TECHNICAL SPECIFICATIONS

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SECTION 02050 TREE PROTECTION

PART 1 GENERAL

1.01 SUMMARY

A. Scope of work:
   1. Protect, and maintain all existing trees and other vegetation not designated for removal.

B. Related sections can include, but may not be limited to:
   1 Section 02100 - Site Clearing and Demolition
   2 Section 02200 - Earthwork
   3 Section 02221 - Excavation, Backfill and Compaction
   4 Section 02700 - Storm Drainage
   5 Section 02713 – Domestic Water Systems
   6 Section 02722 – Sanitary Sewerage
   7 Section 02810 - Irrigation
   8 Section 02900 - Landscaping
   9 Section 02970 - Landscape Maintenance

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. American Joint Committee on Horticultural Nomenclature (AJCHN), Standardized Plant Names

B. American Association of Nurserymen, Inc. (AAN), American Standard for Nursery Stock.

C. Sunset Western Garden Book, Lane Publishing CO.

D. Agricultural Code of California.

E. State of California Department of Transportation Standard Specifications, Current Edition

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Submit four (4) copies of product data or "cut-sheets" for all products proposed for use.

PART 2 PRODUCTS

2.01 MATERIALS

A. Protective Fencing:
   1 Protective fencing shall consist of four foot (4') to six foot (6') high Ablaze orange plastic fencing material installed with metal posts and wire ties. Fence fabric shall be accepted by District’s representative.
   2 Metal posts shall be accepted by District’s representative.

PART 3 EXECUTION

3.01 GENERAL

A. Protect, and maintain all existing trees and other vegetation not designated for removal.

B. At a minimum, protect all existing trees and other vegetation not designated for removal from the following:
   1 Breaking, cutting and/or skinning of branches, bark and/or roots
   2 Stockpiling of building materials, soil or trash within dripline
   3 Vehicular traffic and parking

C. Trees (and other vegetation not designated for removal) that become damaged during the life of the project shall be repaired or replaced by the contractor at no cost to the District subject to the discretion of the District's representative.

3.02 PROTECTIVE FENCING

A. Prior to site clearing, demolition or grading, install acceptable protective fencing around all existing trees and other vegetation not designated for removal one (1) foot beyond dripline or as directed by District's representative.

B. Locate structural roots by hand probing and set posts with care to preclude root damage.

C. Space protective fencing posts at 6'-0" centers maximum and securely attach fabric.

D. Maintain protection until Final Acceptance of project.

E. Install signage indicating that the protective fencing and area within shall not be disturbed.

F. When work is required within the fenced protection area, submit a written request to the District's representative stating work to be performed and approximate time of completion. No work shall be allowed within the protected fenced area without the prior acceptance by the District's representative. Fencing shall be replaced promptly following completion of said work.

3.03 GRADING AND TRENCHING

A. The earth surface within protective fencing shall not be altered except as acceptable to the District's representative. Any grading or trenching necessary within the dripline shall be done by hand per the discretion of the District's representative.

3.04 IRRIGATION

A. Provide and/or maintain irrigation for all existing trees and other vegetation not designated for removal as necessary to promote healthy, vigorous growth. Weekly watering shall occur with a 20 minute soak per tree.

3.05 ROOT PRUNING

A. Root pruning shall consist of a smooth, final cut and shall be performed wherever a root 2" or more in diameter has been broken or severed.

3.06 CANOPY PRUNING

A. All pruning shall be completed by a tree care contractor or under supervision of a licensed arborist.

B. Prune all existing trees to remain and be protected per the following:
   1 Proper removal of all dead branches and live "stubs" three (3) inches and over in diameter.
   2 Removal of all broken or loose branches and other debris lodged in trees and shrubs.
   3. Removal of all live branches which interfere with tree structural strength and healthful development. These include:
      a. Limbs which rub and abrade a more "important" or dominant branch, and as directed by the District's representative
      b. Limbs of weak structure
      c. Limbs with twigs and foliage obstructing the development of more "important" branches, as directed by the District's representative
      d. Branches near the end of a limb which may produce more weight than the limb is likely to support
      e. Branches conflicting with building or vehicular roadways
   4. Removal of all branches located between grade level and ten (10) feet above grade over pedestrian walkways.

c. Selectively prune branches as deemed necessary by the District's representative.

3.07 PRUNING REPAIRS

A. Prune and treat any damaged area as directed by the District's representative.

3.08 CLEAN-UP

A. Branches, trimmings and debris remaining upon completion of each operation shall become property of the Contractor and shall be promptly removed from the Site.

END OF SECTION

SECTION 02100 SITE CLEARING AND DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all site clearing and demolition work plus all related activities as shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the site clearing and demolition work is shown on the Drawings and can include, but is not necessarily limited to the following:
   1 Demolition, removal and disposal of designated items
   2 Careful removal, protection and re-installation of designated items
   3 Careful removal and salvage of designated items
   4 Disconnection and capping of existing utility and/or irrigation lines
   5 Incidental demolition of abandoned utility and irrigation lines
   6 Spraying until dead, clearing, grubbing vegetated areas and/or roto-tilling in existing turf areas
   7 Protection of existing plant material

C. Related sections can include, but may not be limited to:
   1 Section 02050 - Tree Protection
   2 Section 02200 - Earthwork

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California Department of Transportation Standard Specifications, Current Edition

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 Submittals and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Indicate the proposed time line for site clearing and demolition work including all required shut off times and capping of utility services on the project schedule.

C. Submit a written description of all proposed salvage, demolition and removal procedures to the District's representative for review before work is started. Procedures shall include:
   1 List of items to be removed and disposition of materials specified to be salvaged
   2 Plan of coordination with other work in progress
   3 Disconnection schedule of utility services
   4 Detailed description of methods and equipment to be used for each operation
   5 Sequence of operations

1.04 QUALITY ASSURANCE

A. The District shall obtain and pay for all permits required in connection with this work. Fees for the dumping of debris shall be paid for by the Contractor.

1.05 PROJECT CONDITIONS

A. Dust Control:
   1. The contractor shall, at all times, prevent the formation of airborne dust on and around the project site with the use of sprinkled water or other means acceptable to the District's representative. Non-compliance with proper dust control measures shall be grounds for issuance of "stop work" orders by the District's representative until such time as satisfactory measures are implemented.

B. Utility Services:
   1 Issue written notices of planned demolition operations to utility companies and coordinate site clearing and demolition improvements as requested by said utility companies.
   2 Existing power poles and lines serving existing occupied buildings shall remain. Arrange all necessary work in order to maintain utilities not designated for removal.
   3 Coordinate work in order to maintain utilities to any applicable temporary on-site facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Conform to Section 01400 - Quality Control (as applicable).

B. Carefully identify limits of demolition.

C. Mark project areas as directed by the District's representative and as necessary to clearly identify the interface of items to be removed and items to be left in place intact.

3.02 PREPARATION

A. Protection:
   1 Make provisions and take necessary precautions to protect all existing items not designated for removal. Any existing item or area damaged during construction operations shall be replaced or repaired to an Aas-was≅ or better condition at no additional cost to the project and subject to the acceptance of the District's representative.
   2 Erect barriers, fences, guard rails, enclosures, chutes, and shoring as necessary to protect personnel, structures, and utilities remaining intact.
   3 Provide warning signs and lighting as necessary for vehicular and personnel protection. Maintain warning signs during construction as required by applicable safety ordinances and as reasonably prudent.
   4 Coordinate arrangements for items to be salvaged and turned over to the District.
   5 Notify Underground Service Alert (USA), (800) 642-2444, and local utility companies to verify locations of existing utilities a minimum of 48 hours prior to beginning work.
   6 Provide tree protection fencing prior to any demolition work.

B. Traffic Access:
   1 Ensure minimum interference with roads, streets, driveways, sidewalk and adjacent facilities.

2 Do not close or obstruct streets, sidewalk, alleys or passageways without acceptance from the District's representative.

3 Provide approved alternate routes around closed or obstructed traffic ways as required by the District's representative.

4. Maintain access to adjacent existing buildings to ensure uninterrupted operations during demolition work.

3.03 DEMOLITION

A. General:

1. Refer to drawings for extent of demolition work.

B. Paving:

1. Demolish paving in accordance with local noise ordinance regulations and as acceptable to the District's representative.

C. Filling:

1. Completely fill below-grade areas and voids resulting from demolition work. Install appropriate, acceptable fill material consisting of soil, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter. Meet compaction requirements as specified.

D. Other:

1. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both the nature and extent of the conflict. Submit report to District's representative in written, accurate detail. Pending receipt of directive from District's representative, rearrange selective demolition schedule as necessary to continue overall job progress without delay.

E. Clearing and Grubbing:

1 Prior to site clearing, all existing vegetation (below twelve inches (12") in height) and turf areas to be removed shall be sprayed with a non-selective broad spectrum systemic herbicide for perennial vegetation and straight contact herbicide for annual vegetation in accordance with a licensed pest control advisor or herbicide manufacturers recommendations.

2 Allow a sufficient period of time to ensure that all sprayed vegetation is dead (refer to manufacturer's recommendations).

3 Irrigation heads shall be salvaged and provided to District.

4 Clear/strip vegetative material from soil surface and remove unless noted otherwise. Existing turf areas to be removed need not be stripped, but may be cross-ripped in two opposite directions and roto-tilled into the ground to a minimum six inch (6") depth. Remaining clods of turf shall be no larger than two inches (2") in diameter.

5 Contractor is responsible for stockpiling and protecting all topsoil needed for landscaping improvements. Refer to Earthwork and Landscape Specifications.

F. Utilities and Related Equipment:

1 The locations of existing utilities, as may be shown on the Drawings, are approximate. Should existing utilities not shown on the Drawings be encountered during construction operations, notify the District's representative immediately, and re-direct work to avoid delay. The District's representative shall then determine what action, if any, is required.

2 Remove all abandoned utilities as indicated and as uncovered by the work, and terminate in a manner conforming to code.
3 Remove and salvage designated items and related equipment and deliver to a location acceptable to the District's representative.

G. Underground Piping:

1 Existing storm drain and irrigation systems, as may be shown on the Drawings, may be modified to allow for construction of new items as a part of this project. Caution shall be exercised so as not to damage underground piping not scheduled for removal.
2 Remove underground piping as indicated, or as necessary, and backfill to designated compaction density.
3 Manholes and lines scheduled for removal which connect to active systems shall have their active remaining portions capped, plugged, or blind-flanged as appropriate.
4 Materials used for pipe terminations and temporary connections shall be the same as the existing lines. Fittings and flanges shall be of weight and class suitable for the service in which used.

3.04 SALVAGE

A. Demolition:

1 Materials or equipment to be demolished shall become the property of the Contractor except for items specified to be salvaged for the District.
2 Carefully remove items to be salvaged to avoid damage.
3 Irrigation heads, valves and existing controller shall be salvaged and provided to District. Contractor shall clean and box items. Items shall be returned to District corporation yard.

B. Replacement:

1. In the event items not scheduled to be demolished are damaged, promptly replace or repair such items to an as-was or better condition per the discretion of the District's representative at no additional cost.

C. Materials scheduled for removal shall not be placed on view to prospective purchasers or sold on site.

3.05 CLEANING

A. Debris and Rubbish:

1 Remove and transport debris and rubbish as it accumulates and dispose in a legal manner via recognized haul routes per Section 01500, in a manner that will prevent spillage on streets or adjacent areas.
2 Remove all tools, equipment and appliances used for demolition from the site upon completion of the work.
3 Clean entire project area, adjacent streets, and pavements to a broom-clean, Astain-free condition per the discretion of the District's representative.

END OF SECTION

SECTION 02200 EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all earthwork and related work shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the earthwork is shown on the Drawings and can include, but is not necessarily limited to the following:
1 Topsoil stripping, stockpiling, and replacement into planting areas
2 Rough grading
3 Filling and backfilling to attain required grades
4 Excavating for paving, footings and foundations
5 Adherence to requirements, recommendations and/or Best Management Practices (BMPs) for storm water management as may be outlined in the Project Storm Water Pollution Prevention Plan (SWPPP), or as required by governing agencies

C. Related sections can include, but may not be limited to:
1 Section 01050 - Field Engineering
2 Section 01300 - Submittals
3 Section 01720 - Project Record Drawings
4 Section 02050 - Tree Protection
5 Section 02100 - Site Clearing and Demolition
6 Section 02230 - Base Courses
7 Section 02900 - Landscaping

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. International Conference of Building Officials (ICBO):
1. California Building Code (CBC):
a. Chapter 33 – Site Work, Demolition, and Construction.

B. American Society for Testing and Materials (ASTM):
1 D 1557-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-pound Rammer and 18-inch Drop.
2 D 2992 - Test Methods for Density of Soil in Place by the Sand- Cone Method.

C. California Occupational Safety and Health Standards (OSHA):
1. Article 6 - Excavations and Shoring.

D. State of California Department of Transportation Standard Specifications, Current Edition

1.03 SUBMITTALS

A. Project Record Drawings:
1 Conform to Section 01720 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.
2 Accurately record locations of utilities remaining, re-routed utilities, new utilities, and newly discovered utilities by horizontal dimensions, elevations, inverts, and slope gradients.

B. Import Topsoil
   1 It is the contractors responsibility to determine if import topsoil is required on the project.
   2 As applicable, contractor shall submit four (4) samples (1 quart-sized “zip-lock” plastic bag min. each) of proposed import topsoil(s) with their current accompanying fertility and structure analyses, prepared by a recognized soil and plant laboratory, for review and acceptance by the District’s representative prior to use.

1.04 QUALITY ASSURANCE

A. Geotechnical Investigation:
   1 A geotechnical investigation report has been prepared for use on this project. The recommendations contained therein have been incorporated into the Contract Documents.
   2 The District may designate and pay for the services of a Geotechnical Engineer to make recommendations based on the soil conditions encountered, the results of field and laboratory tests, and observations of the activities performed under this Section.
   3 Relative compaction densities specified for structural fills under footings, slabs, or pavements shall be determined in accordance with ASTM D-2992 and D-1557, unless otherwise noted.

B. Certification:
   1 The contractor shall certify source and type of backfill and topsoil proposed to be incorporated into the work, at the request of the District’s Representative.
   2 The contractor shall certify elevations of excavations, footings, subgrades and finish grades with the use of a Licensed Surveyor, at contractor's expense, at the request of the District’s Representative.

1.05 PROTECTION

A. Protect all existing structures, fences, roads, sidewalks, paving, curbs, and other items as necessary from earthwork activity.

B. Protect above or below grade utilities which are to remain.

C. Protect trees to remain in accordance with Section 02050 - Tree Protection (as applicable).

D. Repair damage to any existing site features which are to remain. Repair and restoration shall be equal to quality and appearance of prior condition and to the satisfaction of the District’s representative.

1.06 PROJECT CONDITIONS

A. Underground Utilities: Unknown buried utility lines may exist. If encountered, notify District’s representative immediately for direction and re-direct work to avoid delay.

1 Cooperate and coordinate with District's representative and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility district.

2 Do not interrupt existing utilities serving occupied facilities without proper notification to, and written direction from, District's representative.

B. Wet Conditions: No grading operations shall be conducted when excessively wet conditions exist as determined by the District's representative.

C. Contractor shall provide de-watering equipment as required to continue scheduled operations and provide optimum working conditions at no additional cost to District.

D. Dry Conditions: Contractor shall apply sufficient water to materials during construction to properly compact materials and control dust.

1.07 GRADE STAKES AND LINES

A. All grading and subgrading shall be controlled by contractor-installed intermediate grade stakes and lines necessary to obtain the finished grade elevations shown or implied in the Drawings. Subgrade and finish grade surfaces shall conform to the control planes established by these grade stakes and lines.

B. Protect and maintain all existing bench marks, monuments and other reference points. If disturbed or destroyed, they shall be replaced at the Contractor's expense.

C. Contractor shall set temporary bench marks as necessary to properly complete construction operations.

1.08 SURVEYING

A. Contractor shall be responsible for hiring a licensed professional surveyor to perform all surveying, layout and staking. Contractor shall be responsible for informing District's representative (minimum two (2) working days notice) when staking and layout is scheduled so that a review of completed chalk lines and staking can take place.

1.09 TOLERANCES

A. Refer to related specification sections for grading tolerances of specified improvements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Select material for structural backfill shall be in accordance with applicable portions of Section 19 - Earthwork, of the Standard Specifications, unless modified by recommendations and requirements of the Project Geotechnical Report.

B. Topsoil: Excavated material from top 6 inches (maximum) of existing grade (unpaved areas) and/or acceptable import material graded free of roots and rocks

larger than two inches, subsoil, debris, weeds, large mats of grass, and other deleterious material.

C. Subsoil: Excavated material below top 6 inches of existing grade, graded free of clay clods larger than 6 inches, rocks larger than 3 inches, and debris.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify all required lines, levels, contours, datum, control points and property lines required to properly establish limits of work.

B. Verify elevations of critical existing grades as noted on Drawings and as directed by District's representative. Notify District's representative of discrepancies prior to start of work and re-direct work to avoid delay.

C. Identify all known below grade utilities. Stake and flag locations.

D. Identify and flag surface grades and utilities.

E. Contact Underground Service Alert (USA) (800-642-2444) and local utility companies to verify locations of existing utilities a minimum of two (2) working days prior to excavation.

3.02 PROTECTION

A. Maintain and protect existing utilities remaining which pass through work area.

B. Perform excavation work near utilities by hand. Provide necessary protection as the work progresses.

C. Provide and maintain protection for walks, curbs, drains, trees, corners of structures, etc., as necessary to prevent damage.

D. Barricade and/or cover open excavations occurring as part of this work and post with warning lights to the satisfaction of the District's representative. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

E. Keep adjacent properties, streets and drives clean of any dirt, dust, or stains caused by earthwork operations.

F. Upon discovery of unknown utility or concealed conditions, notify the District's representative immediately and re-direct work to avoid delay.

G. Control dust on and near the work, and on and near off-site borrow areas.
   1 Thoroughly moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of any other activities that may occur on the site.
   2 Non-compliance with proper dust control measures shall be grounds for issuance of "stop work" orders by the District's representative until such time as satisfactory measures can be implemented.

3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from all areas scheduled for paving or rough grading and stockpile material in neat wind-row(s) in location(s) that have been previously established which will cause least interference to construction operations, and which is/are acceptable to the District's representative.

B. Do not excavate topsoil that has become wetted to, or beyond, the saturation point that would be required for optimum compaction.

C. Stockpile topsoil in wind-row(s) of a height not to exceed 8 feet, protect from erosion, and cover as necessary to prevent formation of dust.

D. Topsoil excavation shall occur for the entire area or per field. No topsoil excavation shall occur for partial field areas without approval.

E. Topsoil staging areas shall be clearly defined and protected from other grading and utility operations.

3.04 ROUGH GRADING

A. Grade site subsoil to establish proper subgrade elevations and site contouring as described or implied in the Drawings:

B. Contouring:
1 Construct landforms depicted in the Drawings to the satisfaction of the District's representative.
2 "Round-off" all tops of slopes.
3 "Feather" all toes of slopes.

C. Compaction: Compact subgrade areas as follows unless otherwise noted:
1 Areas to be planted: Maximum eight inch (8") lifts to be between 85% and 90% relative compaction.
2 Areas to be paved: Maximum eight inch (8") lifts to at least 90% relative density. The top 12" shall be compacted to at least 95 percent relative compaction.
3 Additional lifts should not be placed if the previous lift did not meet the required density, relative compaction, moisture content or if the soil conditions are not stable.
4 All fill soils shall be compacted to no less than 90% relative compaction at moisture content of 2 to 4 percent for pavement area. Fill lifts shall also not exceed eight inch (8") lifts.
5 Compacted subgrade should be non-yielding under construction traffic, including a loaded ten-wheel truck such as a water or dump truck, in all pavement areas. Removal and subsequent replacement of some material (i.e. areas of excessively wet materials, unstable subgrade, or pumping soils) may be required to obtain the minimum 95 percent compaction to the recommended depth of 12 inches.

D. Locate all excess subsoil material on site. Refer to "Material Storage" below.

E. Entire project or individual field area shall be rough graded at one time. No earthwork operation shall occur for partial field areas without approval.

3.05 EXCAVATION

A. Remove and dispose of all miscellaneous materials encountered when establishing required grade elevations.
   1. Miscellaneous materials can include but are not limited to: pavements and other obstructions, underground structures, utilities, abandoned irrigation materials, and other materials encountered per the discretion of the District's representative.

B. Stability of Excavations:
   1 Comply with any applicable recommendations contained within the Project Geotechnical Report and requirements of agencies having jurisdiction.
   2 Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

C. De-watering: Provide and maintain, at all times during construction, ample means and devices with which to promptly remove and properly dispose of water from any source entering structural excavation, pipe trenches, or other excavations. All costs incurred from de-watering activities shall be paid for by the contractor.

D. Excavation for Structures:
   1. Conform to elevations and dimensions shown in the drawings within a tolerance of plus-or-minus one tenth (0.10') of a foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete form-work, installation of services, and quality review.

E. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations, and grades as shown in the Drawings.

F. Material Storage: Stockpile satisfactory excavated materials where appropriate, until required for use. Stockpile topsoil and subgrade soil in separate piles. Place, grade and shape stockpiles for proper drainage.
   1 Locate and retain stockpiles away from edge of excavations.
   2 Dispose of excess soil material in a legal fashion after it has become evident that the material is no longer needed on the project and is of no value to the District.

3.06 TOPSOIL PLACEMENT

A. Thoroughly cross-rip all subgrade soil to a depth of twelve (12) inches prior to placing the specified thickness of topsoil back into all applicable planting areas. Secure review and acceptance of ripping depth prior to placement of topsoil. Refer to Section 02900 – Landscaping for this process.

B. Topsoil placement requirements for planting areas shall be as follows:
   1 All planting areas: Shall contain or receive a minimum of six (6) inches of clean, acceptable topsoil.
   2 Topsoil shall not be placed until all earthwork and utility operations are complete.
   3 Topsoil shall be installed at one time for entire project or entire field area. No partial placements shall occur.

C. Compact topsoil to 84% to 89% relative density.

D. Maintain all slopes and gradients established during subgrade operations and shape landforms to satisfaction of the District's representative.

E. Refer to Section 02900 - Landscaping for finish grading information and finish grades at edge of planting areas and hardscape.

3.07 TOLERANCES

A. Finish grades of landscape areas shall be as required to ensure positive drainage as shown on Drawings and as acceptable to the District's representative.

3.08 FIELD QUALITY CONTROL

A. The District Representative shall review and accept work at the following stages:
   1 Topsoil removal and stockpile.
   2 Grading plan for project. Plan shall provide strategy for grading sequence for entire site at one time or by field. Limits and sequence shall be reviewed and coordinated.
   3 Cross ripping of subgrade shall be reviewed and observed.

END OF SECTION

SECTION 02221 EXCAVATION, BACKFILLING, AND COMPACTING

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation, and services to complete all excavation, trenching, backfilling, compaction, and related work as shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of all trenching, backfilling, and compaction is shown on the Drawings and may include, but is not necessarily limited to, the following:
1 Sanitary Sewer Line Installation
2 Storm Drainage System Installation
3 Potable Water Line Installation
4 Irrigation System Installation
5 Electrical Conduit Installation
6 Paving Installation

C. Related sections can include, but may not be limited to:
1 Section 01050 -Field Engineering
2 Section 01720 -Project Record Drawings
3 Section 02050 -Tree Protection
4 Section 02200 -Earthwork
5 Section 02520 -Portland Cement Concrete
6 Section 02539 -Sanitary Sewage Systems
7 Section 02700 -Storm Drainage
8 Section 02713 -Domestic Water Systems
9 Section 02810 -Irrigation
10 Section 02900 -Landscaping
11 Geotechnical Investigation by Construction Testing Services dated 12/02/05

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California Department of Transportation Standard Specifications, Current Edition

1.03 SUBMITTALS

A. Project Record Drawings:
1 Conform to requirements of Section 01720 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.
2 Accurately record locations of utilities remaining, re-routed utilities, new utilities, and newly discovered utilities by horizontal dimensions, elevations, inverts and slope gradients as practical.

