

SECTION 334101
LANDSCAPE DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Drain Rock.
 - 2. Geotextile Fabric.
 - 3. Pipe and Fittings.
 - 4. Trench Drain and Frame.
 - 5. Paving Area Drain Cover.
 - 6. Planting Area Drain Cover.

- B. For Trenching and Backfilling, see Section 312333.

- C. For Landscape Maintenance Period, see Section 320100.

- D. For Site Concrete, see Section 321316.

- E. For Irrigation, see Section 328400.

- F. For Soil Preparation and Soil Mixes, see Section 329113.

- G. For Planting Area Finish Grading, see Section 329119.

- H. For Plant Material, see Section 329300.

- I. For Site Storm Drainage Utilities, see Section 334000.

1.2 DEFINITIONS

- A. Acceptance: Wherever the terms “acceptance” or “accepted” are used herein, they mean acceptance of Owner’s representative in writing.

- B. PVC: Polyvinyl Chloride.

- C. SDR: Standard Dimensional Ratio.

1.3 REFERENCES

- A. ASTM — American Society for Testing and Materials:
 - 1. D 698 — Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort. Most current edition.
 - 2. D 1557 — Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort. Most current edition.
 - 3. D 2729 — Specification for PVC Sewer Pipe and Fittings. Most current edition.

4. D 3034 — Specification for Type PSM PVC Sewer Pipe and Fittings. Most current edition.
5. F 679 — Specification for PVC Large-diameter Plastic Gravity Sewer Pipe and Fittings. Most current edition.

B. Caltrans Standard Specifications – Most current edition.

1.4 SUBMITTALS

A. Product Data:

1. Pipe and Fittings.
2. Geotextile Fabric.
3. Paving Area Drain.
4. Planting Area Drain.
5. Trench Drain and Frame.
6. Drain Rock.

B. Shop Drawings:

1. Provide shop drawings for Trench Drain, Trench Drain Grates and Paving Area Drain. Show shop and erection details, to scale, including dimensions, sizes, thicknesses, gauges, finishes, joining, segments, joints, attachments, holes, welds, bolts, elevations and relationship of work to adjoining construction. Prepare details at not less than 3 inches = 1 foot.
2. Where items must fit and coordinate with finished surfaces and/or constructed spaces, take measurements at site and not from the Drawings.
3. Indicate welded connections using AWS A2.0 welding symbols.

C. Samples:

1. Trench Drain Frame and Grates, 12 inches in length.

D. Record Documents:

1. Maintain on the construction site a record of materials and equipment installed each day.
2. Daily record information neatly to scale, on full-size prints of the irrigation construction documents.
3. Include changes, substitutions, and manufacturer's names and catalog numbers for materials and equipment.
4. Show actual locations of drains, grates, clean-outs and piping.
5. Show dimensions from easily-identifiable permanent structures such as walls, curbs, buildings or walks.
6. Procure reproducible sepia mylars of the current construction documents from the Owner's representative.
7. After Work completion, transfer information noted on prints to the reproducible mylars and submit to the Owner's representative for review of general information content (Owner's representative will not be responsible for errors or omissions).
8. Contractor shall be responsible for accuracy of information and errors or omissions.
9. If first submittal is not accepted by Owner's representative, resubmit until accepted.
10. Submit accepted final record documents to Owner.

1.5 QUALITY ASSURANCE

- A. Contractor Qualifications:
 1. Have successfully installed landscape drainage similar to the quality specified for a period of not less than 5 years.
 2. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.
- B. Regulatory Requirements: Meet requirements of applicable laws, codes, and regulations required by authorities having jurisdiction over Work.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Storage:
 1. Store products with protection from weather or other conditions which would damage or impair the effectiveness of the product.
 2. Protect PVC pipes and fittings from direct sunlight.
 3. Store pipe on beds equal to or longer than pipe.

1.7 SITE CONDITIONS

- A. Environmental Requirements:
 1. Lay and join pipe in dry trenches.
- B. Existing Conditions:
 1. Prior to Work commencement review locations of existing public underground utilities and structures with appropriate utility companies and clearly mark in field.
 2. Prior to Work commencement review location of existing private underground utilities and structures with Owner and clearly mark in field.
 3. Prior to Work commencement and after reviewing the Owner’s record irrigation documents, review and clearly mark in field heads, valve boxes and other underground equipment, materials and structures.

