRAVEL (GW): fine-to coarse-grained sand, with gravels up to 2" dia., gravels are subangular to subrounded, loose, medium to light gray.							4" dia. SCH 80 PVC blank casing 0' - 145'
- 120-									
- 125-		SAND (SP): fine-grained, uniform sand, no fines, loose, medium brown. SANDY GRAVEL (GW): fine-to coarse-grained sand, subangular to subrounded gravels up to 2" dia					0		cement/bentonite seal 0' - 136'
-130-									
		SILTY SAND (SM): fine-grained sand, dense, occasional subrounded gravel clasts 1-1/2" to 2-1/2" dia., reddish brown.					0		4' bentonite seal 136' - 140'

Dates Drilled: 3/16/94 -	Logged by: Jason L. Hole	omb Checked by: Richard F. Escandor
Equipment: 10" Dia. Hammer Rig	Driving Weight and Drop:	140 lb / 30 in
Ground Surface Elevation(ft): 410	Depth to Water(ft):	154.8 Feet

		SUMMARY OF SUBSURFACE CONDITIONS	SAM	PLES		Ī			
DEPTH (ft)	GRAPHIC LOG	This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	DRIVE	BULK	BLOWS/FOOT	OVA (ppm)	FID (ppm)	LABORATORY TESTS	SUMMARY OF WELL INSTALLATIONS
- - -145-		SILTY SAND (SM): fine-grained sand, dense, occasional subrounded gravel clasts 1-1/2" to 2-1/2" dia., reddish brown.					0		4" dia. SCH 80 PVC blank casing 0' - 145'
- - -150-		SILTY CLAY (CL): stiff, very plastic, reddish brown. SAND (SP): fine-to medium-grained, micaceous sand, uniform, poorly graded, light brown to light gray.							4" dia. SCH 80, 0.020 slotted screen 145' -180'
- - 155— -	¥	- becoming very moist							
-160-	¥	- wet cuttings, sand							sand backfill 140' - 200'
- 165–		- free water in cuttings					0		
- - - 170		GRAVELLY SAND (SW): medium-to coarse-grained sand with fine to coarse gravels, saturated, loose, medium gray to brown.							
	****	SAND (SP): medium-grained, poorly graded, uniform sand, medium brown.							



Project Name. Blythe Monitoring Well Project No. 93-16-141-03

Drawing No. A-2e

Dates Drilled:3/16/94	Logged by: <u>Jason L. Holcomb</u>	Checked by: Richard F. Escandon
Equipment: 10" Dia. Hammer Rig	Driving Weight and Drop:	140 lb / 30 in
Ground Surface Elevation(ft): 410	Depth to Water(ft):	154.8 Feet

		SUMMARY OF SUBSURFACE CONDITIONS	SAM	IPLES					
DEPTH (ft)	GRAPHIC LOG	This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	DRIVE	BULK	BLOWS/FOOT	OVA (ppm)	FID (ppm)	LABORATORY TESTS	SUMMARY OF WELL INSTALLATIONS
180- 185- 195- 200-		SAND (SP): medium-to coarse-grained with fine gravel 1/2" dia., medium brown. - with gravel, medium-to coarse-grained, fine-to coarse-gravels, subangular to subrounded clasts					0		4" dia. SCH-80 PVC, .020 slotted screen 145' - 180' 180': END CAP sand backfill
		End of boring at 200 feet. Groundwater encountered at 160 feet during drilling. Groundwater stabilized at 154.8 feet on 3/17/94. Borehole converted to monitoring well on 3/17/94.							200': Bottom of Borehole