1.04 QUALITY ASSURANCE

A. Control of Work: Comply with Section 5 of the Standard Specifications.

B. Control of Materials: Comply with Section 6 of the Standard Specifications.

C. Trench Safety: Comply with applicable portions of Sections 5 and 7 of the Standard Specifications and requirements of other agencies having jurisdiction (OSHA etc.).

1.05 SEQUENCING AND SCHEDULING

A. Refer to all other Contract Documents, determine the extent and character of related work, and properly coordinate work specified herein with that described elsewhere to produce a complete, operational installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide materials as described below free of debris, roots, wood, scrap material, vegetative matter, refuse, soft unsound particles, or other deleterious and objectionable materials.

B. Select Backfill: Select backfill material shall be sand conforming to Section 19-3.025B of the Standard Specifications.

C. Native Backfill: Native backfill shall be acceptable soil material excavated from the project site. This material will be considered unclassified and no testing other than for compaction will be required. Additional material required for backfill shall be acceptable to the District's Representative.

D. Permeable Material: Permeable material shall be Caltrans Class II permeable rock material.

E. Aggregate Base: Refer to Section 02230 – Base Courses.

PART 3 EXECUTION

3.01 PREPARATION

A. General:
   1 Prior to trenching, the contractor shall pothole existing utilities at locations indicated or implied on the plans, where new piping or utilities will cross existing utilities of uncertain depth to determine the elevation of the utility in question and ensure that the new line will clear the potential obstruction.
   2 The Contractor shall mark out all construction areas in white, non-permanent paint and contact Underground Service Alert (U.S.A.) (800-642-2444) to locate all known utilities a minimum 48 working hours prior to any excavation.
   3 Should an existing crossing utility present an obstruction, the proposed line shall be adjusted as acceptable to the District's Representative to clear the existing utility.

3.02 TRENCH EXCAVATION

A. General:
   1 Excavation shall include removal of all water and materials that interfere with construction. Remove any water which may be encountered in the trench by pumping or other methods prior to pipe laying, bedding and backfill operations. Trenches shall be sufficiently dry to permit proper jointing and compaction.
   2 It shall be the contractor's responsibility to direct vehicular and pedestrian traffic safely through or around the work area at all times.
   3 The contractor shall relocate, replace, reconstruct or repair, to an "as-was" or better condition, all surface or subsurface improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the construction activities. Except as specified in other Sections or shown in the Drawings, this provision applies to all surface improvements of whatever nature such as walls, fences, above-

grade utilities, landscaping, paving, structures, or other physical features whether shown in the Drawings or not and to all subsurface improvements such as utilities which may be indicated in the Drawings or marked in the field. The contractor shall connect such utilities to existing systems and leave all in a workable and operating condition. The cost of this work shall be considered as included in other items of work and no additional compensation will be allowed.

4 The maximum allowable trench width at the top of pipe shall be 18 inches greater than the pipe diameter.

5 New utility trenches extending deeper than 2 feet below finish grade should be located a minimum of five feet away from foundations.

B. Existing Paving Areas:

1 Existing asphalt concrete paving over new trenches shall be sawcut, removed, and legally disposed. Existing asphalt concrete paving shall be neatly sawcut one foot (1') greater on each side than the trench width. If a longitudinal pavement joint or edge of pavement is located within three feet of the limit of excavation, all intervening pavement shall be removed and replaced after completion of backfilling. If concrete curb and/or gutter are to be replaced, the adjacent existing asphalt concrete paving shall be sawcut two feet (2') from the edge of concrete curb and/or gutter.

2 Existing portland cement concrete paving over new trenches shall be sawcut to a minimum depth of 1-1/2 inches in straight lines either parallel to the curb or at 90 degree angles to the alignment of the sidewalk prior to being broken out. No section to be replaced shall be smaller than 30 inches in either length or width. If the sawcut would fall within 30 inches of a construction joint, expansion joint, or edge, or within 12 inches of a score mark, the concrete shall be removed to the joint, edge, or mark.

C. Walkway Areas: Backfill for trenches or other excavations within walkway areas should be compacted in six inch (6") maximum layers, unless otherwise noted, with hand-held tampers to assure adequate subgrade support.

D. Compacted Fill Areas: Where trenches must be excavated in compacted fill, these trenches shall be backfilled with the fill materials excavated and re-compacted in the layers and to the density specified for the particular area.

E. Open Trench:

1 No trench shall be left in an open un-protected condition at the end of the day. At the end of the day any open trench shall be protected in a manner acceptable to the District’s Representative.

2 Provisions for trench crossings and access shall be made at all street crossings, driveways, water gate valves, and fire hydrants unless otherwise acceptable to the District’s Representative.

F. Excavated Material:

1 All excavated material not required for backfill or of value to the District shall be removed and legally disposed of by the contractor at no additional cost.

2 Material excavated in streets and roadways shall be laid alongside the trench no closer than two feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.

3 Provisions shall be made whereby all storm and waste water can flow uninterrupted in gutters or drainage channels to drainage structures.

4 Excavated material shall not be stored on existing landscaping or paving without provisions being made to protect the surface below from being stained or otherwise adversely affected.

G. SHORING
1 Should excavations extend more than 4 feet below existing ground surface, shoring will be required.
2 Excavations can be sloped back to an inclination of 1.5 horizontal to 1 vertical as an option for shoring in these conditions.
3. Utility trenches shall be excavated according to accepted engineering practices following OSHA.

3.03 PIPE BEDDING

A. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be de-watered as necessary. The District's Representative shall determine the suitability of the trench bottom and the amount of sand, gravel, or crushed rock needed to stabilize the soft foundation.

3.04 TRENCH BACKFILL AND COMPACTION

A. General:
1 Construct backfill in two operations (initial and final).
2 Do not backfill where the foundation material in trench is already saturated, except as acceptable to the District's Representative. Provide a minimum cover as may be specified.
3 Where settling greater than the tolerance allowed for grading occurs in trenches and pits due to un-stable subgrade material, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.
4 For utilities under roads, streets, concrete slabs or other areas to be paved, place final backfill in 6-inch maximum loose lifts. Compact all backfill surrounding ducts, conduits, pipes and other structures, including the top 12-inches of subgrade to 95 percent of ASTM D1557 maximum density. Backfill to permit the rolling and compacting of the completed excavation with the adjoining material providing the specified density necessary to enable paving of the area immediately after backfilling has been completed.

B. Initial Backfill:
1 Prior to trench backfill, the condition of the trench and laying of pipe shall be acceptable to the District's Representative.
2 Select backfill material shall be used as initial backfill for all utilities except irrigation piping, unless otherwise noted. After the pipe has been properly laid and accepted by the District's Representative, select backfill material shall be placed on both sides of the pipe and compacted to the depth shown in the Drawings.
3 Compaction: The initial backfill material shall be hand tamped in layers not exceeding four inches (4") in uncompacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortional stress. After handtamping, the relative compaction of the initial backfill material shall be at least 95% relative compaction.

C. Final Backfill:
1 Native backfill material shall be used for final backfill, unless otherwise noted.
2 Compaction: Final backfill compaction shall be by mechanical means with backfill material placed in layers not exceeding six inches (6") in loose depth. Each layer shall be thoroughly compacted before succeeding layers are placed. The use of machine tampers, except manually held types, shall not be permitted. Final backfill shall be compacted to a relative compaction of 95% for paving areas. In planting areas, provide

acceptable topsoil to required depth compacted to 85% to 89% maximum relative compaction.

D. Jetting: No jetting shall be allowed.

3.05 TRENCH SURFACING

A. General
1 In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench.
2 All backfill shall be flush with adjoining grade in a firm, unyielding position with no visible settling for a period of one year after Final Acceptance.

B. Paved Areas
1. Temporary surfacing acceptable to the District's Representative shall be laid within one day after backfilling (except where the contractor elects to place permanent surfacing within this time period) until permanent paving is installed.

END OF SECTION

SECTION 02230 BASE COURSES

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all base course preparation, installation and related work as shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the base course work is shown on the Drawings and may include, but is not necessarily limited to, the following:
   1 Grading and compaction of subgrade soil for areas to receive pavement, structures, base material, etc.
   2 Furnishing and placing of aggregate base material.

C. Related sections can include, but may not be limited to:
   1 Section 01050 -Field Engineering
   2 Section 02200 -Earthwork
   3 Section 02520 -Portland Cement Concrete

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California Department of Transportation Standard Specifications, Current Edition

1.03 QUALITY ASSURANCE

A. Control of Work: Conform to Section 5 of the Standard Specifications.

B. Control of Materials: Conform to Section 6 of the Standard Specifications.

1.04 SUBMITTALS

A. Conform to the requirements of Section 01300 and/or applicable Division One and Division Two Specifications, General Conditions and Special Provisions.

B. Submit material certificates of compliance and/or sieve analyses for all products and materials proposed to be used in work covered by this Section.

1.05 PROJECT/SITE CONDITIONS

A. Wet Conditions: No subgrade preparation or base material placement shall occur when excessively wet conditions exist in the opinion of the District’s Representative.

B. Dry Conditions: Contractor shall provide dust control in conformance with Section 10 of Standard Specifications and shall provide water to subgrades and base courses as necessary to achieve compaction goals.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be stockpiled on site in locations that, in the opinion of the contractor, cause least interference with construction operations and as acceptable to the District's Representative.

B. Materials shall not be stockpiled in proposed planting areas.

C. Protect materials from segregation, contamination and wind and water erosion.

1.07 SEQUENCING AND SCHEDULING

A. Work of this section shall not proceed until all underground utilities and irrigation sleeving has been installed and accepted.

B. Contractor shall schedule work so that installation of paving/surfacing occurs no later than five (5) working days after placement and proper compaction of base materials. Base materials left un-paved longer than this time period shall be subject to testing and re-compaction at the contractors expense.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate Base: Aggregate base shall be Class 2, 3/4" maximum material conforming to Section 26-1.02A of the Standard Specifications. No recycled materials will be accepted.

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

A. Preparation of subgrade shall conform to Section 6 of the Standard Specifications.

B. Remove unsuitable subgrade material as necessary and replace with suitable material or aggregate base per the discretion of the District's Representative.

C. Scarify to a depth of 12 inches and moisture conditioned and compacted. Moisture conditioning shall be between 2 and 4 percentage points above the optimum moisture content and recompacted.

D. Compaction: Compact subgrade areas as follows unless otherwise noted:
   1 Areas to be paved: Maximum eight inch (8") lifts to at least 90% relative density. The top 12" shall be compacted to at least 95 percent relative compaction.
   2 Additional lifts should not be placed if the previous lift did not meet the required density, relative compaction, moisture content or if the soil conditions are not stable.
   3 All fill soils shall be compacted to no less than 90% relative compaction at moisture content of 2 to 4 percent for pavement area.
   4 Compacted subgrade should be non-yielding under construction traffic, including a loaded ten-wheel truck such as a water or dump truck, in all

pavement areas. Removal and subsequent replacement of some material (i.e. areas of excessively wet materials, unstable subgrade, or pumping soils) may be required to obtain the minimum 95 percent compaction to the recommended depth of 12 inches.

E. In areas other than the upper one foot of finished in turf areas and the upper one foot of finished subgrade in vehicle traffic pavement areas, the soils shall be compacted to at least 90 percent relative compaction.

F. Subgrade preparation for pavement areas shall extend laterally for at least two feet beyond the edge of pavement.

G. This scope of work is not for landscape or planting areas unless otherwise noted.

3.02 BASE MATERIAL PLACEMENT

A. Conform to Section 26 of the Standard Specifications.

B. Obtain acceptance of subgrade preparation work prior to placing base material thereon.

C. Place and compact base material in six inch (6") maximum lifts unless otherwise noted. Compaction shall be at least 95 percent relative compaction.

D. Base material shall be moisture conditioned to between optimum and 3 percent above optimum prior to placement and compaction.

3.03 TOLERANCES

A. Conform to Section 26 of the Standard Specifications.

3.04 CLEAN-UP OF WORK AREA

A. The contractor shall remove and legally dispose of excess materials/spoils and debris from the job site on a daily basis.

3.05 PROTECTION OF FINISHED PRODUCT

A. The contractor shall provide lighted barricades, signs and other devices as necessary to prevent damage to finished base courses.

END OF SECTION

SECTION 02317 TRENCHING FOR SITE ELECTRICAL WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building .

1.02 REFERENCES

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 1997.

B. ASTM D 698 - Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 1991 (Reapproved 1998).

C. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 1990 (Reapproved 1996).

D. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 1991 (Reapproved 1998).

E. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994.

F. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System); 1998.

G. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1996.

H. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1996.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: as noted on drawings.

1.04 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Compaction Density Test Reports.

1.05 PROJECT CONDITIONS

A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.
   1 Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2 Prevent contamination.
   3 Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, underground utilities, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.
   1. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.

B. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
   1. Grade in accordance with ASTM D 2487 Group Symbol SW.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

3.02 TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter which could damage piping or impede consistent backfilling or compaction.

G. Remove excavated material that is unsuitable for re-use from site.

H. Remove excess excavated material from site.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 ft (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.
   1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:
   1 Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
   2 At other locations: 95 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

3.05 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Utility Piping, Conduits, and Duct Bank:
   1 Bedding: Use sand.
   2 Cover with sand.
   3 Fill up to finish grade elevation with general fill.
   4 Compact in maximum 6 inch lifts to 95 percent of maximum dry density.

3.06 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

3.07 FIELD QUALITY CONTROL

A. See Section 01410 - Testing and Inspection, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: as determined by inspector.

3.08 CLEAN-UP

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 02520 PORTLAND CEMENT CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation, and services to complete all concrete and related work as shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the concrete work is shown on the Drawings and may include, but is not necessarily limited to the following:
   1 Seatwalls, Retaining walls
   2 Valley Gutters
   3 Mowbands and Edge bands
   4 Accessible Ramps
   5 Flatwork, Slabs and Walkways
   6 Expansion, Deep Score and Score Joints
   7 Misc. Footings

C. Related sections can include, but may not be limited to:
   1 Section 01300 - Submittals
   2 Section 02200 - Earthwork
   3 Section 02230 - Base Courses
   4 Section 02700 - Storm Drainage
   5 Section 02810 - Irrigation
   6 Section 02870 - Site Furnishings
   7 Section 02900 - Landscaping

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California Department of Transportation Standard Specifications, Current Edition

1.03 SUBMITTALS

A. Conform to Section 01300 and applicable Division One and/or Division Two specifications, General Conditions and Special Provisions.

B. Submit cut-sheets, mill certificates, certificates of compliance etc. for all products proposed for use on the project.

1.04 QUALITY ASSURANCE

A. Concrete
   1 Conform to Section 01400 Quality Control (as applicable).
   2 All formwork, joint patterns, base material, reinforcement and other miscellaneous items such as “dobies” and ties shall be reviewed and accepted by the District’s Representative prior to pouring concrete. Contractor shall have

any and all such items in place and shall give a minimum of two (2) working day lead-time notice to District's Representative when scheduling the review request. Contractor shall also schedule and allow a minimum of two (2) working days after review for possible modifications to concrete preparation work, at no cost or delay to the project.

3 The District's Representative shall at all times have access to any off-site batch plant or quarry supplying materials for subject project and trucks en route to the project site. The District's Representative may at any time request slump tests and secure samples of concrete, cement, aggregates or other materials. All applicable materials shall be provided by the contractor at no additional cost to the District.

4 Any specified review or observation by the District's Representative of the concrete work shall be requested by the contractor at least two (2) working days prior to the need for the review or observation.

5 Finishes and colorants other than the concrete darkening agent (see Part 2 Products) are called out in the Drawings. A four foot by four foot (4' x 4') sample of all concrete colorants (including concrete darkening agent) and finishes shall be poured by the contractor in the field for review and acceptance by the District's Representative. Sample shall include all joints, finishes and tooled conditions for approval. Contractor shall schedule review well in advance of concrete operations to allow for color and/or finish modifications if necessary.

6. Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified:
   a. Uniform Building Code, current edition
   b. Part 2, Chapter 26, Title 24, C.C.R.
   c. ACI 301 Specifications for Structural Concrete for Buildings
   d. ACI 318 Building Code Requirements for Reinforced Concrete
   e. ACI 614 Recommended Practice for Measuring, Mixing, and Placing Concrete
   f. Concrete Reinforcing Steel Institute, A Manual of Standard Practice

7 Concrete Testing Service: The District may retain and engage a testing laboratory to perform material evaluation tests.

1.05 DELIVERY AND STORAGE

A. Deliver concrete reinforcement to job site properly tagged and ready to set. Store above ground surface on platforms, skids, or other supports. Coordinate delivery and storage of all other materials as appropriate.

PART 2 PRODUCTS

2.01 CONCRETE MATERIALS

A. Concrete shall be Portland Cement Concrete conforming to Section 90 of the Standard Specifications. Unless otherwise specified, all concrete shall be Class B at a minimum.

B. Cement shall be Type II cement conforming to ASTM Designation C150 as modified by Section 90 of the Standard Specifications.

C. Mortar shall conform to Section 51 of the Standard Specifications. Mortar, when used for patching, shall match the color of the work to be patched.

D. Water used for mixing shall be potable.

E. Minimum mix requirements: It shall be the contractor's responsibility to design the concrete mixes to provide the minimum requirements listed below. Increase cements content over that listed if necessary to obtain the specified compressive strength. Minimum ultimate compression strength of concrete at 28 days is as follows:

Item	Strength	Max. slump	Size of aggregate	Cement (# of 94 lb. sacks per yard)	W/C Ratio
Slab-On-Grade	3,000	4"	3/4"-1"	5	.60
Walls/Footings	3,000	4"	3/4"-1"	5	.60
Thrust Blocks	2,500	4"	3/4"-1'	4.5	.45

2.02 OTHER MATERIALS

A. Formwork materials shall be surfaced lumber, plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide from material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection, and as follows:

1 All form panels shall be placed in a neat, symmetrical pattern, subject to the acceptance of the District's Representative.

2 Form clamps or bolts shall be used to fasten forms. The use of ties consisting of twisted wire loops to hold forms in position during the placing of concrete shall not be permitted unless noted otherwise.

3 All exposed sharp edges shall be bullnosed to prevent mortar runs and to preserve smooth, straight lines, unless otherwise acceptable to the District's Representative or noted in the Drawings.

4 Before concrete is placed in forms, all inside surfaces of forms which will later be removed shall be thoroughly coated with commercial quality form oil, which will permit the ready release of the forms and will not discolor the concrete.

5. Where form panels are attached directly to the studding or joists, the panels shall be not less than five-eighths of an inch (5/8") thick, and the studding, or joists, shall be spaced not more than twelve inches (12") center to center.

a. Form panels less than five-eighths of an inch (5/8") thick, otherwise conforming to the requirements specified, may be used with a continuous backing of surfaced material three-fourths of an inch (3/4") thick.

b. Form panels more than five-eighths of an inch (5/8") thick attached to studding or joists spaced at more than twelve inches (12") center to center may be used, provided that the deflection of the panel between studding or joists does not exceed that of a five-eighths inch (5/8") thick panel attached to studding or joists spaced at eighteen inches (18") center to center.

6 Curved surfaces shall be formed with timber, plywood, masonite, or sheet metal as appropriate. Sheet metal shall have masonite or plywood backing. Plywood

for forming shall be ACX or better grade.

B. Expansion Joints:
   1 Joint primer: Sonneborn horizontal paving joint primer No. 733, or No. 766, one component solvent based primer or acceptable equal.
   2 Key Kold joint: Burke or approved equal
   3 Expansion joint: One-half inch (2") asphalt impregnated fiber strips in compliance with ASTM D1751 or acceptable equal. Expansion joint material shall be variety with zip-strip H-channel joint sealant receptacles. If proposed joint material is not installed with sealant receptacles then, the expansion joint material shall be completely covered with a Sonneborn Sonofoam closed cell backer rod or acceptable or equal prior to application of joint sealant. Provide three eighth inch (3/8") tooled edges each side of joint material. Refer to Drawings for additional information.
   4 Expansion joint sealant: Self leveling sonolastic elastomeric polyurethane joint sealant in accordance with Federal Specification TT-S-00227E, Type I, Class A-Sonneborn SL-2, (800) 433-9517, or acceptable equal. Color shall match concrete. Sonneborn products are available through the Cade Co. San Jose, CA (408) 292-3435.

C. Score Joints:
   1. Score joints: Shall be three eighth inch (3/8") radius tooled joints to a one inch (1”) depth.

D. Reinforcing bars: Comply with Section 2603 (f) and 2528 (b), Title 24, C.C.R. and ASTM A-615. Grade 60, deformed, except #3 and smaller may be Grade 40. Test in accordance with Sec. 2628, Title 24, C.C.R. Bars shall be in a new, first-class condition.

E. Smooth Dowel Steel Bars for Expansion Joints: ASTM A-29, #3 smooth Grade 40. Provide as indicated on drawings. Where shown, provide metal dowel sleeve at one end of dowel (or other approved break-bond method), to permit lateral movement at dowel within concrete section. Provide for movement with equals joint width plus one-half inch (2"). Bars shall be in a new, first-class condition.

F. Tie Wires: Black annealed, ASTM A-82, minimum 16 gauge.

G. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, support and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying district CRSI specifications, unless otherwise acceptable.

H. Concrete Darkening Agent: Add one quarter pound (1/4 lb.) of Davis Colors Inc. colorant #8084 Black (or acceptable equal) per 94 lb. sack of cement to all exterior concrete which will be exposed to view when cured (Drain rims and concrete receiving other colorants excluded). Contact Davis Colors Inc. for local distribution information Ph.: (800)-800-6856 Fax: (213)-269-1053. Other colorants shall be as noted in the Drawings.

I. No admixtures will be allowed without prior acceptance by the District’s Representative.

J. Skate Blocks: Shall be from Ravens Forge Skateboard Solutions. Flat Bar design model number FB1.0R

PART 3 EXECUTION

3.01 EXCAVATION

A. In addition to the general grading excavation required, the contractor shall excavate to the required depths in the locations shown for flatwork, retaining walls, curbs, footings, etc. Excess excavation shall be replaced with concrete poured monolithically with the wall or pavement, at no additional cost to the District.

3.02 FORMING

A. All forming shall conform to Section 51 of the Standard Specifications and as follows:

1 The Contractor shall build forms with a high degree of care and shall select from materials of adequate strength and smoothness to produce smooth, even surfaces of uniform texture and appearance, free of bulges, depressions, or other imperfections per the discretion of the District's Representative. Remove any residue remaining on concrete after forms are removed.

2 Concrete walls are to be vibrated as necessary to provide uniform density. No concrete surfaces with rock pockets or honeycombing shall be accepted.

3 Transition of curves to straight lines and of curves to curves shall be formed as smooth, continuous, and uninterrupted with typical 90 degree radius alignment at the points of tangency.

3.03 CONCRETE CONSTRUCTION

A. All concrete shall be mixed in accordance with Section 90 of the Standard Specifications.

B. Construction of concrete substructures shall conform to applicable provisions of Section 51 of the Standard Specifications.

C. Construction of concrete curbs, gutters, sidewalks, wheelchair ramps, and driveway aprons shall conform to Section 73 of the Standard Specifications.

D. At the termination of all curbs, the final eighteen inch (18") length of curb shall be tapered from the full curb height to the gutter flow line or adjacent pavement elevation unless noted otherwise on the plans.