1.8 WARRANTY

- A. General Description: In addition to manufacturer’s warranties, warrant Work for a period of one year from date of Final Completion against defects in materials and workmanship.
- B. Additional Items Covered: Warranty shall also cover repair of damage to other materials and workmanship resulting from defects in materials and workmanship and trench backfill settlement.
- C. Exceptions: Contractor shall not be held responsible for failures due to ordinary wear, neglect by Owner, vandalism, and other causes outside the Contractor’s control.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND SUPPLIERS

- A. Plastic catch basins, planting area drains and grates:
 - 1. National Diversified Sales (NDS) – <http://www.ndspro.com>.
 - 2. Or accepted equal.

- B. Geotextile fabric:
 - 1. Mirafi – www.tcmirafi.com.
 - 2. Carthage Mills – www.carthagemills.com.
 - 3. Or accepted equal.

- C. Worm drive hose clamps:
 - 1. McMaster-Carr Supply Company – <http://www.mcmaster.com>.
 - 2. Or accepted equal.

- D. Vehicular Rated Trench Drains:
 - 1. Urban Accessories – www.urbanaccessories.com.
 - 2. Or accepted equal.

- E. Vehicular Rated Paving Area Drain:
 - 1. Urban Accessories – www.urbanaccessories.com.
 - 2. Or accepted equal.

- F. Flexible Couplings:
 - 1. Fernco Inc., Sparks – <http://www.fernco.com>.
 - 2. Or accepted equal.

2.2 MATERIALS

- A. Perforated and Solid Non-perforated Pipe:
 - 1. ASTM D 3350 Cell, Classification 324420C
 - 2. ASTM D 1248 Type III, Class C, Category 4, Grade P33
 - 3. AASHTO M252 double-wall, corrugated, HDPE, smooth-interior wall.
 - 4. Or equal.

- B. Perforated and Solid Corrugated Pipe Fittings:
 - 1. ASTM F 405, HDPE.
 - 2. Or equal.

- C. Saddle Fitting for Connections to HDPE Pipe:
 - 1. Fittings recommended by HDPE pipe manufacturer.
 - 2. Or equal.

- D. Couplings for Cast-iron Area Drain Pipe to Solid Pipe:
 - 1. Fernco flexible coupling as recommended by pipe manufacturer.
 - 2. Or equal.

- E. Plastic Planting Area Drains:
 1. Type: Round flat grates
 2. Color: Black
 3. Quantity: See Drawings

- F. Vehicular Rated Trench Drain and frame:
 1. Type: Jamison (7" x 36")
 2. Metal: Cast Ductile Iron, **ASTM A536 class 65-45-12 (Addendum 03)**
 3. Finish: Rust Conditioner
 4. Or accepted equal

- G. Vehicular Rated Area Drain:
 1. Type: Slot T-24 (5 ¼" **Round DIA**, 8.375" **Round DIA**, See Plans) (**Addendum 03**)
 2. Metal: Cast Ductile Iron, **ASTM A536 class 65-45-12(Addendum 03)**
 3. Finish: Rust Conditioner
 4. Quantity: See Drawings
 5. Or accepted equal.

- H. Geotextile Fabric:
 1. Mirafi 140 NC (for California Clay Soils – for tree subdrainage and french drains)
 2. Or accepted equal.

- I. Drain Rock:
 1. Crushed clean pea gravel, 1/4-inch diameter.

- J. Cleanout for Planting Areas:
 1. Schedule 80 female adaptor with brass male pipe thread plug.

- K. Sand Backfill: Durable particles, free of thin or elongated pieces, lumps of clay, soil, loam or vegetable matter, with the following particle size gradation:

Sieve Size (Square)	Percent Passing
4	100
16	80-100
50	20-60
100	10-40
200	0-10

- L. Granular Embedment:
 - 1. Free flowing sandy material which contains no clay, reasonably free of organic material.
- M. Planting Area Backfill for Upper 12 Inches:
 - 1. Upper 12 inches of soil excavated from trenches stockpiled separately on site.
- N. Water for Sprinkling Backfill:
 - 1. Clean, potable.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection:
 - 1. Use every possible precaution to prevent damage to existing conditions to remain.
 - 2. Provide barricades, fences or other barriers as necessary to protect existing conditions to remain from damage during construction.
 - 3. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
 - 4. Submit written notification of conditions damaged during construction to the Owner and Owner's representative within 2 working days of observed damage and before damage is covered.