E. Where new concrete is poured in more than one pour, adjacent pours shall be dowelled together.

3.04 CONCRETE JOINTS

A. Joints shall be constructed at locations indicated and as detailed in the Drawings.

B. Construct concrete joints as follows:

1. Expansion Joints:

a. General. Refer to drawings for location and type expansion joints.

b. Install to full depth of slab per drawings and manufacturers instructions.
c. Key kold joints – install per manufacturers recommendations and joints shall not be covered with concrete. Tool joint to remove concrete from edge of metal.
d. Fiber expansion joints - After allowing concrete to fully cure, remove zip strips and install expansion joint sealant. Expansion joint sealant. Install per drawings and manufacturers instructions.

2. Score Joints: Refer to drawings for locations.

C. Curb and edge band joint locations – unless otherwise noted on plans
1 Every five feet for score joints
2 Install fiber expansion joints fifteen feet maximum.
3 Align score and fiber expansion joints with proposed fence posts.
4 Install fiber expansion joints at all corners, beginnings and endings of radii.

3.05 EDGING

A. All edges of slabs, curbs, and other structures shall be tooled with a one inch (1") radius edging tool, unless otherwise specified in the Drawings.

B. All trowel marks resulting from tooling of edges shall be carefully trowelled out.

3.06 REINFORCEMENT

A. Reinforcement installation shall conform to the provisions of the Standard Specifications as follows:
1 Cleaning -Section 51-1.05
2 Bending -Section 52-1.06
3 Placing -Section 52-1.07
4 Splicing -Section 52-1.08
5 Lapped Splices -Section 52-1.08A

3.07 CONCRETE PLACEMENT

A. Concrete placement shall conform to Section 40 of the Standard Specifications.

B. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other acceptable means shall be used to prevent segregation.

3.08 SURFACE DRAINAGE

A. Finish surfaces shall drain properly with no areas of standing water. Tops of curbs, walls and foundations shall be level unless otherwise specified.

3.09 CURING

A. All newly placed concrete shall be cured in accordance with the provisions in Section 90 of the Standard Specifications.

3.10 PROTECTION

A. All newly placed concrete shall be protected in accordance with the provision in Section 90-8 of the Standard Specifications.

B. Provide all necessary security to protect the concrete from vandalism. Any concrete which is defaced or damaged during the course of this contract shall be replaced by the Contractor at no additional cost to the District.

3.11 CONCRETE FINISHES

A. Patching of concrete to repair or disguise flaws, imperfections or other damage, shall commence only with the acceptance of the District's Representative. Patching color and finish shall conform to the original adjacent concrete color and finish and the District's Representative shall be the sole judge in this respect. Any patching of concrete walls must occur prior to final wall finishing.

B. Provide concrete finishes where shown in the Drawings and as follows:
   1 Trowel Finish: Trowel finish shall be smooth and clean with no obvious trowel marks.
   2 Broom Finish: Broom with medium bristled broom to a uniformly roughened surface. Heavy broom finish for all ramps that exceed 6%. Finished surface shall be clean with uniform and straight lines.
   3 Light Sandblast Finish: Finished surface shall be a light sand finish with little or no aggregate exposed.
   4 Provide samples, as previously specified, of all concrete finishes for review and acceptance prior to pouring concrete. All accepted samples shall be left on Job site as quality control examples until removal and disposal of samples is acceptable to the District's Representative.

3.12 BUILT-INS

A. Refer to drawings for additional information relating to built-ins that shall be coordinated with concrete work (e.g., light fixtures, benches, handrails, guardrails, site furnishings, signs, etc).

B. Skate Blocks: Install per manufacturer as indicated on drawings.

3.13 CLEANING

A. Remove excess base material, concrete spills, cement stains and all other excess materials from all project areas prior to Final Acceptance.

3.14 TOLERANCES

A. Concrete
   1 Vertical deviation from specified grades shall not exceed 0.04 foot.
   2 Surface smoothness deviations shall not exceed 1/8 inch in 8 feet, in any direction.
   3 Thickness shall not be more than 0.01 foot less than planned thickness at any point.

END OF SECTION

SECTION 02540 SYNTHETIC TURF PLAYING FIELD

PART 1 GENERAL

1.01 SUMMARY

A. It shall be the responsibility of the successful contractor to provide all labor, materials, equipment and tools necessary for the complete installation of the drainage, grading, quarry fines, coarse drainage stone, underdrains, and composite base. The synthetic turf material and installation is bid separately and is not included as part of this contract. Coordination of installation of the composite base with installation of the synthetic turf system shall be included in this scope of work.

B. Related sections include, but may not be limited to:
   1 Section 01070 – Conformance Survey
   2 Section 02200 – Earthwork
   3 Section 02700 – Storm Drainage

1.02 JOB CONDITIONS

A. Contractor shall be responsible for stabilizing all top of subgrade elevations for the synthetic turf areas prior to receiving the porous composite material base and for executing any fine grading as may be necessary or incidental to placement of the synthetic turf.

B. Playing field subgrade preparation shall be complete and approved by the District's representative prior to commencement of Work under this Section.

C. Prevent surface water and subsurface or groundwater from flowing into excavations and flooding project site and surrounding area. Do not allow water to accumulate in excavations. Remove water to prevent softening of sub grades.

1.03 QUALIFICATIONS AND SUBMITTALS

A. The contractor shall be required to submit information from the synthetic turf installer and/or manufacturer that complies with the following:
   1 The successful contractor must provide competent workmen skilled in this specific type of porous composite base installation. The designated Supervisory personnel on the project. The porous composite base manufacturer shall have a representative on site to certify the installation and warranty compliance.
   2 The installation foreman of the porous composite base must have installed at least two (2) fields in the last two (2) years of the specified material.
   3 Contractor must have installed at least (2) outdoor installations of 80,000 square feet or more.

1.04 SUBMITTALS

A. Submit product data on pipe accessories and filter fabric.

B. Submit manufacturer's installation instructions.

C. Certification: Submit five (5) copies of certification signed by Contractor and drainage

system Installer that installed materials conform to specified requirements and system was successfully checked and tested prior to covering with drainage sand or gravel aggregate.

D. Submit one sample of composite base material to District Representative.

E. Submit conformance survey of field subgrade.

1.05 MATERIAL TESTING

A. Testing of proposed base rock will be performed in the following steps:
1. *Pre-construction Testing:* Contractor shall submit one quart composite of any subdrain trench or quarry fines material. The District's testing agent will evaluate these materials ASTM C136 and ASTM D75 testing protocol as a guideline. This representative sample will be used for comparison with all subsequent samples submitted for acceptance during construction.

C. Payment for initial material testing is the responsibility of the District. Any test, which must be repeated on materials that have failed to meet specifications or are as a result of shortages, will be borne by the Contractor.

C. The testing reports shall initially be submitted to the Architect for approval ten (10) calendar days prior to scheduled placement on the playing fields.

D. The Contractor shall include the following items:
1 Identification of proposed source and supplier.
2 Current lab mechanical analysis of the proposed stone using ASTM standards for sieve analysis.
3 Sample sizes as determined by the District.
4 Certification that the supplier can deliver the total quantity of material needed to complete the project in a timely manner.

E. All field base stone must come from one supplier only. During construction, samples may be taken in the field and analyzed periodically by the District to assure strict compliance with the specifications. The rock shall be sampled at the source. Material delivered to the site not meeting specifications shall be rejected by the District. All material rejected by the District shall be removed from the site at the Contractor's expense.

1.06 PROJECT RECORD DOCUMENTS

A. Accurately record location of pipe runs, connections, cleanouts and invert elevations.

1.07 DISTRICT'S TESTING AGENT

A. To be determined.

B. The District reserves the right to change testing laboratories if the need arises.

1.08 WARRANTY

A. All engineering base materials and workmanship shall be guaranteed for a period of one year commencing at the date of the Notice of Project Completion.

B. The Contractor shall submit its Manufacturer's Warranty commencing at the date of the Notice of Project Completion. The warranty coverage shall not be prorated nor limited to the amount of the usage.

PART 2 MATERIALS

2.01 SYNTHETIC INFILL TURF

A. As supplied by the owner in this section.

2.02 MANUFACTURED POROUS CLOSED CELL COMPOSITE UNDERLAYMENT MATERIAL

A. Shall be a manufactured porous closed cell composite underlayment material (0.9 inch thickness). Approved product is BROCK. Contact name is Dave Brown, ph: (805) 683-3505.

2.03 SUBDRAIN TRENCH DRAIN ROCK

A. Shall be ¾" X ½" crushed drain rock that meets the following criteria:

Mesh Size	% Passing
¾"	100
5/8"	100
½"	90-100
3/8"	70-90
#4	25-40
#8	15-30
#30	5-15
#50	0-7
#200	0-3

B. The subdrain trench rock profile will extend from the bottom of the trench to the top of the quarry fines layer, extending laterally to both edges of the subdrain trench.

C. The trench rock shall be angular in nature and no "smooth/round" rock to be accepted or placed.

2.04 ENGINEERED BASE MATERIAL

A. Under this base design, Quarry Fines (or commonly called crusher fines) shall be

crushed aggregate that conform to Caltrans Test Methods #202 and 217. Gradations shall be consistent with the following:

%PASSING

Sieves	Top Stone
¾"	100
5/8"	100
½"	100
3/8"	90-100
#4	70-90
#8	30-70
#16	25-60
#30	20-30
#50	10-30
#100	10-20
#200	0-10

B. Closed Cell Porous Composite: Brock (0.9 inch thick pad). Contact is Dave Brown, Brock USA Western Sales Manager, phone no. (805) 683-3505.

2.04 GEOTEXTILE FABRIC

A. Woven geotextile (Separation Fabric) placed on the subgrade shall conform to the following specifications.

Mechanical Properties Test Method Unit Minimum Ave. Roll Value

Wide width tensile strength ASTM D4595 lbs/in 100(MD), 120(CD) Grab tensile strength ASTM D4632 lbs 200(MD), 200(CD) Grab tensile elongation ASTM D4632 % 15(MD), 10(CD) Trapezoid tear strength ASTM D4533 lbs 75(MD), 75(MD) Mullen burst strength ASTM D3786 psi 400 Puncture strength ASTM D4833 lbs 90 Apparent opening size ASTM D4751 mm 0.300 Permittivity ASTM D4491 sec^{-1} 0.05 Flow rate ASTM D4491 $gal/min/ft^2$ 5.0

2.05 SYNTHETIC TURF EDGE CONNECTIONS

A. Synthetic turf edge connections to concrete shall be glued to the concrete edgeband. Refer to details for additional information.

2.06 DRAINAGE ELEMENTS

A. Refer to Specification Section 02700 for all in-field drainage elements.

PART 3 EXECUTION

3.01 SUBGRADE AND PREPARATION

A. Contractor shall verify that subgrade has been prepared according to specification with regard to compaction, grade tolerances and is free of debris, non-compactable material, topsoil, or organics prior to beginning work.

B. Top of subgrade elevations shall be verified on a 25-foot grid using laser-operation survey instruments. Grades must be within ½ " plus or minus from the elevations shown on the plans. In addition, no point within the 25-foot grid deviates more than ¾ " from any other point within the 25-foot grid.

C. Prior to acceptance of the subgrade, a conformance survey will be prepared by the Contractor. The Contractor will be responsible to provide a certified conformance survey prepared by a Licensed Surveyor. The survey shall be based on a 25 foot grid showing the field crown, the center of the subgrade elevation of the subdrain trench edges, and the perimeter of the field. The Architect shall be provided 2 working days to review and respond to the Conformance Survey. Any portion of the survey that does not conform to the requirements identified above in item 3.01-B will be corrected by the Contractor. Areas out of conformance will be resurveyed (following the identical procedure stated above) by the Surveyor, and these revised points shall be added to the original digital file for review and acceptance by the Architect. All delays and costs incurred due to grades out of conformance are the sole responsibility of the Contractor. At any point during construction following acceptance of the subgrade by the Owner, the Owner reserves the right to recheck the subgrade to verify it is still in conformance. It is the Contractor's responsibility to protect the grading and compaction tolerances of the subgrade after conformance survey is complete and prior to installation of permeable rock material.

D. The geotextile filter fabric shall be installed over the compacted and prepared subgrade, as shown on the plans, without disturbing grades.

3.02 PLACING THE QUARRY FINES BASE

A. The quarry fines must be laid without damaging the soil bed. It is very important to not create any depressions with heavy equipment. The specified stone or aggregate supplied must conform to the recommended specifications. The quarry fines shall be installed on top of the compacted subgrade in a single compacted lift. Contractor to complete compaction and fine grading operation by manually screeding the entire rock surface. The finished quarry fines supplied must be stable and unyielding.

B. The quarry fines shall <u>not</u> be spread over the top of the subdrain trenches as shown on the plans. Subdrain trenches (this includes area extending above the trench to the backing of the synthetic turf) shall be free of the quarry fines and shall only consist of the geotextile fabric, subdrain trench drain rock, and perforated subdrain pipe, as shown in the Construction Drawings.

C. Excess water shall not be applied during installation of rock base and rough grading due to the potential of softening the subgrade and altering the grading.

D. Quarry fines and subdrain trench rock shall be smoothed and compacted uniformly to design grades by alternating raking, water settling, and rolling operations. The stone base shall be a uniform thickness, and shall be compacted to 93% relative compaction.

E. The quarry fines and subdrain trench rock grades shall not vary from the specified grades more than one-quarter of one inch (¼") in ten feet (10') when measured in any one direction.

F. The system shall remain for a minimum of 21 days and recompacted prior to an acceptance of the base, conformance survey is prepared by the Contractor. Refer to Section 01070 for conformance surveying requirements.

G. The turf manufacturer and installation subcontractor must accept the base prior to the installation of the closed cell composite system.

3.03 INSTALLATION OF MANUFACTURED BASE MATERIAL

A. Closed Cell composite shall be installed per the Contract Drawings and in strict compliance with the manufacturer's installation instructions. Contractor to exercise extreme care in order to avoid disturbing the compacted stone base.

B. The BROCK system must be laid without damaging the rock fines bedding. It is very important to not create any depressions with heavy equipment.

3.04 INSTALLING THE SYNTHETIC TURF

A. The turf manufacturer and installation subcontractor must accept the aggregate base prior to the installation of the porous composite base material and synthetic grass system.

END OF SECTION

SECTION 02582 UNDERGROUND ELECTRICAL STRUCTURES PART 1 GENERAL

1.01 SECTION INCLUDES

A. PVC Non-metallic Conduit and Ducts

B. Underground pull boxes

C. Accessories

1.02 REFERENCES

A. ASTM C 858 - Underground Precast Concrete Utility Structures.

B. ASTM C 891 - Installation of Underground Precast Utility Structures.

C. ASTM C 1037 - Inspection of Underground Precast Utility Structures.

D. NEMA TC 6 - PVC and ABS Plastic Utilities Duct for Underground Installation.

E. NEMA TC 9 - Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

F. NEMA TC 10 - PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.

G. NEMA TC 14 - Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings.

H. UL 651A - Type EB and A PVC Conduit and HDPE Conduit.

1.03 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for nonmetallic conduit and manhole accessories.

C. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast pullboxs, vaults, and pullboxes. Shop drawings shall include reinforcements for conduit openings and stamped by a registered structural engineer.

D. Field Samples: Provide sample of actual plastic duct delivered to site, two each 2 feet long.

E. Project Record Documents: Record actual routing and elevations of underground conduit and duct, and locations and sizes of pullboxes.

F. Shop drawings of manhole, vault, and pullbox covers complete with nameplate schedule.

1.04 QUALITY ASSURANCE

A. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 CONDUIT AND DUCT

A. Plastic Utilities Duct: NEMA TC 6; PVC Type DB.
   1 Duct Fittings: NEMA TC 9.
   2 Product: Carlon P&C Duct or approved equal.
   3 Plug fittings with pull tab.
   4 Nominal size: Six (6) inches for electrical conduits, or as shown in drawings.

B. Plastic Communications Duct and Fittings: NEMA TC 10, Type DB.
   1 Product:Carlon P&C Duct or approved equal.
   2 Plug fittings with pull tab.

3 Nominal size: Four (4) inches for telecommunication conduits, or as shown in drawings.

2.02 UNDERGROUND PULLBOXES

A. Manufacturers: Jensen Pre-cast, Christy Concrete Products, BES Concrete Products

B. Sizes: 17" (width) x 30"(length) x 24"(depth), (Minimum Dimensions)

C. Pullboxes shall be precast concrete as indicated on plans.
   1. Traffic Box - High density reinforced concrete box with non-setting shoulders positioned to maintain grade and facilitate back filling. Utility boxes shall be used where shown on the drawings. Use steel checker plate, H/20 loading, bolt down. Provide 12" extension piece.

2.03 ACCESSORIES

A. Underground Warning Tape: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines. Orange colored tape with suitable warning legend will describe buried telecommunications lines.

B. Duct spacers shall be Wunpeece, Carlon Snap-Loc or equal. Spacers shall be provided with rebar holder.

C. Ground Rod - 3/4" x 10' minimum, copper clad. Blackburn, Erico, or equal.

D. Grounding Electrode Conductor - # 1 bare copper conductor minimum.

E. Pullrope - 3/16" dia. min., 150 lbs test, yellow nylon

F. Duct Plugs - removable, reusable, plastic plugs. Watertight, airtight, and gastight with provisions for pullrope attachments.

PART 3 EXECUTION

3.01 EXAMINATION

A. Duct bank routing is shown in approximate locations unless dimensions are indicated. Route as required to complete duct system. Verify routing and termination locations of duct bank prior to excavation for rough-in.

B. Manhole locations are shown in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system. Verify locations of manholes prior to excavating for installation.

3.02 DUCT BANK INSTALLATION

A. Layout
   1 Duct bank routing shown in the drawings is approximate. Exact conduit routing shall be determined with close coordination with Project Manager. Account for existing field conditions, and new field conditions in coordinating the final routing of duct banks.
   2 Conduct exploratory excavation sufficiently ahead so that any obstacles can be determined pre-hand, and mediated sooner to make necessary offsets and bends around existing obstacles.

B. Depth and Clearances
   1 Install power and communications duct to locate top of ductbank minimum 36 inches below finished grade.
   2 Install duct with minimum slope of 4 inches per 100 feet (0.33 percent). Slope duct away from building entrances and to manholes where possible.

3 Underground conduits shall be as specified PVC for electrical and telecommunications. PVC Coated rigid steel conduit shall be used in areas crossing steam piping, minimum 3 feet length on either side of steam piping. Maintain a minimum of 3 feet clearance between steam or hot water piping and electrical conduits.

C. Installation
1 Install conduits as recommended by manufacturer using approved couplings, fittings, and cement.
2 Cut duct square using saw or pipe cutter; de-burr cut ends.
3 Insert duct to shoulder of fittings; fasten securely.
4 Join nonmetallic duct using adhesive as recommended by manufacturer.
5 Wipe nonmetallic duct dry and clean before joining. Apply full even coat of adhesive to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
6 Install no more than equivalent of three 90-degree bends between pull points for power.
7 Install no more than equivalent of two 90-degree bends between pull points for tel/com.
8 Provide suitable fittings to accommodate expansion and deflection where required.
9 Terminate duct at manhole entries using end bell.
10 Stagger duct joints vertically in concrete encasement 6 inches minimum.
11 Use suitable separators and chairs installed not greater than 4 feet on centers.
12 Band ducts together before backfilling.
13 Securely anchor duct to prevent movement during concrete placement.
14 Provide minimum 4 inch concrete cover at bottom, top, and sides of ductbank.
15 Connect to existing concrete encasement using dowels.
16 Connect to manhole wall using dowels.
17 Provide suitable pull string in each empty duct except sleeves and nipples.
18 Immediate after backfilling and compaction swab ducts. Draw a testing mandrel not less than 12 inches long with a diameter 1/4" less than the interior diameter of the conduit through each conduit. Then draw a stiff wire bristle brush and size to match conduit diameter until conduit is clear of all particles of earth, sand, and gravel. Use suitable duct plugs to protect installed duct against entrance of dirt and moisture.
19 Interface installation of underground warning tape with backfilling. Install tape 12 inches above concrete envelope.

3.03 UNDERGROUND PULLBOX INSTALLATION

A. Install and seal precast sections in accordance with ASTM C 891.

B. Install pullboxes plumb.

C. Use precast neck and shaft sections to bring pullbox cover to finished elevation. Refer to grading plans for finished elevations.

D. Attach cable racks to inserts after pullbox installation is complete.

E. Provide crushed rocks min 6" in bottom of pullboxes for proper drainage or install drains and connect to closest site drainage system.

F. Install two ground rods, one on each opposite corners. Ground rods shall project 6" above pullbox floor.

G. Knock-out a 2" diameter hole in sump area of pullbox.

H. Clean pullbox of any debri prior to substantial completion. Drain pullbox of water.

END OF SECTION

SECTION 02633 MANHOLES, FRAMES AND COVERS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Prefabricated manholes for storm and sanitary sewers.

B. Cast iron frame and cover.

C. Pipe connections.

D. Cast-in-place or prefabricated base.

1.02 RELATED SECTIONS

A. Section 02324 – Trenching; Section 02539 Sanitary Sewer Systems

B. Section 02630 – Storm Drainage

C. Section 02765 – Site Concrete; Section 03200 – Concrete Reinforcement

1.03 REFERENCES

A. ASTM A48 – Specification for Gray Iron Castings.

B. ASTM C150 – Specification for Portland Cement.

C. ASTM C478 –Specification for Precast Reinforced Concrete Manhole Sections.

1.04 SUBMITTALS

A. Product Data: provide data on precast reinforced concrete manhole sections, cast iron frame and cover, prefabricated base, preformed joint material and water stops.

1.05 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01720. PART

2 – PRODUCTS

2.01 MATERIALS

A. Manholes: Manholes shall be constructed of concentric precast reinforced concrete sections in accordance with ASTM C478. Precast concrete sections shall be manufactured by a process that will produce a dense, homogeneous concrete section of first quality. Steps or rungs will not be allowed in maintenance holes. The sections shall have a minimum wall thickness of 6 inches for 60 inch diameter sections. Cement used in manufacturing the sections for sanitary sewer manholes shall be Type V Portland Cement as specified in ASTM C150. Manhole sections shall be sealed using preformed joint material, cold applied, ready to use plastic joined sealing compound Quick-Seal, Ram-Nek, or equal and grout. All manholes shall have reinforced cast-in-place or reinforced precast concrete bases and formed channels with inverts to match the adjoining pipes. Manhole sections shall be designed for a minimum of HS-20 traffic loading plus earth loads. Calculate earthload with a unit weight of 130 pcf.

B. Manholes in sewers constructed of PVC lined reinforced concrete pipe shall be provided with compatible PVC lining from the top of the base up to and including ½-inch minimum of the cast iron frame. PVC-lining shall conform to the requirements of Section 02532, “Reinforced Concrete Pipe (PVC-lined).”

C. Castings: Castings for manhole frames and covers shall be non-rocking and shall conform to the requirements of ASTM A48, Class 35B. Cast iron covers and frames shall be heavy duty traffic type, 24 inches in diameter, with a curved blind pickhole, and embossed lettering for “Storm Sewer” or “Sanitary Sewer”, as applicable. Frame and cover shall be designed for H-20 traffic loading. For installations in unimproved areas, cover and frames shall be bolted. All castings shall be thoroughly cleaned and subject to a hammer inspection after which they shall be twice dipped with an asphalt or coal tar coating applied at a temperature of not less than 290 degrees F. nor more than 310 degrees F.

D. Castings Suppliers, or Equal:

1 Phoenix P-1002 for field installations. Phoenix P-1090 for street and paved installations.
2 D & L Supply Company A-1024.

E. Water Stops: Plastic pipe connections to precast concrete manholes and cast-in-place bases shall also be sealed using a premolded elastomeric waterstop material.

F. All connections to precast concrete manholes shall be made with non-shrink grout.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All precast concrete manholes shall be installed in strict conformance with the manufacturer’s printed instructions on a well compacted foundation as specified in Section 02324, “Trenching”.

B. Manhole frames and covers shall not be set to final grade until the pavement has been completed. Frame and cover shall be set and adjusted to grade after final paving. The street cut in asphalt concrete pavement shall be circular and paving around the maintenance hole shall be in accordance with the Drawings. Openings in manholes shall be protected from construction loads, debris and unauthorized entry.

C. Manhole sections shall be set so as to be vertical with sections in true alignment. The joint of the previously set section shall be clean and covered with preformed joint sealant before the next section in placed. The joint material shall be installed in accordance with manufacturer’s printed recommendations.

D. No pipe ends shall protrude into the manhole. No bell section of the pipe shall be placed into the manhole wall.

E. Structure backfill and compaction shall be as specified in Section 02324, “Trenching”.

END OF SECTION

SECTION 02700 STORM DRAINAGE

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all storm drainage system improvements and related work as shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the drainage work is shown on the Drawings and includes, but is necessarily limited to, the following:
   1. Storm drainage system installation

C. Related sections can include, but may not be limited to:
   1 Section 01300 - Submittals
   2 Section 01720 - Project Record Drawings
   3 Section 02200 - Earthwork
   4 Section 02221 - Excavation, Backfilling and Compaction
   5 Section 02230 - Base Courses
   6 Section 02520 - Portland Cement Concrete
   7 Section 02540 – Synthetic Turf Playing Field
   8 Section 02870 - Site Furnishings

1.02 REGULATORY REQUIREMENTS AND REFERENCES

A. State of California Department of Transportation Standard Specifications, current edition.

B. California Building Code

1.03 SUBMITTALS

A. Submit cut-sheets or samples of all products to be used in conformance with Section 01300 Submittals and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Record Drawings:
   1 Conform to Section 01720 Project Record Drawings.
   2 Accurately record location of new piping, drain structures, and connections to existing systems using horizontal dimensions, elevations, inverts and slope gradients as applicable.

1.04 QUALITY ASSURANCE

A. Control of Work: Conform to Section 5 of the Standard Specifications.

B. Control of Materials: Conform to Section 6 of the Standard Specifications.

1.05 PROTECTION OF PROJECT SITE

A. Make provisions for, and take the necessary precautions to protect existing and new work from damage during entire life of project.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store pipe neatly and orderly, stacked and blocked to prevent damage. Cracked, checked, spalled or otherwise damaged pipe shall be removed from site.

B. Use of chain slings shall not be permitted.

C. All piping, fittings and related materials shall be carefully handled at all times.

D. All pipelines, fittings and drainage structures shall be kept clean and closed during construction.

1.07 PROJECT/SITE CONDITIONS

A. Work of this section shall not be executed when site conditions are detrimental to quality of work as determined by the District Representative.

1.08 SEQUENCING AND SCHEDULING

A. Coordinate work of this section with all other work contained in the Contract Documents.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. All pipe and fittings shall be clearly and permanently marked to identify manufacturer, type, class, or schedule and NSF approval as applicable.

B. Corrugated High Density Polyethylene (CHDPE) Pipe (Perforated and Solid Wall)

1. High-density polyethylene perforated corrugated pipe with an integrally formed smooth waterway. Nominal sizes shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway). Corrugations may be either annular or spiral. All sizes shall conform to the AASHTO classification "Type S". Pipe manufacturer for this specification shall comply with the requirements for test methods, dimensions, and markings found in AASHTO Designations M252 and M294. Pipe and fittings shall be made from virgin PE compounds which conform with the requirements of cell class 324420C as defined and described in ASTM D 3350.

    a. The minimum parallel plate stiffness values when tested in accordance with ASTM D2412 shall be as follows: Diameter Pipe Stiffness 4 inch (100 mm) 50 psi (340 kPa) 6inch (150 mm) 50 psi (340 kPa) 8 inch (200 mm) 50 psi (340 kPa) 10 inch (250 mm) 50 psi (340 kPa) 12 inch (300 mm) 50 psi (340 kPa) 15 inch (375 mm) 42 psi (290 kPa)

2. The fittings shall not reduce or impair the overall integrity or function of the pipeline. Common corrugated fittings include in-line joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as “tees”, “wyes”, and end caps. These fittings may be installed by various methods, such as snap-on, screw-on, bell and spigot, and wrap around. Couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the pipe

manufacturer shall be used. Where designated on the plans and as required by the manufacturer, a neoprene or rubber gasket shall be supplied. Installation of the pipe specified above shall be in accordance with ASTM Recommended Practice D2321 as covered elsewhere in these specifications.

3. Corrugated Polyethylene Pipe shall be N-12 drainage pipe as manufactured by Advanced Drainage Systems, Inc. or approved equal.
4. Unless otherwise noted, Contractor has option of using either CHDPE or PVC pipe as specified.

C. Smooth Polyvinyl Chloride Pipe (P.V.C.) and fittings: Shall be polyvinyl chloride pipe, SDR 26 Spigot, Type I P.V.C. 1120, NSF approved. Comply with ASTM D3034.

D. Smooth Polyvinyl Chloride Perforated Drain Pipe (Perf P.V.C.) and fittings: Conform to Section 68 of the Standard Specifications. Provide bell and non-pressure rated P.V.C. SDR35 pipe with two rows of perforations 120 degrees apart on bottom of pipe five inches on center. Pipe shall conform with ASTM D 2729 and ASTM D 3034.

2.02 DRAINAGE STRUCTURES

A. Manholes: Provide frame, cover, grade rings, and all related materials as required by the construction drawings for a four foot diameter manhole. Materials available through Hansen Concrete Products. Ph:(408) 262-1091, Fax (408) 262-0936, or approved equal.

B. Catch Basins:

1 All catch basins shall have round grates. 24-inch catch basins are to be model RB 24 as supplied by Central Precast. Ph:(408) 262-1091, Fax (408) 262-0936, or approved equal.
2 Grates in paved areas shall have grates that conform to ADA Regulations.
3 All catch basins to have locking mechanism or screw down grate to frame.
4 Provide two grade rings at each catch basin.

C. Extensions: Provide box extensions, junction boxes and grade rings compatible with structures as necessary to finish at the proper elevation and to facilitate future elevation adjustments as noted below.

D. Clean Outs: Shall be as shown or noted in the Drawings.

E. Area Drains: Shall be 12” Round area drains (model RB12) as supplied by Central Precast. Ph:(408) 262-1091, Fax (408) 262-0936, or approved equal.

G. Drinking fountain drain: Zurn 415 flood drain model Z415SH. 8”x8” square drain with cast iron body and bronze grate.

2.03 MISCELLANEOUS MATERIALS

A. Drainage Rock: Shall be ¾” inch crushed drain rock or acceptable equal as shown in the drawings, materials available through Stevens Creek Quarry, Cupertino, or TMT Enterprises, San Jose.

B. Pea Gravel: Shall conform to the following gradation requirements:

U.S. Standard Sieve Mesh	Allowable Range % Retained on Sieve
1/2 inch (12.5 mm)	95% passing
1/4 inch (6.3 mm)	20 – 45% passing
10 mesh (2.0 mm)	No more than 10% passing
18 mesh (1.0 mm)	No more than 5% passing

C. Perforated Drain Sand: Shall be washed concrete sand with the following characteristics:
   1 100% passing a #4 screen and no more than 4% passing a #200 screen.
   2 A total silt and clay % if no more than 5%.
   3 Shall be crushed or naturally angled sand – no rounded silica sand.
   4 Approved product and Supplier- G-8 Sand-Brown Sand Co-Tim 209-234-1500 or TMT Enterprises – Matt Moore408-432-9040.

D. Filter Fabric for French Drain: Shall be Mirafi 140N or acceptable equal.

E. Filter Fabric Fasteners: Metal clip type staple.

F. Mortar: Shall conform to all applicable sections of the Standard Specifications. Mixture shall be a 1:2 Portland Cement to sand mixture with a minimum of water.

G. Reinforcing bars: Refer to Section 02520.

H. Minor concrete: Refer to Section 02520.

PART 3 EXECUTION

3.01 PIPE LAYING

A. General: Pipe shall be installed per manufacturers' instructions and in conformance with the Contracts Documents.

B. CHDPE Pipe:
   1 Pipe shall be installed with a minimum cover under the H-20 live load = 12 inches to the top of subgrade elevation.
   2 Minimum compaction for pipe subject to H-20 live load is 90% per Section 19, Standard Specifications.
   3 CHDPE pipe shall be laid and jointed in accordance with generally accepted practice and the following provisions to provide the required work.

C. P.V.C. (perforated and non perforated) Pipe:
   1 Pipe shall be laid in trench to specified lines and grades fully and evenly supported by bedding material. Excavate bedding as required so bell fittings are clear from soil 12" on each side of joint and to a depth sufficient to avoid contamination of joint.
   2 Pipe shall be laid beginning at the outlet and proceeding with each bell end facing upgrade.
   3 Cut pipe square and ream to remove burrs.
   4 Connections shall be solid, true to grade and watertight. Grease gaskets as

necessary to facilitate joining pipe.

3.02 DRAINAGE STRUCTURES

A. General: Set rim or cover elevations to specified grades utilizing a minimum of two grade rings (or extensions) at top of drainage structure to facilitate potential elevation adjustments in the future.

B. Catch Basins and Area Drains: Install as shown in the Drawings and as follows:
   1 Excavate as required.
   2 Set on firm, unyielding base. Set on compacted select backfill material if directed by District Representative.
   3 Prefabricated units not having a bottom shall be set on a poured-in-place concrete slab with smooth trowel finish. Mortar and properly seal unit to slab, making a water tight connection.
   4 Install pipe inlets and outlets to specified elevations. Grout and/or seal all joints to a watertight condition with material per manufacturer’s recommendation.

C. Manholes: Install per manufacturer's recommendations and as shown in the Drawings.

3.03 FIELD QUALITY CONTROL

A. The District Representative shall review and accept work at the following stages:
   1 Excavated trench with bedding in place prior to any pipe being laid.
   2 Pipe laid prior to backfilling. Any pipe covered prior to review and acceptance shall be uncovered and re-backfilled at contractor's expense.
   3 Drainage device location and pipe connection.

END OF SECTION

SECTION 02713 DOMESTIC WATER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all domestic water systems and related work shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the domestic water system work is shown on the Drawings and can include, but is not necessarily limited to the following:
   1. Water supply and distribution system(s):
      a. Domestic water system, including all pipes, fittings, valves, valve boxes, connections, and fire hydrants
      b. Compliance with AWWA C-600-87
      c. Intermediate staking and layout for domestic water system

C. Related sections can include, but may not be limited to:
   1 Section 02221 - Excavation, Backfilling, and Compaction
   2 Section 02230 - Base Courses
   3 Section 02520 - Portland Cement Concrete
   4 Section 02810 - Irrigation
   5 Section 02900 - Landscaping

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. AWWA - latest edition

B. California Plumbing Code - latest edition

C. State of California Department of Transportation Standard Specifications, current edition.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Submit copies of product data or “cut-sheets” for all products proposed for use.

1.04 RECORD DOCUMENTS

A. Project Record Drawings:
   1 Conform to Section 01720 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.
   2 Accurately record locations of utilities remaining, re-routed utilities, new utilities, and newly discovered utilities by horizontal dimensions, elevations, inverts, and slope gradients.

1.05 QUALITY ASSURANCE

A. Unless otherwise specified, install all materials in accordance with manufacturer's recommendations. Contractor shall make all necessary repairs to the domestic water system as well as to other work affected by defects in the system through project Final Acceptance and specified warranty period. All repairs shall be made at the

contractor's sole expense.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store PVC pipe in a neat and orderly manner fully supported and protected from sunlight.

B. Do not dump pipe off truck. Pipes are to be delivered, unloaded and handled so as to prevent damaging the material.

1.07 PROJECT/SITE CONDITIONS

A. PVC pipe shall not be cemented during wet conditions as determined by the District Representative.

B. Trench excavation and backfilling shall not be executed during excessively wet conditions as determined by the District's Representative.

1.08 SEQUENCE AND SCHEDULING

A. Refer to all other Contract Documents, determine the extent and character of related work, and properly coordinate work specified herein with that described else where to produce a complete, operational installation.

B. Contractor shall be solely responsible for coordinating, sequencing, and scheduling all work with all applicable trades and/or sub-contractors so as to insure proper and timely performance.

1.09 GUARANTY

A. Conform to Section 01700 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Contractor shall provide a written guarantee covering entire system against defects in installation, workmanship, and equipment for a period of one year from date of final acceptance.

C. Contractor shall make necessary repairs to the system as well as to other work affected by defects in the system during warranty period. Repairs shall be made at the Contractor's sole expense.

1.10 MAINTENANCE

A. Service: Contractor shall service and maintain domestic water system as necessary until project Final Acceptance.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. General:
   1 Pipe materials for domestic water line shall be in conformance with the Uniform Plumbing Code and local agencies.
   2 Plans and details, if shown, are schematic in nature and do not necessarily identify all fittings and appurtenances required to provide a complete installation. The contractor is responsible for providing complete and functional systems.

3 Materials and procedures not specifically addressed herein shall comply with the appropriate AWWA standard.

4 All materials proposed for use shall be in a new, “first class” condition unless otherwise noted.

B. Water Lines 3 Inches and Greater Diameter:

1. Ductile Iron Pipe (DIP): Pipe shall conform to AWWA C151, minimum Class 52. All ductile iron pipe shall be cement mortar lined in conformance with AWWA C104. Pipe shall be of domestic manufacture; U.S. Pipe Tyton joint, Pacific States; or acceptable equal. Buried ductile iron pipe and fittings shall be wrapped in an 8-mil. thick polyethylene film sleeve. The Contractor shall furnish certification that all pipe supplied for this project has been manufactured in compliance with all requirements of AWWA C151.

2. Polyvinyl Chloride Pipe (PVC): Pipe shall conform to AWWA C900, Class 200, cast iron O.D. sizes. Pipe shall be of domestic manufacture; JM Mfg. Co., PW Pipe, Certainteed Fluid-Tite; or acceptable equal. Pipe shall be furnished with integral bells. Spigot end pipe with separate double hub couplings is not acceptable. The Contractor shall furnish certification that all pipe supplied for this project has been manufactured in compliance with all requirements of AWWA C900.

C. Water Lines 2 (two) Inches and Smaller Diameter:

1. Pipe shall be annealed (soft) Type “K” copper (Cu).

D. Couplings and Sleeves:

1 General: Couplings and Sleeves shall be a minimum of 200-psi working pressure-rated unless otherwise noted. Couplings and sleeves shall be mechanical joint type.

2. For DIP and PVC Pipe 3" thru 12":
   a. Unless otherwise noted, couplings and sleeves for DIP and PVC shall be ductile iron conforming to AWWA C153, and shall be 350 psi working pressure rated. Couplings, sleeves, and accessories shall be of domestic manufacture; U.S. Pipe Trim Tyte, Union Foundry, Tyler; or acceptable equal.
   b. Unless otherwise noted, flanges on all DIP spools shall conform to AWWAC115.

3. For PVC Pipe 2” and smaller:
   a. Schedule 40, solvent-weld PVC socket couplings.

4 For Copper Tubing:
   a. Couplings for copper tubing shall be Mueller 110 compression connections or acceptable equal.

E. Valves:

1. Gate valves:
   a. Use gate valves designed for a working pressure of not less than 150 psi.
   b. Provide connections as required for the piping in which they are installed.
   c. Provide an arrow on the operating nut or wheel, cast in metal, indicating direction of opening.

2. Thrust Blocks:
   a. Thrust blocks shall be constructed of Class “A” concrete. Thrust block dimensions shall conform to the California Plumbing Code.

F. Valve Boxes
   1 Shall be 10” round boxes for gate valves.
   2 Valves shall be labeled with “water” on lid.
   3 Boxes located in landscape areas shall be plastic. Valve boxes shall be round model equivalent to Carson Model 910-10 with 910-4 lid.
   4 Boxes located in paving shall be concrete with concrete lid.
   5 Valve boxes shall have a bolt down lid.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to starting work, test and verity that water pressure levels meet the domestic water system requirements. Notify the District’s Representative immediately of any discrepancies and re-direct work to avoid delay.

B. The utility plan and the piping details are diagrammatic. Pipe lines shown parallel in the Drawings may be placed in a common trench, provided that a minimum horizontal distance of six (6) inches is maintained between buried lines, except for sanitary sewer lines, which require ten feet (10’) horizontal clearance.

3.02 HANDLING

A. Handle pipe accessories so as to ensure delivery to the trench in sound, undamaged condition.

B. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.

C. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during laying operations by plugging or other acceptable method.

D. Before installation, inspect each piece of pipe and each fitting for defects:

E. Replace all material found to be defective (before or after laying) with sound material meeting the specified requirements, without additional cost to the District.

F. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

3.03 PIPE CUTTING

A. Cut pipe neatly and without damage to the pipe.

B. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.

C. Use wheel cutters when practicable.

D. Cut pipe square, and remove all burrs prior to use.

3.04 TRENCHING

A. Conform to Section 02221.

B. Excavate trenches with vertical sides uniform bottom, free of deleterious materials, and wide enough for pipes to lay side by side, fully supported on bottom.

1 No lines shall be installed parallel to and directly over another line.
2 When lines must cross, the angle shall be forty-five to ninety degree (45-90°), and a minimum of six (6) inch vertical clearance shall be maintained.

C. Provide minimum coverage as follows:
1 Pressurized service: 24" in landscape areas, 30" under pavement.

3.05 PLACING AND LAYING

A. General:
1 Lower pipe and accessories into trench by means recommended by the manufacturer.
2 Except where necessary in making connections to other lines, lay pipe with the wide bell end opening facing source.
3 Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate wells, couplings, and joints.
4 Replace pipe that has been disturbed after laying.
5 Do not lay pipe in water, or when trench conditions are unsuitable for the work. Dewater trench until jointing is completed.
6 Securely close open ends of pipe and valves when work is not in progress.
7 Where any part of coating or lining is damaged, repair at no additional cost to the District.
8 Follow manufacturer’s detailed instructions in installing and assembling pipe.

B. Plastic Pipe:
1 Position pipe and fittings in trench in a manner that identifying markings will be readily visible for inspection.
2. Cutting and joining:
a. Protect against abrasion from serrated holding devices.
b. Remove burrs and glosses from surfaces to be jointed; use abrasive paper, file, or steel wool.
c. Remove dirt, dust, and moisture by wiping clean with dry cloth.
2 Align pipe system components without strain.
3 Support plastic pipe in trenches with a two (2) inch min. layer of bedding Provide a min. three (3) inch bedding sand cover. Allow no rocks, debris, or potentially damaging substances within six (6) inches of plastic pipe in trenches.

C. Connections:
1. Use appropriate fittings to suit the actual condition where connections are made between new work and service points.

3.06 JOINTING

A. Other joints:
1 Mechanical joints and push-on type joints: Install in accordance with AWWA C600, modified as necessary by the recommendation of the manufacturer to provide for special requirements of specified pipe.
2 Make connections between different types of pipe and accessories with transition fittings.
3 Rubber gaskets: Handle and install in strict accordance with the recommendations of the manufacturer. Lubricants for gaskets shall be manufactured by or approved by the pipe manufacturer for use under the conditions found in the field.

3.07 SETTING VALVES AND VALVE BOXES

A. General:
1 Center valve boxes on the valves, setting plumb.
2 Tamp earth fill around each valve box to a distance of four feet on all sides, or to be undisturbed trench face if less than four feet.
3 Tighten mechanical joints, and fully open and close each valve to assure that all parts are in working condition.

3.08 THRUST BLOCKS

A. General:
1. Provide and install thrust blocks in accordance with California Building Code requirements and installation guidelines.

3.09 TESTING, INSPECTING, AND DISINFECTION

A. Closing uninspected work: Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been completely inspected and tested, and has been accepted.

B. Time for making test:
1. Except for joint material setting, or where concrete reaction backing necessitates a five day delay, pipelines joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill. All testing of water service shall be in accordance with the requirements of AWWA C600 for hydrostatic testing. Contractor to keep records of each piping test, including date and time of test, name of witnessing District representative, test pressure, description of piping tested, and remarks (i.e. leaks and repairs made). All tests shall last 4 hours and be tested at 200 psi.

C. Disinfection:
1. Before acceptance of the potable water system, disinfect each unit of completed service line in accordance with AWWA C601 and criteria of the local District/County.
a. Proposed method shall be submitted to the District's Representative for review and acceptance.
b. Perform all tests and disinfection in a manner acceptable to governmental agencies having jurisdiction.

2. Furnish two copies of a Certificate of Compliance to the District.

3.10 BACKFILLING

A. General:
1 Backfill only after specified tests have been performed and accepted.
2 Clean trenches of all debris and deleterious material before backfilling.
3 Backfill, as specified or shown in Drawings free from deleterious material.
4 Compact trenching to 95% relative compaction under pavement and 85% relative compaction within planting areas.
5 Trench surfaces shall be flush with finish grade. All trench settling shall be corrected by the contractor at no additional cost to the District.

3.11 DEMONSTRATION

A. Instruct District's personnel in complete and proper operation of domestic water system per Section 01700 Contract Closeout.

3.12 FINAL REVIEW

A. Provide District's Representative with all Guaranty and record drawing requirements prior to Final Review.

END OF SECTION

SECTION 02722 SANITARY SEWERAGE

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all sanitary sewerage and related work as shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the sewerage work is shown on the Drawings and includes, but is necessarily limited to, the following:
   1. Sanitary sewerage system installation

C. Related sections can include, but may not be limited to:
   1 Section 02200 - Earthwork
   2 Section 02221 - Excavation, Backfilling and Compaction
   3 Section 02230 - Base Courses
   4 Section 02520 - Portland Cement Concrete
   5 Section 02713 - Domestic Water Systems
   6 Section 02870 - Site Furnishings

1.02 REGULATORY REQUIREMENTS AND REFERENCES

A. California Plumbing Code

B. State of California Department of Transportation Standard Specifications, current edition.

1.03 QUALITY ASSURANCE

A. Control of Work: Conform to Section 5 of the Standard Specifications.

B. Control of Materials: Conform to Section 6 of the Standard Specifications.

1.04 PROTECTION OF PROJECT SITE

A. Make provisions to take the necessary precautions to protect existing work from damage during execution of this work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store pipe neat and orderly stacked and blocked to prevent damage. Cracked, checked, spalled or otherwise damaged pipe shall be removed from site.

B. Use of chain slings shall not be permitted.

C. Pipe, fittings, precast sections, cast iron fittings, covers and all other materials shall be carefully handled at all times.

C. All pipelines and fittings shall be kept clean and closed during construction.

1.06 PROJECT/SITE CONDITIONS

A. Work of this Section shall not be executed when site conditions are detrimental to quality of

work as determined by the District's Representative.

B. PVC pipe shall not be solvent welded during wet conditions.

1.07 SEQUENCING AND SCHEDULING

A. Refer to all other Contract Documents, determine the extent and character of related work, and properly coordinate work specified herein with that described else where to produce a complete, operational installation.

B. Contractor shall be solely responsible for coordinating, sequencing, and scheduling all work with all applicable trades and/or sub-contractors so as to insure proper and timely performance.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. All pipe and fittings shall be clearly and permanently marked to identify manufacturer, type, class, or schedule and NSF approval as applicable.