3.2 TRENCH EXCAVATION

- A. Excavation:
 - 1. In planting areas excavate and stockpile separately upper 12 inches of soil to be used later for backfilling upper 12 inches of trenches in planting areas.
 - 2. Pile materials suitable for back-filling a sufficient distance from banks of trenches to prevent slides or caveins.
 - 3. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods.
 - 4. Excavate width of the trench to provide adequate space for workers to place and joint the pipe or culvert properly, but hold the clear space between the barrel of the pipe and trench wall to the minimum required for a satisfactory installation.
 - 5. Excavate trench to width necessary for sheeting and bracing and proper performance of the Work.
 - 6. Accurately grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length, except for portions of pipe sections where it is necessary to excavate for bell holes and for proper making of pipe joints.
 - 7. Dig depressions for joints after trench bottom has been graded and only 1/2 inch greater length, depth and width than the bell, as required for properly making the particular type of joint, and to insure that the bell does not bear on the bottom of the hole.
 - 8. Over-cut with sand cushion may also be employed for pipe at Contractor's option.
 - 9. Pile excavated material on one side only of trenches to permit ready access to and use of existing fire hydrants, valves, manholes and other utilities system appurtenances.

10. Remove and dispose of excavated materials not required or satisfactory for backfill.
11. Keep surface drainage of adjoining areas unobstructed.
12. Remove water by pumping or other accepted method and discharge at a safe distance from the excavation.

B. Unsatisfactory Fill:

1. When unsatisfactory fill incapable of properly supporting pipe is encountered in bottom of trench, notify Owner and soils engineer in writing.
2. Upon Owner approval, remove unsatisfactory fill to depth accepted by the soils engineer.
3. Backfill over-depths with material accepted by the soils engineer.
4. Compact over-depth fill material to 95 percent as determined by ASTM D 1557.
5. Back-filling of unauthorized overdepths shall be at the expense of the Contractor.

3.3 PIPE INSTALLATION

A. Manufacturer's Requirements: Meet requirements of the manufacturer's current printed instructions.

B. Pipe Laying:

1. Furnish and place in position necessary batter boards, string lines, plummets, graduated poles, etc., required in establishing and maintaining the lines and grades.
2. Protect batter boards and location stakes from possible damage or change of location.
3. Begin laying of the pipe on the prepared foundation at the outlet or downstream end with the spigot or tongue end of the pipe joint pointing downstream and proceed toward the inlet or upstream end with each abutting section of pipe properly matched, true to the established lines and grades.
4. Provide acceptable equipment for hoisting and lowering the sections of pipe into the trench without disturbing the prepared bedding foundation or the sides of the trench.
5. Clean ends of the pipe carefully before the pipe is placed in the trench.
6. As each length of pipe is laid, protect openings to prevent the entrance of earth or bedding material.
7. Fit and match pipe so that when laid in the prepared bedding it will form a smooth, uniform conduit.

C. Jointing: Meet requirements of pipe manufacturer's current printed instructions.

3.4 GEOTEXTILE FABRIC, DRAIN ROCK AND PERFORATED PIPE INSTALLATION

A. Wrapped Drain Rock Around Perforated Pipe:

1. Center fabric strip over trench.
2. Overlap uphill fabric edges over downhill fabric edges a minimum of 12 inches.
3. Install drain rock and pipe as shown on Drawings.
4. After drain rock is installed, fold fabric over top of drain rock with minimum 12 inch overlap.
5. Attach fabric ends to pipe as shown on the Drawings.
6. Immediately backfill 2 inches depth sand layer on lapped fabric.

3.5 TRENCH BACK-FILLING OVER SOLID PIPE

A. General Backfill:

1. Coordinate backfilling with testing of utilities.
2. Where damage is likely to result from withdrawing, leave sheeting in place and cut off a minimum of 24 inches below finished grade.
3. Carefully backfill trenches with granular backfill and deposit in 9 inch maximum layers, loose depth.
4. Bring up granular backfill material evenly on both sides of pipe for its full length and thoroughly and carefully compact until pipe has a cover of not less than 1 foot.
5. Reopen trenches and excavation pits improperly backfilled, or where settlement occurs, to the depth required to obtain the specified compaction, then refill and compact, and restore the surface to the specified grade and compaction.

B. Backfill Under Paving:

1. Backfill as specified above for general backfill, except that remainder of trench above the granular backfill material shall be backfilled with field sand in 6 inch maximum layers, and each layer moistened and compacted to 95 percent of the maximum density obtained at optimum moisture as determined by ASTM D 1557.
2. Backfill to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

C. Backfill in Planting Areas:

1. Backfill as specified above for general backfill except bring granular fill up to 12 inches below finish grade.
2. Compact granular fill to a maximum 75 percent as determined by ASTM D 1557.
3. Backfill upper 12 inches with stockpiled soil from upper 12 inches of trench excavation.
4. Settle upper 12 inches of soil by sprinkling with minimum 2 inches of water.

3.6 FIELD QUALITY CONTROL

- #### A. Field Observation Reviews by Owner's representative: Coordinate and schedule with Owner's representative.

3.7 CLEANING

- #### A. General: Clean and keep clean until Owner accepts maintenance.

END OF SECTION