B. Polyvinyl Chloride Pipe (P.V.C.) and fittings: Polyvinyl chloride pipe shall be SDR 26 Bell and Spigot, Type I P.V.C 1120, NSF approved. Comply with ASTM D-3034.

C. Ductile Iron Pipe (DIP) joints and fittings: Shall be Class 50, rubber gasket push-on type, in compliance with AWWA C-151, C-111 and C-110.

D. Vitrified Clay Pipe (VCP), and fittings: Shall be extra strength in compliance with ASTM C700, unglazed for socket and spigot joint.

2.02 STRUCTURES

A. Clean Outs: Shall be as detailed on Drawings. Christy "F8" clean out boxes are acceptable in non-vehicular travel areas. For vehicular travel areas, Christy "G5" clean out boxes shall be used.

2.03 MISCELLANEOUS MATERIALS

A. Crushed Rock: Shall be ¾" bedding rock as conforming to Section 200.1.2 of the "Standard Specification for Public Works Construction", commonly referred to as the "Greenbook."

B. Mortar: Conform to all applicable sections of the Standard Specifications. Mixture shall be a
1:2 Portland Cement to sand mixture with a minimum of water.

C. P.V.C. Solvent Cement: Conform to pipe manufacturer's recommendations.

D. P.V.C. Primer: Conform to pipe and solvent cement manufacturer's recommendations.

E. Reinforcing Bars: Refer to Section 02520.

F. Minor concrete shall conform to Section 02520 and all applicable sections of the Standard Specifications.

PART 3 EXECUTION

3.01 PIPE LAYING

A. General: The District's Representative shall review and accept all pipe prior to installation. Pipe shall be installed in conformance with Section 02221 of these Specifications. All sanitary sewer installations shall be reviewed and accepted by the District's Representative prior to backfilling.

B. Pipe:
1 Pipe shall be laid in trench to specified lines and grades fully and evenly supported layer of bedding material as specified and identified on the Drawings. Excavate bedding as required so bell fittings are clear from soil six inches (6") on each side of joint and to a depth sufficient to avoid contamination of joint. Refer to Drawings for additional information.
2 Pipe shall be laid beginning at the outlet and proceeding with each bell end opening facing upgrade.
3 Cut pipe square and ream to remove burrs prior to use.
4. Connections:
a. Thoroughly clean and dry all components to be joined.
b. Apply primer and sufficient cement to coat joint surfaces of both components and fill gaps but not in excess.
c. Join pipe, wipe off excess cement, and fully support pipe until joint has cured.

C. Provide sleeving where shown or needed and wherever pipes run through walls using schedule 40 PVC pipe (min. one quarter [1/4] inch diameter larger than pipe) or other acceptable method.

3.02 STRUCTURES AT GRADE

A. General: Set rim or cover elevations to specified grades. Adjust as required to set flush with proposed grades and/or pavement sections.

B. Clean Outs:
1 Excavate as required.
2 Set on firm unyielding base. Set on compacted select backfill material unless noted otherwise.

3.03 SANITARY SEWER CONNECTIONS

A. Sanitary sewer connections to existing sewer mains shall be made water tight, straight and true to line, grade and "crown to crown" unless noted otherwise..

3.04 FIELD QUALITY CONTROL

A. The District's Representative shall review and accept work at the following stages:
1 Excavated trench with bedding in place prior to any pipe being laid
2 Pipe laid prior to backfilling. Any pipe covered prior to acceptance shall be uncovered for review and re-backfilled at contractor's expense.

B. The Contractor shall furnish the necessary labor, equipment and materials necessary to perform air tests of the completed sewerage project before the system is placed in operation or connected to other lines.

C. In no case shall the Contractor place the newly constructed sewer in operation without acceptance by the District's Representative.

3.05 PIPELINE TESTING & FLUSHING

A. New sections of sanitary sewer shall be air tested using the following procedures:

1. Test is conducted between two (2) consecutive manholes, or as directed by the District's Representative.
2. The test section of the sewer line is plugged at each end. One of the plugs used at the manhole must be tapped and equipped for the air inlet connection for filling the line from the air compressor.
3. Service laterals, stubs and fittings into the sewer test section should be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowouts.
4. Connect air hose to tapped plug selected for the air inlet. Then connect the other end of the air hose to the portable air control equipment which consists of valves and pressure gauges used to control the air entry rate to the sewer test section, and to monitor the air pressure in the pipe line. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve and a monitoring pressure gage having a pressure range from 0-5 psi. The gage shall have minimum divisions of .10 psi and an accuracy of .40 psi.
5. Connect another air hose between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment set-up. Test operations may commence.
6. Supply air to the test section slowly, filling the pipe line until a constant pressure of 3.5 psi is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psi.
7. When constant pressure of 3.5 psi is reached, throttle the air supply to maintain the internal pressure above 3.0 psi for at least 5 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap or plug, release the pressure in the line and tighten all leaky caps and plugs. Then start the test operation again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new five-minute interval must be allowed after the pipe line has been refilled.
8. After the stabilization period, adjust the air pressure to 3.5 psi and shut-off or disconnect the air supply. Observe the gage until the air pressure reaches 3.0 psi. At 3.0 psi commence timing with a stop watch which is allowed to run until the line pressure drops to 2.5 psi at which time the stop watch is stopped. The time required, as shown on the stop watch, for a pressure loss of 0.5 psi is used to compute the air loss.
9. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the

section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at that time.

10. If the time, in minutes and seconds, for the 0.5 psi drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

Requirements for Air Testing:

Pipe size (In inches)	Time Min.	Sec.
4	2	32
6	3	50
8	5	06
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	45
21	13	30

(For larger diameter pipe use the following: Minimum time in seconds = 462 x pipe diameter in feet).

11. For eight (8) inch and smaller pipe, only: If, during the five minute saturation period pressure drops less than 0.5 psi after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.
12. Multi-pipe sizes: When the sewer line undergoing test is 8" or large diameter pipe and includes 4" or 6" laterals, the figures in the table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, compute the average size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psi for the averaged diameter pipe.
13. Adjustment Required for Groundwater:
    a. An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased .433 psi for each foot the ground water level is above the invert of the pipe.
    b. Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.
        1) Install a 2" diameter pipe nipple (threaded one or both ends, approximately 10" long) through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.
        2) Seal pipe nipple with a threaded 2" cap.
        3) Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the pipe nipple to remove any obstructions, and then connecting a clear plastic tube to the pipe nipple.
        4) Hold plastic tube vertically permitting water to rise in it to the groundwater level.
        5) After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
        6) Determine air pressure correction, which must be added to the

3.0 psi normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.

Example: If the vertical height of water from the sewer invert to the top of the water column measures 11.55 feet, the additional air pressure required would be:

(11.55) / (2.31) = 5.0 psi

Therefore, the starting pressure of the test would be 3.0 plus 5 or 8.0 psi, and the 2lb. drop becomes 7.5 psi. There is no change in the allowable drop (0.5 psi) or in the time requirements established for the basic air test.

B. After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove any rock or other debris that is flushed out during cleaning.

END OF SECTION

SECTION 02810 IRRIGATION

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all water supply, irrigation system and related work as shown on the Drawings and specified herein.

B. Scope of work: The general extent of the water supply and irrigation system work is shown on the Drawings and may include, but is not necessarily limited to the following:
1 Installation of water backflow prevention system
2 Installation of automatic irrigation systems and controls

C. Related sections can include, but may not be limited to:
1 Section 02221 – Excavation, backfilling and compacting
2 Section 02900 - Landscaping

2. Section 02970 - Landscape Maintenance

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. American Society for Testing and Materials (ASTM)
1 B 62-85 - Standard Specifications for Composition Bronze or Ounce Metal Castings.
2 D 1784-81 - Standard Specifications for Rigid (PVC) Compounds and Chlorinated Poly (vinyl Chloride) (CPVC) Compounds.
3 D 1785-86 - Standard Specifications for (PVC) Plastic Pipe, Schedules 40 and 80.
4 D 2241-84 - Standard Specifications for PVC Pressure-Rated Pipe (SDR Series).
5 D 2564 Standard Specifications for Solvent Cements for (PVC) Plastic Pipe and Fittings.
6 F477 Specification for Elastomeric seals (gaskets) for joining plastic pipe.

B. National Sanitation Foundation (NSF), requirements for Seal of Approval.

C. Plastics Pipe Institute (PPI), recommendations for hydrostatic design stresses for PVC pipe.

D. State of California Department of Transportation Standard Specifications, current edition.

E. Permits and Fees: Contractor is responsible to obtain all required permits and pay all associated fees unless otherwise noted.

F. City of Livermore, Guidelines for the Use of Recycled Water, current edition.

G. Las Positas College Design Guidelines.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 and/or applicable Division One and Division

Two specifications, General Conditions and Special Provisions.

B. Submit the following at the beginning of the project:
   1 Four (4) copies of Materials List of all products specified.
   2 Four (4) copies of the Product Data or cut sheets of all products specified. No substitutions shall be permitted without written acceptance by the District's Representative.

C. Submit the following at project close-out:
   1 Final Record Drawings: Two sets of these shall be produced, one for placement at or within the irrigation controller cabinet reduced to 11" x 17". One full size set for storage at another location desired by the District's Representative.
   2 Both sets shall have all the irrigation valve zone lateral lines color-coded so as to readily distinguish between adjacent zones. The valve size, station number and gallons per minute shall be legible at each valve and shall match how the controller is wired. Additionally, each valve shall be annotated to describe which type of irrigation it is, ie: spray, rotor, bubbler, etc.
   3 The color-coded copies shall then be professionally laminated in minimum 5 mil clear plastic.
   4 Turn-over Materials: Provide one (1) each of the following to the District Representative:

      i. One (1) Quick Coupler attachment key equipped with standard thread hose bib per five (5) Quick Couplers installed on the project.

      ii. One (1) key for locking Quick Coupler covers per five (5) Quick Couplers installed on the project.

1.04 RECORD DOCUMENTS

A. Comply with Section 01720 and applicable Division One and Division Two specifications, General Conditions and/or Special Provisions.

B. Accurately record locations of all piping and equipment that varies from what is shown on the Drawings horizontally to within one (1) foot and vertically to within 0.5 feet.

1.05 QUALITY ASSURANCE

A. Unless otherwise specified, install all materials in accordance with manufacturer's recommendations.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store PVC pipe in a neat and orderly manner fully supported and protected from sunlight.

B. All equipment shall be delivered, unloaded and handled so as to protect from damage at all times.

1.07 PROJECT/SITE CONDITIONS

A. PVC shall not be cemented during wet conditions per the discretion of the District's Representative.

B. Trench excavation and backfilling shall not be performed during excessively wet conditions per the discretion of the District's Representative.

1.08 SEQUENCE AND SCHEDULING

A. Contractor shall be solely responsible for coordinating, sequencing and scheduling all work with all applicable trades and/or sub-contractors so as to insure proper and timely performance.

1.09 GUARANTY

A. Conform to Section 01700 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Contractor shall provide a written guaranty covering entire system against defects in installation, workmanship and equipment for a period of one year from date of Final Acceptance.

C. Contractor shall make necessary repairs to the system as well as to other work affected by defects in the system during guaranty period. Repairs shall be made at the Contractor's sole expense.

1.10 MAINTENANCE

A. Conform to Section 02970 - Landscape Maintenance.

B. Service: Contractor shall service and maintain system during specified Landscape Maintenance Period.

C. The entire irrigation system shall be under full automatic operations for a period of two days prior to any planting.

D. Final Acceptance and start of guaranty period shall occur no later than the end of the specified Landscape Maintenance Period.

PART 2 PRODUCTS

2.01 GENERAL

A. Use only new materials of brands shown on Drawings, specified herein or as acceptable to the District's Representative.

2.02 PIPE

A. PVC Pipe: Polyvinyl chloride (Type I) plastic pipe PVC 1120 for recycled water use per plan, NSF approved, and conforming to the City of Livermore, Guidelines for the Use of Recycled Water and the Las Positas College Design Guidelines.

B. Pipe shall be Schedule 40 for sizes less than 4" and Class 200 'Ring-tite' for sizes 4"

and larger.

C. Pipe sizes 1 ¼" and 3" shall not be used.

2.03 PVC FITTINGS

A. PVC Fittings: Polyvinyl chloride (Type I) plastic fittings 1120, Schedule 40 or Schedule 80 as may be noted in the Drawings.

B. PVC Nipples: Polyvinyl chloride (Type I) plastic fittings 1120, Schedule 80.

2.04 BACKFLOW PREVENTER DEVICE

A. N/A.

2.05 BACKFLOW PREVENTER ENCLOSURE

A. N/A.

2.06 VALVES AND SENSORS

A. Remote Control Valves: As specified on Drawings.

B. Master Valve: As specified on Drawings.

C. Quick Coupling Valves: As specified on Drawings. Provide purple valve covers if system is designed for recycled water.

D. Gate Valves / Ball Valves: As specified on Drawings.

E. Flow Sensors: As specified on Drawings.

F. Moisture Sensors: As specified on Drawings.

2.07 VALVE BOXES

A. Remote Control Valves: As specified on Drawings. RCV boxes shall be rectangular model equivalent to Carson Model 1419-12 with 1419-4 lid. Boxes shall be labeled as "Irrigation – RCV" on lid.

B. Quick Coupling Valves: As specified on Drawings. Valve boxes shall be round model equivalent to Carson Model 910-10 with 910-4 lid. Boxes shall be labeled as "Irrigation – QC" on lid.

C. Gate Valves / Ball Valves: As specified on Drawings. Valve boxes shall be round model equivalent to Carson Model 910-10 with 910-4 lid. Boxes shall be labeled as "Irrigation – Valve" on lid.

D. Valve Boxes: Valve boxes shall be bolt down type lids and of a variety. Other boxes manufactures are approved equals: Applied Engineering Inc., NDS, or Christy Concrete.

F. Color of plastic boxes and lids shall be purple, and with lids marked “Recycled Water” or “Recycled”.

2.08 AUTOMATIC CONTROLLER AND ENCLOSURE

A. Controller: As specified on Drawings.

B. Enclosure: As specified on Drawings.

2.09 BOOSTER PUMP

A. Controller: As specified on Drawings.

B. Enclosure: As specified on Drawings.

2.10 VALVE WIRING

A. Low Voltage:
   1. Conductors:
      a) Control wires shall be UL rated for direct burial, Type UF, 14 gauge wire. Insulating jacket color shall be red.
      b) Common wires shall be UL rated for direct burial, Type UF, 12 gauge wire. Insulating jacket color shall be white.
      c) Spare control wires shall be UL rated for direct burial, Type UF, 14 gauge wire, Insulating jacket color shall be blue.
      d) Spare common wire shall be UL rated for direct burial, Type UF, 12 gauge wire. Insulating jacket color shall be green.
   2. Splice connectors: 3M "DBY" splice connectors or acceptable equal.

2.11 CONNECTING COMPOUNDS

A. Primer: IPS Corporation Weld-on #P-70.

B. Cement:
   1 IPS Corporation Weld-on #705 for Class 200 P.V.C. or schedule 40 P.V.C. (up to 6" diameter). IPS Corporation Weld-on #711 shall be used for larger pipe diameters and schedule 80 P.V.C.
   2 IPS Corporation Weld-on #795 for flexible P.V.C. to rigid P.V.C. connections.

2.12 SPRINKLER HEADS

A. Sprinkler Heads: As specified on Drawings. As applicable, if system is designed for recycled water, provide purple nozzles or rotor covers.

2.13 ADDITIONAL MATERIALS

A. Pipe Detection Tape: "Sentry Line" three (3) inch wide, detectable, "Caution Water Line Buried Below" tape as available from Terra Tape Inc. Houston, Texas (800)-231-6074 or acceptable equal.

B. Pipe Sleeving: Six (6) inch class 200 PVC, unless noted otherwise.

C. Teflon tape shall be of a variety commonly used for wrapping threaded connections.

D. Reinforced Tracer Wire: Copperhead Reinforced Tracer Wire available at Copperhead Industries, LLC. 877-726-5644.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to starting work, test and verity that water pressure levels meet the requirements specified on the Drawings. Notify the District's Representative immediately of any discrepancies.

B. Irrigation plans are diagrammatic. Pipe lines shown parallel in the Drawings may be placed in a common trench, provided that a minimum horizontal distance of three inches (3") is maintained between buried lines.

C. Sprinkler heads are shown schematically. Suspected discrepancies in coverage or sizes of areas to be irrigated shall be brought to the attention of the District's Representative prior to installation. Contractor shall re-direct work to avoid delay while awaiting resolution.

3.02 PREPARATION

A. Contractor shall make provisions and take necessary precautions to protect existing work or features.

B. Layout: Coordinate lay-out of system with District's Representative as necessary.

3.03 TRENCHING

A. Conform to Section 02221 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Excavate trenches with vertical walls, uniform bottom, free of deleterious materials, and wide enough for pipes to lay side by side, fully supported on bottom. There shall be a minimum three inch (3") clearance between all pipes.
   1 No lines shall be installed parallel to and directly over another line.
   2 When lines must cross, the angle shall be forty-five to ninety degrees, and a minimum of three inch (3") vertical clearance shall be maintained.

C. Provide minimum coverage depths as follows:
   1 Mainline: 24" in landscape areas, 30" under paving.
   2 Lateral Lines: 18" in landscape areas, 30" under paving.

D. Hydraulic driving methods shall not be used under paved surfaces.

3.04 PIPE INSTALLATION

A. Comply with applicable Division One and Division Two specifications, General Conditions and/or Special Provisions and manufacturer's instructions.

B. Rubber Ring Seal Joint:
   1 Use factory-made male end or prepare field-cut male end to exact specifications

of factory-made end.

2 Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's specifications.

3 Lubricate male end according to manufacturer's instructions and insert male end to specified depth. Use hands only when inserting PVC pipe.

4 Thrust blocks shall be provided where specified and as necessary to resist system pressure on ring-tite pipe and fittings. Thrust blocks shall be concrete and the size shall be based on an average soil safe bearing load of 1,000 pounds per square foot.

5 Form thrust blocks in such a manner such that concrete comes in contact only with the fittings. Thrust blocks shall be between solid soil and the fitting

C. Thrust Blocking:

1 Provide thrust blocks at all changes in size or direction. Bends, reducers, plugs, and the opposite side of tee branches all require thrust blocks.

2 The size of the thrust block is determined by the working pressure, the size and type of fitting and the soil conditions at the job site. To calculate the area of contact with the soil, follow these steps:

a) Calculate the total thrust by selecting thrust/100 by size and type of fitting from Table 1 and multiplying thrust/100 by system pressure divided by 100.

b) Divide the total thrust by the bearing capacity of the soil in excavation (from Table 2) to determine the area (in square feet) of thrust block required to be in contact with the undisturbed soil.

TABLE 1 THRUST/100 TABLE (POUNDS PER 100 PSI)

SIZE	TEES PLUGS	90EBENDS	45EBENDS	22E BENDS
2	363	513	259	141
2 ½	531	751	379	207
3	788	1114	562	207
4	1302	1841	928	307
6	2822	3990	2012	1101

TABLE 2 SOIL BEARING CAPACITY

Soil Type	**Safe Bearing Load (lbs per sq ft)**
Soft Caly	1,000
Sand	2,000
Sand and Gravel	3,000
Sand and Gravel cemented w/ Clay	4,000
Hard Pan	10,000

The engineer is responsible for determining safe bearing loads. When doubt exists, soil bearing tests should be specified.

D. Solvent Welded Joints:
   1 Assemble above ground where possible.
   2 Cut square, ream, and thoroughly clean.
   3 Make joint using specified primer and cement, continuously wiping off excess.
   4 Allow sixty (60) minutes of set-up time before handling and twenty-four (24) hours curing before applying water pressure.

E. Threaded Joints:
   1 Use Teflon tape on all pressurized, threaded plastic to plastic and plastic to steel joints.
   2 Hand tighten and use only light strap-type friction wrench pressure to complete.

F. Snake pipe a minimum of one (1) additional foot per one hundred (100) feet of pipe to allow for expansion and contraction.

G. Pipe shall be installed as specified and generally as shown in Drawings.

H. Cap or plug openings as soon as pipes have been installed to prevent intrusions of debris.

I. Sleeves:
   1 Install pipe sleeves where necessary, where shown and at all points where pipes pass through concrete or masonry. In footings, install sleeving that allows one inch (1") min. clearance around pipe(s).
   2 Each end of sleeve shall extend six inch (6") beyond edge of paving or structure above. Provide removable non-decaying plug at each of sleeve, to prevent earth from entering pipe.

J. Install thrust blocks as shown in Drawings and as described above.

K. Thoroughly flush system prior to installing valves and nozzles.

L. Install pipe detection tape and reinforced tracer wire above mainline.

3.05 EQUIPMENT AND INSTALLATION

A. Booster Pump Device: Install in accordance with local codes and as shown in Drawings.

B. Remote Control Valves:
   1 Install as shown in Drawings.
   2 Valve boxes shall be set plumb and square with adjacent structures.
   3 Install valve tags in an acceptable manner with valve station and controller number.
   4 Provide twelve (12) inches minimum separation when valve boxes are grouped together and align in a neat and orderly manner.
   5 Locate valves in shrub/ground cover areas whenever possible.

C. Quick Coupler Valves:
1. Install as shown in Drawings.

D. Gate Valves / Ball Valves:
1. Install as shown in Drawings.

E. Controller:
1 Install as shown in Drawings.
2 District's Representative shall determine final approved location(s) per manufacturer's Specifications.
3 Label cabinet door exterior with permanent, one (1) inch tall (minimum) letter or number designations corresponding with plan designations (as applicable).
4 Affix reclaimed water warning on controller enclosure (as applicable).

F. Control Wire:
1 Connect control wires to controller in sequential arrangement according to identification number in the Drawings. Label each controller station with permanent non-fading labels indicating identification number of valve controlled.
2 Install as shown in Drawings.
3 Do not tape wires in sleeves.
4 Make all splices in valve boxes using only specified connectors.
5 Provide thirty six (36) inch wire coil at each remote control valve and at all mainline directional changes.
6 Install two spare control wires and one looped spare common wire to run by, and loop into, every remote control valve on system. Terminate wires inside controller enclosure unconnected and clearly labeled as extra.
7 All wiring shall be installed in a PVC pipe sleeve large enough to allow withdrawal and insertion of individual wires.
8 If any control wire run is over 2000', up-size applicable control wire to be 12 gauge.

G. Sprinkler Heads:
1 Install as shown in Drawings.
2 Install plumb with finish grade.
3 Thoroughly flush all lines prior to installing nozzles.

H. Tree Bubblers:
1 Install in drain pipe sump as may be shown in Drawings.
2 Coordinate installation with planting operations to ensure timely and proper placement of heads.

3.06 FIELD QUALITY CONTROL

A. General:
1 Notify District's Representative for the following reviews, with 2 working days minimum notice:
a.) Pressure testing mains and laterals
b.) Coverage test prior to planting
c.) Pre-maintenance observation
d.) Final observation

2 Contractor shall provide all equipment and personnel required to conduct tests.
3 Provide up-to-date Project Record Drawings at each review.
4 If District's Representative is called out for review prior to the system being ready as specified, the contractor shall be back-charged for the full cost of the review.

B. Pressure Tests:
1 Do not install remote control valves, quick couplers, or any other valve assembly until testing of pressure main lines has been accepted by the District's Representative.
2 Testing shall occur with trenches open. Small amounts of backfill between fittings shall be allowed to prevent pipe displacement. All fittings shall be visible prior to testing.
3. Test all pressure supply lines under hydrostatic pressure of 125 p.s.i. minimum. Pipe shall hold pressure for a period of six (6) consecutive hours with no more than five (5) p.s.i. loss in order to pass test.
4 Lateral lines shall be tested under full line pressure for a period of one (1) hour prior to backfilling. Cap all heads and center load pipe between fittings prior to testing.
5 Correct all deficiencies revealed by tests to the satisfaction of the District's Representative.

C. System Flushing:
1 After sprinkler pipe lines and risers are in place and connected, and prior to installation of automatic valves, quick couplers, and sprinkler nozzles, thoroughly flush all lines with water to completely clean lines of debris.
2 Install sprinkler nozzles only after lines have been flushed to the satisfaction of the District's Representative.

D. Coverage Tests:
1 Perform coverage tests after all systems are completed and operational, after finish grading (Refer to Section 02900 - Landscaping) has been completed, but prior to any planting, in the presence of the District's Representative.
2 Correct all deficiencies to the satisfaction of the District's Representative prior to planting.

3.07 BACKFILLING

A. General:
1 Backfill only after specified tests have been performed and accepted.
2 Clean trenches of all debris and deleterious material before backfilling.
3 Backfill, as shown in Drawings, with native material granular in nature and free from deleterious material. Install pipe detection tape over entire run of mainline as shown in Drawings.
4 Compact trenching to 95% relative density under pavement and 85% relative density within planting areas.
5 Dress off trench surfaces flush with finish grade.

3.08 ADJUSTING

A. Adjust and balance system to eliminate over spray and fogging/misting and as directed by District's Representative.

3.09 DEMONSTRATION

A. Instruct District's personnel in complete and proper operation of system prior to Final Acceptance.

3.10 FINAL REVIEW

A. Provide District's Representative with all Record Drawing submittals, turn-over materials, salvaged items and warranty requirements prior to Final Review.

END OF SECTION

SECTION 02830 CHAIN LINK FENCING

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, equipment, facilities, transportation and services to complete all chain link fencing installations and related work as shown on the Drawings and/or specified herein.

B. Scope of work: The general extent of the chain link fencing improvements is shown on the Drawings, and can include but is not necessarily limited to the following:
   1 Galvanized chain link fabric, posts, gates, hardware, and related appurtenances.
   2 Thermally fused and bonded PVC coated (“vinyl coated”) Galvanized chain link fabric with painted posts, gates, hardware, and related appurtenances.
   3 Concrete footings and/or Mowbands.

C. Related sections can include, but may not be limited to:
   1 Section 01300 - Submittals
   2 Section 02520 - Portland Cement Concrete
   3 Section 02870 - Site Furnishings
   4 Section 02900 - Landscaping

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. ASTM:
   1 A53/A53M-04a Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   2 A123/A123M-02 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   3 A153/A153M-04 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   4 A392-03 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric

B. Chain Link Fence Manufacturers Institute (CLFMI)

C. Industrial Steel Guide for Fence, Rails, Posts, Gates and Accessories

D. State of California Department of Transportation Standard Specifications, current ed.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's descriptive literature and/or standard catalog "cut-sheets" of all materials, coatings, fittings and equipment proposed to be furnished and installed under this portion of the work. Include the manufacturer's name and catalog number for each item where applicable. Clearly annotate (star or asterisk-in black ink) which portions of "cut-sheets" are applicable if more than one product is shown.

B. Shop Drawings: Submit complete Shop Drawings for all different types and sizes of gates and fencing systems.

1. Shop Drawings shall include, but may not be limited to:

a. All information regarding clearances, connections, components and any miscellaneous related appurtenances (such as locking mechanisms etc.)

b. Concrete footing and reinforcement information

C. Installation Instructions and/or Drawings: Submit as applicable.

D. Samples: Color selections for finishes of “vinyl coated” and/or “powder coated” fencing systems.

1.04 SEQUENCE AND SCHEDULING

A. Contractor shall coordinate construction timing of all chain link fencing and related work with installation of concrete work (Section 02520 - Portland Cement Concrete) and all other work.

PART 2 PRODUCTS

2.01 MATERIALS - General Note: It is intended that all fencing, by area, receive the same finish coating wherever possible. Nuts, bolts, applicable moving portions of hinges etc. shall be painted to match with PVC touch-up paint in vinyl or powder coated systems.

A. Fabric:
1 Selvage: Knuckled finish top and bottom.
2 Steel Fabric: Comply with Chain Link Fence Manufacturers Institute (CLFMI) Product Manual. Furnish one-piece fabric widths for fencing up to 16 feet high. Wire sizes includes zinc coating.
3 Size: Two (2) inch mesh, 9-gauge (0.148 inch diameter) unless noted otherwise.
4 Galvanized Wire: Zinc coated wire-ASTM A 392, Class 1, with not less than 1.2 oz. zinc. per sq. ft.
5 Thermally Fused and Bonded PVC (vinyl coated) Finish: ASTM F 668 Class 2b, 7mil (0.18 mm) thickness thermally fused over zinc-coated wire. Color shall be: BLACK

B. Framing:
1 Strength requirements for posts and rails shall conform to ASTM F 669.
2 Pipe shall be straight, true to section, material, and sizes specified, and shall conform to the following weights per foot:

NPS in	Outside Diameter inches (OD) in inches	Type 1 Steel	Type II Steel
1	1.315	1.68	1.35
1.25	1.660 (1-5/8")	2.27	1.84
1.5	1.900 (2")	2.72	2.28
2	2.375 (2-1/2")	3.65	3.12
2.5	2.875 (3")	5.79	4.64
3	3.500	7.58	5.71
3.5	4.000	9.11	6.56
4	4.500	10.79	---
6	6.625	18.97	---
8	8.625	28.55	---

C. Steel Framework:

1. Posts, Rails, Braces, and Gate Frames:
   a. Type I Steel Pipe: Hot-dipped galvanized steel pipe conforming to ASTM F 1083, plain ends, standard weight (Schedule 40) with not less than 1.8 oz. zinc per sq. ft. of surface area coated.
   b. Type II pipe: not applicable

2. End, corner, and pull posts for following fabric heights: Refer to Drawings.
3. Line or intermediate posts for following fabric heights: Refer to Drawings.
4. Top, Bottom and Horizontal Intermediate Rails:
   a. Top, bottom and horizontal intermediate rails (as applicable shall be 1.66" OD (1-5/8"OD)

5. Gate Posts: Furnish posts for supporting single gate leaf, or one leaf of a double gate installation, sizes as indicated in the drawings.
6. Gate Frames: Furnish frames (single or double gate), for nominal gate widths as follows:
   a. Over 10’ width: 2.5” OD
   b. 6 feet to 10 feet: 1.90" OD (2" OD)
   c. Under 6 feet:1.66" OD (1-5/8"OD)

7. For fencing with vinyl coated fabric, posts and railings to be painted with two applications of exterior grade paint. Color shall match vinyl color.

D. Fittings and Accessories:

1. Material: Comply with ASTM F 626. Mill-finished aluminum or galvanized iron or steel, to suit manufacturer's standards.
   a. Zinc Coating: Unless specified otherwise, steel fence fittings and accessories shall be galvanized in accordance with ASTM A 153, with zinc weights per Table 1 of ASTM A153.

2 Tension Wire: 7-gauge (0.177 inch diameter) coil spring steel with finish to
3 Tie Wires: 9 gauge (0.148 inch diameter) steel with finish to match fabric.
4 Post and Line Caps: Provide weather tight closure cap for each post. Provide line post caps with loop to receive wire or top rail with finish to match fabric.
8. Tension Bars: Hot-dip galvanized steel with minimum length 2 inches less than full height of fabric, minimum cross-section of 3/16 inch by 3/4 inch and minimum of 1.2 oz. zinc coating per sq. ft. of surface area.

9. Tension Clips: Minimum 3/4 inch wide 12-gauge (.105 inch) thick with finish to match fabric. (7.9 mm).
10. Hinges: Master Halco heavy duty, or acceptable equal.
11. Concrete: Concrete for footings shall be Class B minimum. Refer to Section 02520 Portland Cement Concrete for additional information.
12. For fencing with vinyl coated fabric, fittings and accessories shall be painted with two applications of exterior grade paint. Color shall match vinyl color.

PART 3 EXECUTION

3.01 PREPARATION

A. Prior to excavation, layout all fencing locations for review and acceptance by District's Representative.

3.02 INSTALLATION

A. Conform to layout shown on Drawings, except as modified by the District's Representative.

B. Erect fencing in strict conformance with reviewed and accepted Drawings, Shop Drawings, and manufacturer's recommendations.

C. Install new footings as shown on Drawings.

D. Posts shall be installed vertical and plumb.

E. General: Install fence in compliance with ASTM F 567. Do not begin installation and erection before final grading is completed, unless otherwise permitted.

F. Excavation: Drill or hand-excavate holes for posts to diameter and spacing indicated in firm, undisturbed or compacted soil.
1 Unless noted otherwise, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times largest cross section of post.
2 Unless noted otherwise, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

G. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space chain link posts maximum 8 feet o.c. and tube steel fence posts 7' 8-3/4" maximum face to face, unless noted otherwise. Surface mount posts with mounting plates where indicated. Fasten with lag bolts and shields. Align tube steel fence panels between posts and firmly attach rail brackets to posts with 1/4" bolt and lock nut insuring panels and posts remain plumb.

H. Top Rails: Run rail continuously through line posts caps, bending to radius for curved runs and at other posts termination into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

I. Bottom Rails: Install bottom rails between posts with fittings and accessories as shown in Drawings (as applicable).

J. Brace Assemblies: Install braces so posts are plumb when diagonal rod is under proper tension.

K. Tension Wire: As applicable, install at bottom of fabric (and at top if top rail is not specified) as shown in Drawings. Install tension wire before stretching fabric and attach to each post with ties. Secure wire to fabric with 12.5 gauge hog rings at 24" on center maximum.

L. Fabric: Leave approximately 2 inches between finish grade and bottom selvages (1 inch at backstops) unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on infield or primary use side of fence (unless noted otherwise), and anchor to framework so that fabric remains in tension after pulling force is released.

M. Tension Bars: Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric integrally woven into post. Thread through fabric, and secure to end, corner, pull, and gate posts with tension clips spaced not over fifteen (15) inches on center.

N. Tie Wires: Use U-shaped wire of proper length to secure fabric firmly to posts and rails with ends twisted at least 2 full turns. Bend ends of wire to minimize hazard to persons or clothing. Tie fabric to line posts 12 inches maximum on center and to rails and braces 24 inches maximum on center.

O. Fasteners: Install nuts for tension clips and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

P. Welding: All welds shall be shop fabricated prior to galvanizing unless otherwise acceptable to District's Representative. Any and all field welds shall be completed by a Certified Structural Welder and shall be "spray-galvanized" or otherwise treated subject to the discretion of the District's Representative.

END OF SECTION

SECTION 02870 SITE FURNISHINGS

PART 1 GENERAL

1.01 SUMMARY

Furnish all labor, materials, miscellaneous hardware, foundations, miscellaneous appurtenances, facilities, transportation and services required for installation of all site furnishings and related work as shown on the Drawings and/or specified herein.

A. Scope of work: The general extent of work contained in this section is shown on the drawings and can include, but may not be limited to, installation of the following:
   1 Soccer goals and nets
   2 Net barrier system
   3 Drinking fountain
   4 Trash Receptacle

B. Related sections can include, but may not be limited to:
   1 Section 01300 - Submittals
   2 Section 02520 - Portland Cement Concrete

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California Department of Transportation Standard Specifications, current edition.

1.03 SUBMITTALS

A. Conform to Section 01300 Submittals and applicable Division One and Division Two specifications, General Conditions and/or Special Provisions.

B. Product Data: Submit catalog Acut sheets of all materials and equipment proposed to be furnished and/or installed under this portion of the work. Include the manufacturer's and distributor's name, sub-contractor as applicable. Insure that the Acut sheets clearly describe the specific product by catalog number and that additional non-specified products that may appear on the same Acut sheet are crossed out where applicable.

C. Samples: Submit samples of colors and finishes for all applicable products and furnishings for selection by District's Representative.

D. Shop Drawings: Submit complete shop drawings for all materials or furnishings requiring field or shop fabrication.

1.04 QUALITY ASSURANCE

A. Review: All equipment shall be reviewed for conformance with the intent of the Contract Documents and accepted by the contractor prior to installation. All site furnishings shall be in a new, "first-class" condition, per the discretion of the District's Representative, prior to Final Acceptance.

1.05 DELIVERY, STORAGE AND HANDLING

A. The contractor is responsible for coordination of the delivery, acceptance, handling and storage of all site furnishings.

B. Store and handle site furnishings as acceptable to the District's Representative and so that work or access of others is not impeded.

C. The contractor shall protect all site furnishings from theft or damage at all times until such items have been accepted by the District.

PART 2 PRODUCTS

2.01 SITE FURNISHINGS Description Manufacturer Model # Finish/Color Distributor/Contact

1.	Soccer Goal	SportsField Specialties, Inc	SC-4905-HS w/ SG2S Safe Mounting System	White powder coated	Sports Field Specialties: Ph (888) 975-3343
2.	20' Tall Netting	-	-	N/A	-
3.	Drinking Fountain	Most Dependable Fountains	440DBSS	Stainless Steel	Sportsfield Specialties, Inc. (Brian Oliver) P.O. Box 231 41155 State Hwy10 Delhi, NY 13753 www.sportsfieldspecialties.com Ph: 949 713-5506

PART 3 EXECUTION

3.01 SEQUENCING AND SCHEDULING

A. Coordinate construction timing of installation of site furnishings in conformance with all other pertinent work.

B. Concrete footings shall conform to requirements of Section 02520 B Portland Cement Concrete unless noted otherwise.

3.02 INSTALLATION

A. Concrete Footings: Install as shown in Drawings unless noted otherwise.

B. Equipment: Conform to layout shown on Drawings. Erect in strict conformance with Details, accepted Shop Drawings, and manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

A. All site furnishings shall be inspected and accepted upon delivery by the Contractor. Final acceptance of site furnishings and locations of site furnishings shall be per the discretion of the District's Representative.

END OF SECTION

SECTION 02900 LANDSCAPING

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, facilities, transportation and services to complete all landscaping and related work as shown on the Drawings and specified herein.

B. Scope of work: The general extent of the landscaping is shown on the Drawings and can include, but may not be limited to the following:
   1 Soil preparation
   2 Fine grading
   3 Turf planting
   4 Tree, shrub, and ground cover planting
   5 Turf Establishment Period
   6 Landscape Maintenance Period

C. Related sections can include, but may not be limited to:
   1 Section 02100 - Site Clearing and Demolition
   2 Section 02810 - Irrigation
   3 Section 02970 - Landscape Maintenance

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. American Joint Committee on Horticulture Nomenclature (AJCHN): Standardized Plant Names

B. American Association of Nurserymen, Inc. (AAN): American Standard for Nursery stock

C. Sunset Western Garden Book, Lane Publishing CO.

D. Agricultural Code of California.

E. State of California Department of Transportation Standard Specifications, current edition.

1.03 SUBMITTALS

A. Conform to requirements of Section 01300 and/or applicable Division One and Division Two specifications, General Conditions and Special Provisions.

B. Plant Materials and Products:
   1 Thirty (30) days prior to planting, submit four (4) copies of documentation that all plants specified have been ordered. Include names and addresses of all suppliers.
   2 Substitutions: If substitutions are required, they shall be brought to the attention of the District's Representative, at time of submittal, for any requested substitutions.

3 Submit four (4) copies of product data or “cut-sheets” for all products proposed for use.

C. Samples: Submit four (4) samples of the following (1 quart size “zip-lock” plastic bag min. each):
1 Soil amendment (with current evaluation and sieve analysis)
2 Bark mulch top dress
3 Topsoil (as applicable, with current fertility and structure analyses)

D. Certificates: Submit “cut-sheets” or other product literature showing certified chemical analysis of the following:
1 All fertilizers
2 All herbicides

1.04 SOURCE/QUALITY ASSURANCE

A. Control of work: Comply with Section 5 of the Standard Specifications.

B. Control of materials: Comply with Section 6 of the Standard Specifications.

C. Contractor shall employ on-site at all times during execution of this Section at least one person who is thoroughly familiar and experienced with the materials and products being installed and proper methods of their installation. Notify the District’s Representative immediately of all changes in supervision.

D. General: Ship plant material and seed with certificates of inspection required by governing authorities. Comply with regulations applicable to plant materials (as applicable).

E. Tree, Shrubs and Plants: Provide trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 “American Standard for Nursery Stock.” Provide healthy, vigorous stock, grown in a recognized nursery in accordance with good horticultural practice and free of disease, insects, etc., larvae, and defects such as girdling or bound roots, knots, sun-scald, injuries, abrasions or disfigurement.

F. Analysis and Standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

G. Quality Review: The District’s Representative shall review all trees and shrubs before planting for compliance with specified requirements for genus, species, variety, size and quantity. District’s Representative retains right to further review trees and shrubs for size and condition of root systems, trunks, stems branches or structure, buds, etc., and to disqualify unsatisfactory or defective material at any time during the progress of work. Remove disqualified trees or shrubs immediately from project site with materials acceptable to District’s Representative.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General:
1 Handle and store all products of this Section in such a manner as to protect them from damage at all times.

2 Storage of products on-site shall be coordinated by the contractor in an orderly manner so as not to unnecessarily impede the work or reasonable use of project site.

B. Plants:
1 Delivery: Coordinate with District's Representative. Provide proper identification for landscape labor force and vehicles at all times while on site.
2 Storage: Coordinate with District's Representative. Provide exposure as required by plant variety and provide wind protection for all plants. Water regularly to maintain thorough moisture in root zone. Temporary, automatic irrigation system will be required at discretion of District's Representative if extended storage period becomes necessary. Protect dark colored plant containers from direct exposure to the sun.
3 Labeling: At least one plant of each variety or type shall be legibly labeled at all times clearly indicating correct plant name as indicated on Drawings. Labels shall be durable with waterproof ink.

C. Fertilizers:
1. Deliver in original, unopened containers with original labels intact and legible which state the guaranteed chemical analysis.

D. Bulk Material:
1 Coordinate delivery and storage of bulk material with District's Representative.
2 Confine materials to neat piles in areas acceptable to the District's Representative.

1.06 PROJECT/SITE CONDITIONS

A. Planting operations shall not be conducted under the following conditions, subject to the discretion of the District's Representative:
1 Freezing weather
2 Excessive heat
3 High winds
4 Excessively wet conditions

1.07 GUARANTY

A. All work executed and all materials provided or used under this Section shall be guaranteed to be free of defects and poor workmanship for a period of one year after Final Acceptance.

B. All plant materials shall be guaranteed to be in a healthy and thriving condition one (1) year after Final Acceptance, unless it can be proven that the unhealthy or non-thriving material is due to causes other than the contractors materials or workmanship.

C. Replace all dead plants and plants not in vigorous condition immediately upon notification by District's Representative during Guaranty Period. Replaced plants shall be subsequently guaranteed by the contractor for an additional year following date of replacement.

D. Repair all defective materials and work as acceptable to the District's Representative during guaranty period.

1.08 TURF ESTABLISHMENT PERIOD

A. Turf Establishment period shall include complete germination of ALL turf and at least two mowings as specified herein, prior to the commencement of the specified Landscape Maintenance Period.

1.09 MAINTENANCE PERIOD

A. Refer to Section 02970 - Landscape Maintenance for information.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be clean on-site material that has been previously stripped from the top 6 inches of original grade or acceptable import material (as applicable). Acceptable topsoil shall be free from "rocks" (rock, stones, rubble, clay clods, etc. over 2" in diameter), roots, toxins, and any other deleterious materials per the discretion of the District's Representative. Refer to Section 02200 – Earthwork.

B. All import topsoil proposed for use shall be submitted to the District's Representative for review and acceptance prior to use. Submit samples and current soil fertility and structure analyses in the quantity previously specified.

2.02 FERTILIZERS

A. General:
1 All fertilizers shall be of an acceptable brand with a guaranteed chemical analysis as required by USDA regulations.
2 All fertilizers shall be dry and (except plant tabs) free flowing.

B. Pre-Plant Fertilizer: Shall be of the following chemical analysis:
1 6% Nitrogen.
2 20% Phosphoric Acid.
3 20% Soluble Potash.

C. Post-Plant Fertilizer: Shall be of the following chemical analysis:
1 16% Nitrogen
2 6% Phosphoric Acid
3 8% Soluble Potash

D. Plant Tabs: Shall be "Gro-Power" 7 gram tabs designed for 12 month slow release with the following chemical analysis by weight (no known equal):
1 12% Nitrogen
2 8% Phosphoric Acid
3 8% Soluble Potash
4 20% Humus
5 4% Humic Acid

6 3.5% Sulfur
7 2% Iron
8 Micronutrients

2.03 SOIL ADDITIVES

A. Soil Amendment

1. Shall be “Super Humus” Compost: As available from BFI Organics Inc. 1995 Oakland Road, San Jose, California, 95131 Ph.: (408) 262-1401 Fx.: (408) 262-0603. Or “Organic Compost” as available from Z-Best Products Inc. 705 Los Esteros Road, San Jose Ca. 95134 Ph.: (408) 934-6152 Fx.: (408) 263-2393. Or acceptable equal. Acceptable material shall meet or exceed the following criteria: a) Gradation: A minimum of 90% of the material shall pass a 2" screen. Material passing shall meet the following criteria:

% Passing Sieve Designation	
85-100	9.51 mm (3/8")
50-80	2.38 mm (No. 8)
0-40	500 Micron (No. 35)

b) Organic Content: Minimum 25% based on dry weight and determined by ash method. Minimum 240 lbs. organic matter per cubic yard of compost.

c) Carbon to Nitrogen Ratio: Maximum 35:1 if material is claimed to be nitrogen stabilized.

d) PH: 5.5-8.0 as determined in saturated paste.

e) Soluble Salts: Refer to manufacturers specification guidelines.

f) Moisture Content: 25-60%

g) Contaminants: Shall be free of glass, metal and visible plastics.

h) Color / Odor: Color shall be dark brown to black. Odor shall be soil-like, (musty or moldy) not sour, ammonia-like or putrid.

B. Soil Conditioner: Shall be “Gro-Power Plus (5-3-1) with 4% Sulfur” available through Gro-Power Inc. Ph.: (800) 473-1307. No known equal.

C. Soil Sulphur: Shall be agricultural grade, 99% pure, pelletized/granular form, not powdered.

D. Iron Sulphate: Shall be “Gro-Power Premium Green” non-staining iron with micro-nutrients, soil penetrant, trace minerals, and humic acids as available through Gro-Power Inc. Ph.: (800) 473-1307. No known equal.

2.04 BARK MULCH TOP DRESS

A. Bark mulch top dress shall be a medium-sized (3/4"-2") decorative chipped wood product free of deleterious and inorganic materials. Material shall be homogenous in appearance, free from sticks or shredded/stringy/fibrous materials.

2.05 PLANTS

A. General

1 All plants shall conform to the species and minimum sizes shown on the Drawings.

2 Quantities shown on the Drawings are for the contractors bidding convenience only. Contractor shall provide plant material to fulfill the intent of the Planting Plan per the discretion of the District’s Representative.

B. Condition: All plants shall conform to the following minimum requirements:
   1 Nursery grown unless otherwise specified
   2 Supplied in appropriate container, balled and burlapped, or bare root as specified on Drawings

2.06 SEED MIXES

A. All seed mixes and seed from which sod was grown shall be, or shall have been:
   1 From current or latest seasons crop
   2 Free of all weed seed and have producers "Statement of Analysis Guarantee"
   3 95% pure by weight with a 90% germination rate
   4 Labeled in conformance to State and U.S.D.A. laws and regulations

B. Mix: Turf seed mix subject to acceptance by the District's Representative, shall be as follows:
   1. Turf: 90/10 Fescue – Blue Mix
      A. 30% Mustand 3 Tall Fescue
      B. 30% Arizona Tall Fescue
      C. 30% Rebel Sentry Tall Fescue
      D. 10% Langra Kentucky Blue Grass
   2. Quality: All seed shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee and dates of test. Prior to seeding at the request of District Representative, the contractor shall provide a letter of certification, original Association of Official Seed Analysts (AOSA) seed test results.

   Seed mix shall be as available from: Delta Blue Grass Co. 1-800-637-8873

2.07 TURF SOD

A. Sod shall be as follows:
   1. Delta mow free blend
      a. 30% Spantan Hard Fescue
      b. 30% Sheeps Fescue
      c. 20% Victory II Chewings Fescue
      d. 20% Jasper E Creeping Red Fescue

   2 Sod shall be large roll cut or specify size of cut
   3 Sod shall have a peat or sand / peat base.
   4. Sod is available at:
      a. Delta Bluegrass
      b. West Coast Turf
      c. Pacific Sod

2.08 HERBICIDES

A. Pre-emergent: "Ronstar-G" pelletized, "Surflan" liquid, or acceptable equal.

B. Other: All other herbicides shall be accepted by District's Representative prior to use.

2.09 TREE STAKES AND TIES

A. Tree stakes and ties shall be as specified on Drawings.

2.10 OTHER MATERIALS

A. Provide all other materials necessary to complete landscaping work as shown on Drawings and specified herein.

B. All products and materials, including those specified above, shall be new, first quality as acceptable to the District's Representative.

PART 3 EXECUTION

3.01 TOPSOIL INSTALLATION

A. Subgrade soil shall be cut or filled to the depth required such that after placement of required amount of topsoil and specified preparation procedures have been accomplished, specified finish grades will be attained.

B. All subgrade soil shall be cross-ripped to a twelve (12) inch minimum depth prior to placement of accepted topsoil. Refer to Preparation (3.02) below. – Confirm you want this step and coordinate with grading specifications.

C. All planting areas shall contain a minimum of six (6) inches of acceptable topsoil. As applicable and where needed; only previously accepted topsoil shall be installed.

D. Refer to Section 02200 - Earthwork for rough grading for information.

3.02 PREPARATION

A. Make provisions and take necessary precautions to protect all existing and new improvements from damage during execution of this work.

B. Initial Preparations:
   1 Prior to any work in this section, thoroughly cross-rip (second rip shall be performed at 90 degrees to first rip) all planting area soil to be cross-ripped to a depth of twelve (12) inches.
   2 Remove all rocks, sticks, clods, debris, and other deleterious materials over one-half (1/2) inch in diameter from top 6 inches of soil.
   3 Float, rake, and roll all planting areas as necessary to establish smooth, clean, non-yielding planting beds.
   4. Prevent erosion of the soil between completion of soil preparation and planting.

C. Concrete Mowbands and Wood Header Boards: Install per Drawings and repeat initial preparations described above as necessary.

3.03 SOIL PREPARATION / FINISH GRADES

A. Thoroughly roto-till the following additives into the top six (6) inches of all planting area soil at the following rates per 1,000 square feet.

   1 6 Cubic Yards Soil Amendment

2 200 Pounds Soil Conditioner
3 35 Pounds Pre-Plant Fertilizer
4 20 Pounds Soil Sulfur

The above additive recipe shall be used for bid purposes only. A site specific fertility test shall be performed by the District's Representative (at District's cost) after rough grading (and applicable topsoil placement or replacement) operations are complete. The results of the test(s) shall be reviewed by the District Representative and direction for amendment additives ratio will be provided. Any variance from "the as-bid" additives or quantities shall be handled by specified procedures relating to changes in the work.

After additives are fully incorporated into the soil, the District's Representative shall perform another test (at District's cost) to check conformance with the newly recommended materials and quantities. If deficiencies are found, the contractor shall be soley responsible for the cost of adding deficient material as necessary and all re-testing required to reach and prove conformance.

The contractor shall notify the District's Representative a minimum of 2 working days prior to the completion of finish grading and soil preparation operations so that fertility testing can be arranged. Contractor shall also schedule seven (7) working days after soil samples have been taken to allow for receipt and evaluation of soil tests at no cost or delay to the project.

B. Planting Area Finish Grades

1 After tilling in additives and re-compaction to 85% relative compaction, rake all planting areas smooth and set finish grades as follows.
2 After soil preparation, finish grades of all planting areas shall be one (1) inch below all adjacent paving, headers, utility boxes, irrigation boxes etc. Finish grade slopes shall be consistent.
3 All drainage structures (i.e. catch basins, area drains, concrete swales, etc) shall be flush with finish grade to allow for proper drainage. Soil shall be sloped consistently from spot elevations provided to drain.
4 In planting areas to receive mulch, depth of mulch shall taper within three (3) feet of paving edge to a depth from 3" to 1" at edge of pavement.
5 Irrigation head elevation relative to finish grade shall be installed per details.

3.04 TURF SEED INSTALLATION

A. Soil preparation and fine grading shall be as previously specified. Prior to seed installation, irrigation shall be tested, coverage test approved and be fully operational. The turf bed shall be reviewed and accepted by the District's Representative prior to seed installation.

B. Seed to be installed using a mechanical drill seeder. Use Brillion type or approved equal.
C. Provide and install temporary fencing around all completed seeded areas. Use 6' tall construction fencing specification for project.

D. Refer to Section 02970 for mowing and maintenance procedures. As applicable, the contractor shall remove turf, re-grade any areas that have been rutted from mowers (or otherwise damaged) and replace turf to the satisfaction of the District's

Representative.

E. Until project Final Acceptance, should it become evident that certain sod areas have not grown, re-seed the areas immediately with seed of the same type as originally used and maintain as specified.

3.04 SOD INSTALLATION

A. Soil preparation and fine grading shall be as previously specified. Prior to sod installation, roll turf bed until a smooth, firm surface with uniform grade has been produced. The turf bed shall be reviewed and accepted by the District's Representative prior to sod installation.

B. Sod shall be unrolled into place with careful attention to tight joints with no overlapping or stretching. Stagger the joints in each new row like rows of bricks (18" minimum stagger). Use a sharp knife for shaping around trees, flower beds or borders. Immediately after placement, soak sod areas with water. Roll sod after watering to smooth out bumps and air pockets, and roll again if sod is not even. Water frequently for the first 10 - 14 days, enough water to saturate soil to a depth of 4". DO NOT LET SOD DRY OUT.

C. Provide and install temporary fencing around all completed sod areas. Use Tensar or Mirafi webbed plastic rolled snow fencing 4' in height with metal stakes at 8' o.c. or acceptable equal.

D. Refer to Section 02970 for mowing and maintenance procedures. As applicable, the contractor shall remove sod, re-grade any areas that have been rutted from mowers (or otherwise damaged) and replace sod to the satisfaction of the District's Representative.

E. Until project Final Acceptance, should it become evident that certain sod areas have not grown, re-sod the areas immediately with sod of the same type as originally used and maintain as specified.

3.06 TURF ESTABLISHMENT PERIOD

A. Prior to commencement of specified maintenance period, **all** turf shall be completely germinated and established, and a minimum of two (2) mowings shall have taken place as follows:

1 First mowing shall take place when turf has reached a height of three inches (3") and turf shall be mown to two inches (2"). Submit written request to the Owner's Representative for acceptability of initiating first mowing.

2 Thereafter, turf shall be mown weekly until all turf is sod-like in appearance and quality, and all other contract requirements shall be fulfilled prior to allowing the maintenance period to commence.

3 Contractor shall receive written notice of acceptance of turf establishment to commence with landscape maintenance period.

4 District Representative shall approve any phasing of turf areas to commence into the maintenance period. Areas may be approved in stages but will require contiguous areas of turf that are completely established.

3.07 TREE, SHRUB AND GROUND COVER PLANTING

A. These areas shall receive topsoil and soil amendments per section 3.01, 3.02, and 3.03 prior to commencing with tree, shrub and ground cover planting. Irrigaiton shall also be installed, reviewed, tested, coverage test approved and operational prior to planting.

B. Layout: Coordinate lay-out of plants with District's Representative for review and acceptance.

C. Plant Pit Excavation:
   1 Excavate pits to sizes indicated in Drawings.
   2 Thoroughly scarify all sides of plant pits to remove "auger slick" and encourage root penetration.

D. Set trees and shrubs in pit on tamped backfill base as per Details. Set plumb and face for best appearance. Thoroughly scarify all plant rootballs to eliminate any circling roots and to encourage root growth. Set plant so root crown will level with or be slightly above surrounding grade after settlement.

E. Backfilling:
   1 Backfill mix for 1 gallon size and larger shall consist of 100% native site soil with plant tabs added per manufacturers recommendations.
   2 Tamp backfill mix under and around rootballs.
   3 Flood plant pit when half backfilled; allow to drain.
   4 Complete backfilling. Tamp as necessary, do not over compact.

F. Watering:
   1 Thoroughly water plants immediately after planting.
   2 Construct water basins as specified in Drawings.

G. Finish Grade Restoration: Restore finish grades by hand raking. Dispose of excess subgrade soil.

3.08 TREE STAKING

A. Stake trees as shown in Drawings.

B. Set stakes plumb, without damage to rootball and sufficiently deep to provide necessary support.

C. Tree ties shall be tied loosely enough to allow movement, yet taut enough to support tree.

3.09 HERBICIDE APPLICATION

A. Apply in accordance with manufacturers' recommendations.

B. Apply pre-emergent herbicide to soil prior to placement of bark mulch top-dress.

3.10 BARK MULCH TOP DRESS

A. Apply three (3) inches of specified bark mulch top dress to all non-turf planting areas and other areas as may be specified in the Drawings.

B. Rake bark mulch top dress evenly to create a uniform surface and pull bark mulch

top dress away from trunks or stalks of plants 1"-2".

C. Bark mulch does not dictate finish grade in planting areas. Mulch to be added to finish grade. Refer to 3.02.

3.11 OTHER MATERIALS

A. Header Board: Install as shown in the drawings.

B. Root Barriers: Install as shown in the drawings.

C. Jute Netting: Install in planting areas as shown on the drawings. Install prior to planting Stake 36” on center. Install plants and mulch after netting.

3.12 FIELD QUALITY CONTROL

A. The District’s Representative shall review and accept the following prior to contractor proceeding with subsequent work:

1 Preparation - At completion of finish grading and prior to planting, grading tolerances and soil preparation shall be checked for conformance to Construction Documents.

2 Layout - Layout of plants, header board, and other major items shall be as directed and/or accepted by the District’s Representative.

3 Pre-maintenance review - At completion of this Section, work shall be reviewed to check conformance with Construction Documents. Acceptance shall mark beginning of the specified maintenance period. If acceptance is not given, a punch-list of items requiring attention will be issued to the contractor. One more review will be allowed after contractor certifies in writing that the punch-list has been completed. Punch-list shall be completed to the satisfaction of the District’s Representative prior to commencement of the Specified Maintenance Period.

B. All costs incurred from repeat reviews required due to contractor not being prepared or non-conformance with Construction Documents shall be back charged to the contractor.

END OF SECTION

SECTION 02970 LANDSCAPE MAINTENANCE

PART 1 GENERAL

1.01 SUMMARY

A. Furnish all labor, materials, facilities, transportation and services to complete all landscape maintenance and related work as shown on the Drawings and specified herein.

B. Scope of work: The general extent of landscape maintenance can include, but may not be limited to the following:
   1 Tree, shrub, ground cover and turf areas
   2 Irrigation systems
   3 General site clean-up

C. Related sections can include, but may not be limited to:
   1 Section 02810 - Irrigation
   2 Section 02900 - Landscaping

1.02 REFERENCES AND REGULATORY REQUIREMENTS

A. State of California Department of Transportation Standard Specifications, current edition.

1.03 QUALITY ASSURANCE

A. Control of work: Comply with Section 5 of the Standard Specifications.

B. Control of materials: Comply with Section 6 of the Standard Specifications.

C. The Maintenance Contractor shall be experienced in horticulture and landscape maintenance, practices and techniques, and shall provide sufficient number of workers with adequate equipment to perform the work during the Landscape Maintenance Period.

1.04 LANDSCAPE MAINTENANCE PERIOD

A. Landscape Maintenance Period shall be **90** calendar days.

B. Continuously maintain the entire project area during the progress of the work, during the specified Landscape Maintenance Period or until Final Acceptance of the project by the District's Representative.

C. Landscape Maintenance Period shall not start until all elements of construction, planting and irrigation for the entire project are in accordance with Contract Documents. A prime requirement is that all turf and landscape areas shall be planted and that all turf areas shall show an even, healthy stand of "sod-like" turf which shall have been mown twice. If such criteria is met to the satisfaction of the District's Representative, a written notification shall be issued to establish the effective beginning date of Landscape Maintenance Period. Additionally, all elements contained on the Pre-maintenance Punch-list shall have been completed to the satisfaction of the District's Representative.

The Landscape Maintenance period shall, per the discretion of the District's Representative, be allowed to start and finish at different times in different areas as applicable.

D. Any day of improper maintenance, as determined by the District's Representative, shall not be credited as an acceptable Landscape Maintenance Period day. The Landscape Maintenance Period shall be extended on a day-for-day basis should this occur until proper maintenance, as determined by the District's Representative, is being performed.

E. Contractor shall secure the project site against trespass, vandalism or theft during the Landscape Maintenance Period subject to the discretion of the District's Representative.

1.05 GUARANTY

A. All work executed under this section shall be guaranteed against any and all poor, inadequate or inferior materials and/or workmanship, as determined by the District's Representative, for the entire Landscape Maintenance Period and for a period of one year after Final Acceptance of project.

B. The contractor shall install all replacement material in conformance with the Contract Documents.

1.06 FINAL ACCEPTANCE

A. Upon completion of all project work, including Landscape Maintenance Period, the District's Representative will, upon written request from the contractor (2 working day minimum notice), make an observation to determine conformance with the Contract Documents.

B. If, at the final project observation, work is found at variance with the Contract Documents, or is otherwise unacceptable, the District's Representative shall issue a punch-list of items requiring attention to the contractor. The contractor shall repair, replace or otherwise correct all non-compliant work, continue Landscape Maintenance Period, and make another written request to the District's Representative to verify punch-list completion. If punch-list is found to be incomplete, or if site is still found to be unacceptable, the contractor shall be back-charged as necessary for all additional observations required to issue Final Acceptance. All replacement materials and installations shall be in accordance with the Contract Documents. Remove rejected work and materials immediately from project. Prior to Final Acceptance, contractor shall provide the District's Representative with all Record Drawings and written Guaranty Statements in accordance with the Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS

A. All materials used shall either conform to Specifications in other sections or shall otherwise be acceptable to the District's Representative. The District's Representative shall be given a monthly record of all herbicides, insecticides and disease control chemicals used.

B. Maintenance fertilizer: shall be "Gro-Power High Nitrogen" as available through Gro-Power, Inc. (800) 473-1307, and shall contain the following chemical analysis (or approved equal):

14% nitrogen 4% phosphoric acid 9% potash

PART 3 EXECUTION

3.01 MAINTENANCE

A. General: Proper maintenance, including watering, weeding, mowing, edging, fertilization, repairing and protection shall be required until entire project is finally accepted, but in any event for a period of not less than the specified Landscape Maintenance Period.

B. Watering: Water appropriately (based on plant type) to insure vigorous and healthy growth until work is accepted. Water or irrigate in a manner to prevent runoff or erosion. When hand watering, use a "water wand" to break the water force.

C. Weeding: Entire project site shall be kept free of weeds at all times. Control new weed growth with pre-emergent herbicides. If weeds develop, use legally approved herbicides.
1 No herbicide shall be used without the District's Representative prior consent. Use only herbicides in accordance with manufacturers recommendations. If selective herbicides are used, extreme caution shall be observed so as not to damage any other plants. Spraying shall be done only under windless conditions.
2 Disease and Pest Control: Disease and insect damage shall be controlled by the use of fungicides and insecticides, subject to the prior consent of the District's Representative. Mole and gopher mitigation shall be accomplished using legal means other than poison baits.

D. Tree "rings" in turf areas: Remove turf from around each tree to create a four (4) foot diameter turf free area.

E. Pruning:
1 Trees: Prune trees to select and develop permanent scaffold branches; to eliminate narrow v-shaped branch forks that lack strength; to reduce potential toppling and wind damage by thinning out crowns; to maintain a natural appearance and to balance crown with roots. Prune only as directed by the District's Representative.
2 Shrubs: The objectives of shrub pruning are the same as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the design.
3 All pruning cuts shall be made to lateral branches, buds or near flush with the trunk. "Stubbing" or heading cuts shall not be permitted.
4 Only skilled workers shall perform pruning work in accordance with standard horticultural pruning practices. Remove from the project all pruned branches and material. Remove and replace any plant material excessively pruned or malformed resulting from improper pruning practices at no additional cost to the

District.

F. Staking: Stakes shall remain in place through the maintenance and guaranty periods and shall be periodically inspected and adjusted by the contractor to prevent rubbing that causes bark wounds, loosen for proper growth or other appropriate reasons.

G. Protection: The contractor shall maintain protection of all planting areas until Final Acceptance. Damaged areas shall be repaired or replaced at the contractors expense. Install a temporary maintenance fence (4' blaze orange with steel driven stakes or acceptable equal) around all turf areas for the entire length of Landscape Maintenance Period.

H. Trash: Remove trash in all project areas plus adjacent pedestrian walkways and parking areas.

I. Replacement: Refer to the Guaranty portion of this Section.

J. Fertilizing: Immediately after completion of planting, fertilize all turf planting areas with specified maintenance fertilizer at rates recommended by the manufacturer for the specific planting type. Repeat application every thirty (30) calendar days until end of specified Landscape Maintenance Period.

3.02 TURF MAINTENANCE

A. Mowing and Edging
   1 Turf shall not be allowed to exceed three (3) inches in height and shall not be mown shorter than one and one half (1.5) inches in height. Turf shall be well established, free of bare spots and weeds, and of a "sod-like" quality to the satisfaction of the District's Representative prior to Final Acceptance.
   2 Excess grass clippings shall be picked up and removed from the site and premises.
   3 Let turf areas dry out enough so that mower wheels do not skid, tear or mark the surface.
   4 Edges shall be trimmed at least twice monthly or as needed for neat appearance. Clippings shall be completely removed and disposed of.

B. Watering: Turf shall be watered at such frequency as weather conditions require to replenish soil moisture below root zone and to establish healthy turf areas.

C. Disease Control: Control all turf diseases throughout the Landscape Maintenance Period with legally approved fungicides and herbicides.

D. Weed Control: Control all broad leaf weeds with selective, legally approved herbicides. No herbicide shall be used without the prior consent of the District's Representative.

E. Replacement: At or near the end of specified Landscape Maintenance Period, a final observation of turf areas shall be made. Remove deceased areas and unhealthy stands of turf from the site; do not bury into the soil. Replant all applicable areas with materials and in a manner acceptable to the District's Representative.

3.03 IRRIGATION SYSTEM

A. System Observation: The contractor shall visually check all systems for proper operation on a weekly basis and make all necessary repairs. All equipment shall be adjusted as necessary for proper coverage and function.

B. Controllers: Program automatic controllers for appropriate seasonal water requirements. Perform a full instruction session in the presence of the District's designated maintenance personnel demonstrating programming, system testing, trouble shooting, etc. Include instructions on how to turn off system in case of emergency.

C. Repairs: All repairs made to the irrigation system shall be at the contractors expense. All repairs shall be made within twenty-four (24) hours.

3.04 FIELD QUALITY CONTROL

A. Final Review: At, or near the end of specified Landscape Maintenance Period, the contractor shall make written request for a final review and the work shall be reviewed for conformance with the Construction Documents. If work is not accepted at time of review, a punch-list of items requiring attention will be issued to the contractor for correction. The Landscape Maintenance Period shall be extended at contractors sole cost as necessary. Upon completion of the punch-list the contractor shall again make written request for review. If, upon re-visiting the site, it is found that the punch-list has not been completed, the review shall end and the contractor shall be back-charged for all additional visits.

B. All re-inspections required due to contractor not being prepared or non-conformance with the Construction Documents shall be back charged to the contractor.

C. Final Acceptance: When work is found to be in conformance with the Contract Documents, subject to the discretion of the District's Representative, a statement of Final Acceptance shall be issued to the contractor.

END OF SECTION

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish all labor, materials, apparatus, tools, equipment, transportation, temporary construction and special or occasional services as required to make a complete working electrical installation, as shown on the drawings or described in these specifications.

1.02 RELATED SECTIONS

A. Perform following work, in accordance with appropriate sections of the specifications cited, where and as necessary to furnish a complete, working electrical installation.
   1. Miscellaneous Metal Work: Include fittings, brackets, supports, welding and pipe as required for raceway and disconnect switch support.

1.03 REFERENCES

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean the latest edition of such publications adopted and published prior to submittal of the bid proposed. Such codes or standards shall be considered a part of this specification as though fully repeated herein.

B. When codes, standards, regulations, etc., allow work of lesser quality or extent than is specified under this Division, nothing in said codes shall be construed or inferred as reducing the quality, requirements or extent of the drawings and specifications.

C. California Administrative Code (CAC) Title 24, Part 3, Basic Electrical Requirements, State Building Standards Electrical Code

D. National Fire Protection Association (NFPA).

E. Equipment and materials specified under this Division shall conform to the following standards where applicable:
   1 UL Underwriters' Laboratories
   2 ASTM American Society for Testing Materials
   3 CMB Certified Ballast Manufacturers
   4 IPCEA Insulated Power Cable Engineer Assoc.
   5 NEMA National Electrical Manufacturer's Assn.
   6 ANSI American National Standards Institute
   7 ETL Electrical Testing Laboratories

F. All base material shall be ASTM and/or ANSI standards.

G. All electrical apparatus furnished under this Section shall conform to National Electrical Manufacturers Association (NEMA) standards and the NEC and bear the Underwriters' Laboratories (UL) label where such label is applicable.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Where items are noted as "or equal" a product of equal design, construction and performance will be considered. Contractor must submit all pertinent test data, catalog cuts and product information required to substantiate that the product is in fact equal. Refer to Division 1, General Requirement for additional requirements. Only one substitution will be considered for each product specified.

C. Submittals shall consist of detailed shop drawings, specifications, "catalog cuts" and data sheets containing physical and dimensioned information, performance data, electrical characteristics, material used in fabrication , material finish and shall clearly indicate those optional accessories which are included and those which are excluded. Furnish one reproducible and 4 prints of each shop drawing.

1.05 CUTTING, PAINTING AND PATCHING

A. Structural members shall in no case be drilled, bored or notched in such a manner that will impair their structural value. Cutting of holes, if required, shall be done with core drill and only with the approval of the Architect.

B. Cutting and digging shall be under the direct supervision of the General Contractor. Include as necessary for the work in this section.

C. The contractor shall be responsible for returning any surface from which he has removed equipment or devices to the condition and finish of the adjacent surfaces.

1.06 SUPERVISION

A. Contractor shall personally or through an authorized and competent representative constantly supervise the work from beginning to completion and, within reason, keep the same workmen and foreman on the project throughout the project duration.

1.07 PROTECTION

A. Keep conduits, junction boxes, and outlet boxes, and other openings closed to prevent entry of foreign matter: cover fixtures, equipment, and apparatus and protect against dirt, paint, water, chemical, or mechanical damage, before and during construction period. Restore to original condition any fixture, apparatus, or equipment damaged prior to final acceptance, including restoration of damaged shop coats of paint, before final acceptance. Protect bright finished surfaces and similar items until in service. No rust or damage will be permitted.

1.08 EXAMINATION OF SITE

A. The Contractor shall visit the site and determine the locale, working conditions, conflicting utilities, and the conditions in which the electrical work will take place. No allowances will be made subsequently for any costs which may be incurred because of any error or omission due to failure to examine the site and to notify the Engineer of any discrepancies between drawings and specifications and actual site conditions. Schedule visits at least 1 week in advance with Owner's Maintenance staff.

1.09 ENVIRONMENTAL REQUIREMENTS

A. After other work such as sanding, painting etc. has been completed, clean lighting

fixtures, panelboards, switchboards, and other electrical equipment to remove dust, dirt, and grease, or other marks, and leave work in clean condition.

1.10 VOLTAGE CHECK

A. At completion of job, check voltage at several points of utilization on the system which has been installed under this contract. During test, energize all loads installed. Measure 3-Phase voltages and note percentage differences. Submit report to Engineer. Include copy in O&M Manual.

1.11 TESTS

A. Perform tests as specified to prove installation is in accordance with contract requirements. Perform tests in the presence of the Engineer and furnish test equipment, facilities, and technical personnel required to perform tests. Tests shall be conducted during the construction period and at completion to determine conformity with applicable codes and with these Specifications. Tests, in addition to specific system test described elsewhere, shall include:
   1. Insulation Resistance: All 600 volt insulation shall be tested at 2500 volts D.C for one minute on all feeder and branch circuit conductors including the neutral, and make a typed
      record of all readings to be included in the maintenance instructions. The direct current amperes shall be recorded at start and at one minute. The value shall be declining and not more than one microampere.
   2 Circuit Continuity: Test all feeder and branch circuits for continuity. Test all neutrals for improper ground.

B. Equipment Operations: Test motors for correct operation and rotation.

C. Product Failure: Any products which fail during the tests or are ruled unsatisfactory by the Engineer shall be replaced, repaired, or corrected as prescribed by the Engineer at the expense of the Contractor. Tests shall be performed after repairs, replacements, or corrections until satisfactory performance is demonstrated.

D. Miscellaneous: Include all test results in the maintenance manual. Cost, if any , for all tests shall be paid by the Contractor.

1.12 DRAWINGS

A. Layout: General layout shown on the drawing shall be followed except where other work may conflict with the drawings.

B. Accuracy:
   1 Drawings for the work under this section are diagrammatic.
   2 Contractor shall verify lines, levels, and dimensions shown on the drawings and shall be responsible for the accuracy of the setting out of work and for its strict conformance with existing conditions at the site.
   3 Contractor shall insure reconnection of existing equipment and circuits affected by contract demolition whether or not reconnection is specifically shown on the contract documents.

1.13 PROJECT RECORD DRAWINGS

A. Refer to General Conditions for contractual requirements. Provide project record drawings as required by the General Provisions of the specifications and as required

herein. Such drawings shall fully represent installed conditions including actual locations of outlets, true panelboard connections following phase balancing routines, correct conduit and wire sizing as well as routing, revised fixture schedule listing the manufacturer and products actually installed and revised panel schedule. All changes to drawings shall be made by qualified draftspersons to match existing linework and lettering as close as possible. When all the changes have been made to the trade drawings, contractor shall produce one (1) full size (E-Size) updated set of trade drawing(s) utilizing AutoCad 2000 or newer and supply one (1) set of Compact Discs (CD's) reflecting same.

1.14 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Furnish to the Engineer four (4) hard back 3-ring binders containing all bulletins, operating and maintenance instructions and part lists and other pertinent information for each and every piece of equipment furnished under this specification. Include service telephone numbers. Each binder shall be indexed into sections and labeled for easy reference. Bulletins containing more information than the equipment concerned shall be properly stripped and assembled.

B. At the time of completion, a period of not less than eight hours shall be allotted by the Contractor for instruction of building operating and maintenance personnel in the use of all systems. All personnel shall be instructed at one time, the Contractor making all necessary arrangements with manufacturer's representative. The equipment manufacturer shall be requested to provide product literature and application guides for the user's reference. Costs, if any for the above services shall be paid by the Contractor.

1.15 WARRANTIES

A. Furnish to the Engineer four (4) hard back 3-ring binders containing all warranties of every piece of equipment furnished under this specification. Include terms and limitations of warranties, contact names, addresses, and telephone numbers of manufacturer. Each binder shall be indexed into sections and labeled for easy reference for each equipment warranty.

1.16 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. All special tools for proper operation and maintenance of the equipment provided under this Section shall be delivered to the District's representative

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Preparation, handling, and installation shall be in accordance with manufacturer's written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Coordinate work and cooperate with others in furnishing and placing this work. Work to reviewed shop drawings for work

done by others and to field measurements as necessary to properly fit the work.

B. Conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 16050 BASIC MATERIAL AND METHODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit, raceways and fittings.

B. Wires and Cables for 600 Volts and less.

C. Wire connections and devices.

D. Outlet boxes.

E. Pull and junction boxes.

F. Disconnect Switches and Fuses

G. Supporting Devices.

H. Identifying Devices.

I. Grounding and Bonding

1.02 REFERENCES

A. NECA (INST) - Standard of Installation; National Electrical Contractors Association

B. NFPA 70 - National Electrical Code - latest edition

1.03 SUBMITTALS

A. Submit in accordance with the requirements of Section 01300 the following items:

B. A list of conduit types indicating where each type of conduit will be used. Indicate conduit manufacturers and fittings to be used.

C. Wires and Cables.

D. Wiring Devices and Plates

E. Nameplates, including engraving schedules where engraved plates are specified.

F. Fused disconnect switches.

1.04 QUALITY ASSURANCE

A. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.05 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated; 1995.

B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated; 1995.

C. ANSI C80.5 - Rigid Aluminum Conduit; 1995.

D. NECA (INST) - Standard of Installation; National Electrical Contractors Association; 1993.

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies; 1993.

F. NFPA 70 - National Electrical Code - latest edition.

PART 2 PRODUCTS

2.01 CONDUIT, RACEWAYS AND FITTINGS

A. Rigid Steel Conduit
   1 Rigid steel conduit shall be full weight, pipe size, finished inside and out by hot-dip galvanizing after fabrication, and shall conform with ANSI C80.1 and UL.
   2 Couplings shall be electroplated steel.
   3 Insulating Bushings: Threaded polypropylene or thermo-setting phenolic rated 150°C minimum.
   4 Insulated grounding Bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw.
   5 Insulated Metallic Bushings: Threaded cast malleable iron body with plastic insulated throat rated 150°C.
   6 Running threads are not acceptable.

B. Non-Metallic Conduit
   1. Schedule 40 PVC underground is an acceptable conduit material.

2.02 WIRING AND CABLES

A. Acceptable manufacturers: CABLEC, Triangle, or equal.

B. Conductor material: All wire and cable shall be insulated, stranded copper conductors. Soft drawn annealed copper wire 98% conductivity, bearing the UL label.

C. Minimum conductor size: AWG No. 12 for all power and lighting branch circuits. AWG No. 14 for all signal and control circuits.

D. Color Coding: System conductors shall be identified as to voltage and phase connections by means of color impregnated insulation or approved colored marking tape as follows:

E. For 120/208 volt, 3 phase, 4 wire systems.
   1 Phase A - Black
   2 Phase B - Red
   3 Phase C - Blue
   4 Neutral - White
   5 Ground - Green

F. for 277/480 Volt, 3 phase, 4 wire system
   1 Phase A - Brown
   2 Phase B - Orange
   3 Phase C - Yellow
   4 Neutral - White
   5 Ground - Green

G. Secondary Wire and Cable, 0 to 600 Volts;
   1. NEC Type THWN, or Type XHHW for feeders and branch circuits in wet or dry locations. NEC type THHN for branch circuits in dry locations.

2.03 WIRE CONNECTION

A. Wire Joints: Wires in sizes from #18 to #8 AWG, stranded conductor, with insulation rated 105 degrees C. or less shall be joined with electrical spring connectors of three part construction incorporating a non-restricted, zinc coated steel spring enclosed in a steel shell with an outer jacket of vinyl plastic with a flexible insulating skirt.

B. Mechanical Compression Connectors and Taps: Stranded conductors from #6 AWG to 750 Kcmil shall be joined or tapped using bolted pressure connectors having cast bronze compression bolts. Fittings shall be wide range-taking and designed to facilitate the making of parallel taps, tees, crosses or end-to-end connections. Split-bolt connectors will not be acceptable.

C. Fixture Connections: Splice fixture wire to circuit wiring with solderless connectors as specified above in paragraph A.

D. Terminating Lugs: Conductors from size No. 6 AWG to 750 MCM, copper, shall be terminated using tin plated hydraulically operated crimping tools and dies as stipulated by the lug manufacturer. Lugs shall be 3M "Scotchlok" series 30014, Burndy Type Ya-L series, or equal.

E. Splicing and Insulating Tape (600 volts and below): General purpose electrical tape shall be suitable for temperatures from minus 18 degrees C to 105 degrees C, shall be black, ultraviolet proof, self-extinguishing, 7 mil thick vinyl with a dielectric strength of 10,000 volts. Apply 4 layers half-lap with 2” over-lay on each conductor.

F. Insulating Putty (600 volts and below): Pads or rolls of non-corrosive, self-fusing, one eight inch thick rubber putty with PVC backing sheet. Putty shall be suitable for temperatures from minus
17.8 degrees C to 37.8 degrees C and shall have a dielectric strength of 570 volts/mil minimum.

G. Insulating Resin: Two Part liquid epoxy resin with resin and catalyst in pre measured, sealed mixing pouch. Resin shall have a set up time of approximately 30 minutes at 21.1 degrees C, and shall have thermal and dielectric properties equal to the insulation properties of the cables immersed in the resin.

H. Terminal Strip Connectors: Terminate wire in locking tongue style, pressure type, solderless lug where applicable.

2.04 WIRING DEVICES

A. Switches: Specification grade, flush mounting, quite operating AC type, with toggle operator, heat resistant plastic housing and self grounding metal strap. Silver or silver alloy contact. Rated 20A at 120-277V and capable of full capacity on tungsten or fluorescent lamp load. Design for up to #10 wire. Use single pole, double pole, three-way, four-way, lighted, pilot, or keyed type, as indicated on drawings or required. Provide ivory color unless otherwise noted. Manufacturer: Leviton, Arrow Hart, or Hubbell.

B. Receptacles: Specification grade, flush mounting receptacles with nylon face. High grade brass allow triple wipe contacts. Provide 2 pole, 3 wire grounding type with a green colored brass hexagonal equipment grounding screw. Grounding shall be rivetless, single piece brass with no mechanical connections in the primary path between point of ground wire termination and ground blades. Use 20A rated receptacles, ivory in color, unless otherwise noted. Manufacturer: Leviton, Arrow Hart, or Hubbell.

1 Isolated Ground - Provide separate path to ground, with orange faceplate or triangle to indicated isolated ground
2 GFCI - Equipped with diagnostic indicator for miswiring.
3 Weatherproof - GFCI type, outdoor rated, with while in use cover

C. Faceplates: Provide nylon cover faceplates for wall receptacles, outlets, and switches. Include thermal mounting screws that match plate and device color. Manufacturer: Leviton, Arrow Hart, or Hubbell.

2.05 OUTLET BOXES

A. Standard outlet boxes: Galvanized, die formed or drawn steel, knock-out type of size and configuration best suited to the application indicated on the plans. Minimum box size, 4 inch square by 1-1/2 inch deep, indoor use. FS cast boxes are required for outdoor use.

B. Cast Metal Outlet Boxes: FS cast boxes are required for outdoor use. Four-inch round, galvanized cast iron alloy with threaded hubs and mounting lugs as required. Boxes shall be furnished with cast cover plates of the same material as the box and neoprene cover gaskets. Thomas and Betts, Crouse-Hinds VXF series, Appleton JBX series or equal.

C. Conduit Outlet Bodies: Cadmium plated, cast iron alloy. Obround conduit outlet bodies with threaded conduit hubs and neoprene gasketed, cast iron covers. Outlet bodies shall be used to facilitate pulling of conductors or to make changes in conduit direction only. Splices are not permitted in conduit outlet bodies. Thomas and Betts, Crouse Hinds Form 8 Condulets, Appleton form 35 Unilets, or equal.

2.06 PULL AND JUNCTION

A. Sheet Metal Boxes: Use standard outlet or concrete ring boxes wherever possible; otherwise use minimum 15 gauge get metal, NEMA 1 boxes, sized to code requirements with covers secured by cadmium plated machine screws located 6 inches on centers. Circle AW Products, Hoffman Engineering Co., or equal.

B. Cast Metal Boxes: Use standard cast malleable iron outlet or device boxes wherever possible; otherwise use cadmium plated, cast malleable iron junction boxes with bolt-on, interchangeable conduit hub plates with neoprene gaskets. Appleton RS series; Crouse Hinds RS series, or equal.

2.07 DISCONNECT SWITCHES

A. All disconnect switches shall be heavy-duty type and have the number of poles, voltage rating, and horsepower rating as required by the motor or equipment. Disconnect switches shall be in enclosures to suit conditions, NEMA 3R for outdoor and NEMA 1 for indoor. Disconnect switches shall be fused unless otherwise noted on the drawings. As manufactured by: Square D - Class 3110, ITE Seimens, or equal.

2.08 FUSES

A. Dual Element, Time Delay, UL Class RK5. Rejection type. Size and Voltage as indicated on equipment. Bussman, Little Fuse, or approved equal.

2.09 ELECTRICAL SUPPORTING DEVICES

A. Concrete Fasteners: Phillips "Red-Head" or equal, self drilling expansion type concrete

anchor.

B. Conduit Straps: Hot-dip galvanized, cast malleable iron, two hole type strap with cast clamp-backs and spacers as required. OZ/Gedney No. 14-50G strap and #141G spacer; Efcor No. 231 strap, and No.131 spacer; or equal.

C. Construction Channel: 1-1/2 inch by 1-1/2 inch 12 gauge galvanized steel channel with 17/32 inch diameter bolt holes, 1-1/2 inch on center, in the base of the channel. Kindorf 905 series, Unistrut P-1000-HS or equal.

D. Cable Ties and Clamps: Thomas and Betts Co. "Ty-Raps" Panduit "Pan-Ty" or equal one piece, nylon, reusable type lashing ties.

E. Fasteners (General) : Wood screws for fastening to wood. Machine screws for fastening to steel. Toggle bolts for fastening to hollow concrete block, gypsum board, or plaster walls. Expansion anchors for attachments to pre-poured concrete.

2.10 IDENTIFYING DEVICES

A. Nameplates: Type NP: Engraved black bakelite, 1 inch by 3-1/2 inch, 1/8 inch high white letters, machine screw retained. For permanent identification of all switchboards, panelboards, circuit breakers in separate enclosures, motor starters, relays, time switches, disconnect switches and other cabinet-enclosed apparatus including terminal cabinets or match existing as closely as possible.

B. Legend Plates: Type LP: Die-stamped metal legend plate with mounting hole and positioning key for attachment to panel mounted operators' devices. Engraved paint-filled characters as specified.

C. Wire & Terminal Markers: Self-adhering, pre-printed vinyl with self-laminating wrap around strip. Markers shall be legible after termination. Brady B191 series, Thomas & Betts WSL series or equal.

D. Conductor Phase Markers: Thomas & Betts WCPHAS series or similar in addition to colored marking as specified under this section of the specifications.

2.11 GROUNDING AND BONDING

A. Ground Rods
   1 Manufacturer: Blackburn, Erico, or approved Equal
   2 Size: 3/4" x 10' Ground Rods

B. Grounding Electrode Conductor, 2/0 for foundation foots, and per NEC.

C. Grounding Well - Christy Box, Valve Box

PART 3 EXECUTION

3.01 CONDUIT AND RACEWAY APPLICATIONS

A. Rigid Steel Conduit: For all exterior applications, all conduits larger than 2” trade diameter, indoor, below eight (8) feet.

B. Electrical Metallic Tubing (EMT): Interior only and above eight (8) feet or when entering a panel from above.

C. Liquidtight Flexible Metallic Conduit: In damp and wet locations for connections to motors, transformers, vibrating equipment and machinery. Connections to all pump motors, flow switches, and similar devices.

3.02 CONDUIT INSTALLATION

A. General
1 All conduit runs shown on the plans are sized based on the use of rigid steel conduit and THWN copper conductors. If conductor type is changed the contractor shall be responsible for resizing conduits to meet code. In no case is conduit to be sized smaller than 3/4" trade diameter.
2 Low voltage wiring shall be installed in conduit, minimum 3/4" trade diameter.
3 Conduits shall be tightly covered and well protected during construction using metallic bushings and bushing "pennies" to seal open ends.
4 In making joints in rigid steel conduit, ream conduit smooth after cutting and threading.
5 Clean any conduit in which moisture or any foreign matter has collected before pulling in conductors. Paint all field threaded joints to prevent corrosion.
6 In all empty conduits or ducts, install an 1100 pound tensile strength polyethylene pulling rope.
7 Conduit systems shall be electrically continuous throughout. Install code size, uninsulated, copper grounding conductors in all conduit runs, grounding conductor shall be bonded to conduit, equipment frames and properly grounded.

B. Layout:
1 All new conduits shall be concealed. Any field conditions that does not allow concealment of conduits shall be reviewed with the Architect prior to rough-in.
2 Locations of conduit runs shall be planned in advance of the installation and coordinated with concrete work, plumbing and framing.
3 Where practical install conduits in groups in parallel vertical or horizontal runs and at elevations that avoid unnecessary off-sets.
4 Low voltage conduit shall be grouped separately and labelled every 10 ft interval as to system (i.e. fire, control, etc)
5 Exposed conduit shall be run parallel or at right angles to the centerlines of the columns and beams.
6 Conduits shall not be placed closer than 12 inches from a parallel hot water or steam line or three inches from such lines crossing perpendicular to the runs.
7 In long runs of conduit, provide sufficient pull boxes per NEC inside buildings to facilitate pulling wires and cables. Support pull boxes from structure independent of conduit supports. These pull boxes are not shown on the plans.

C. Supports:

1 All raceway systems shall be secured to building structures using specified fasteners, clamps and hangers spaced according to Code.
2 Support single runs of conduit using two hole pipe straps. Where run horizontally on walls in damp or wet locations, install "clamp blocks" to space conduit off the surface.
3 Multiple conduit runs shall be supported using "trapeze" hangers fabricated from 3/8 inch diameter, threaded steel rods secured to building structures. Fasten conduit to construction channel with standard two hole pipe clamps. Provide lateral seismic

bracing for hangers.

4. Installation
   a. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation". 1) Do not fasten supports to pipes, ducts, mechanical equipment, or conduit. 2) Do not drill or cut structural members.
   b. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
   c. Install surface-mounted cabinets and panelboards with minimum of four anchors.
   d. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
   e. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

D. Terminations and Joints:
   1 Raceways shall be joined using specified couplings or transition couplings where dissimilar raceway systems are joined.
   2 Rigid conduit connection to enclosures shall be made by Myers type grounding hubs only. EMT connections to enclosures shall be made with compression connector with grounding lock-nuts or bushings.
   3 Conduit terminations exposed at weatherproof enclosures and cast outlet boxes shall be made watertight using appropriate connectors and hubs.
   4 Install expansion couplings where any conduit crosses a building separation or expansion joint.
   5 Install cable sealing bushings on all conduits originating outside the building walls and terminating in switchgear, cabinets or gutters inside the building. Install cable sealing bushings or caulk conduit terminations in all grade level or below grade exterior pull, junction or outlet boxes.

E. Penetrations:
   1 Furnish and install metal sleeves for all exposed interior conduit runs passing through concrete floors or walls. Following conduit installation, seal all penetrations using non-iron bearing, chloride free, non-shrinking, dry-pack, grouting compound.
   2 Install specified watertight conduit entrance seals and membrane clamps at all below grade wall and floor penetrations. Conduits penetrating exterior building walls and building floor slab shall be insulated rigid steel.
   3 Conduits penetrating rated walls, floors, etc. shall be fireproofed.

3.03 CABLE AND WIRE INSTALLATION

A. Examination
   1 Verify that interior of building has been protected from weather.
   2 Verify that mechanical work likely to damage wire and cable has been completed.
   3 Verify that raceway installation is complete and supported.
   4 Verify that field measurements are as indicated.

B. Preparation
   1 In existing conduits that will be reused, pull out existing conductors.
   2 Completely and thoroughly swab raceway before installing wire.

3 Use 50/50 solution of Simple Green. Use CO2 to blow water and soap into conduit - let soak to break up dried out pulling compounds, then pull conductors. Pull one conductor at a time if will not pull all out together.

C. General:
1. Conductors shall not be in conduit until all work of any nature that may cause injury is completed. Care should be taken in pulling conductors that insulation is not damaged.
U.L. approved non-petroleum base and insulating type pulling compound shall be used as needed.
1 All cables shall be installed and tested in accordance with manufacturer's requirements and warranty.
2 Block and tackle, power driven winch or other mechanical means shall not be used in pulling conductors of size smaller than AWG # 1.

D. Splicing and Terminating:
1 All aspects of splicing and terminating shall be in accordance with cable manufacturer's published procedures.
2 Make up all splices in outlet boxes with connectors as specified herein with separate tails of correct color to be made up to splice. Provide at least six (6) inches of tails packed in box after splice is made up.
3 All wire and cable in panels, control centers and equipment enclosures shall be bundled and clamped.
4 Encapsulate splices in exterior outlet, junction and pull boxes using insulating resin kits. All splices for exterior equipment in pump rooms shall be made up watertight.
5 Insulate mechanical compression taps AWG # 1/0 and larger using pre-molded, snap-on insulating boots or specified conformable insulating putty overwrapped with two half-lapped layers of insulating tape.

E. Identification:
1 Securely tag all branch circuits, noting the purpose of each. Mark conductors with vinyl wrap-around markers. Where more than two conductors run through a single outlet, mark each circuit with the corresponding circuit number at the panelboard.
2 Color code conductors size #6 and larger using specified phase color markers and identification tags.
3 All terminal strips are to have each individual terminal identified with specified vinyl markers.
4 All identification shall be legible and readable after completion of installation.

3.04 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

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.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

3.05 INSTALLATION OF BOXES

A. General:
   1 Leave no un-used openings in any box. Install close-up plugs as required to seal openings.
   2 Exposed outlet boxes and boxes in damp or wet locations shall be cast metal with gasketed cast metal cover plates.

B. Box Layout:
   1 Outlet boxes shall be installed at the locations and elevations shown on the drawings or specified herein. Make adjustments to locations as required by structural conditions and to suit coordination requirements of other trades.
   2 Install junction or pullboxes where required to limit bends in conduit runs to not more than 360 degrees or where pulling tension achieved would exceed the maximum allowable for the cable to be installed. Consult wire and cable manufacturer.

3.06 INSTALLATION OF WIRING DEVICES

A. General
   1 Install all devices flushmounted unless otherwise noted on the drawings. Comply with layout drawings for general locations. Consult Architect or Owner for locations that have conflict with other devices or manner not suitable for installation. Avoid place devices behind open doors.
   2 Align devices horizontally and vertically. Device plates shall be aligned vertically with tolerance of 1/16". All four edges of device plates shall be in contact with the wall surface.
   3 Mounting height as indicated on the drawings and according to ADA requirements.
   4 Install device plates on all outlet boxes. Provide blank plates for all empty, spare, and boxes for future use.
   5 Securely fasten devices into boxes and attach appropriate cover plates.
   6 Caulk around edges or outdoor device plates and boxes when rough wall surfaces prevent raintight seal. Use caulking materials approved by Architect/Engineer.
   7 Fireproof around opening of devices located or penetrating firerated construction assemblies.

B. Switches
   1 Where switches are indicated to be installed near doors, corner walls, etc. mount not less than 2 inches and not more than 18" from trim. Verify exact location with Architect or Engineer prior to rough-in.
   2 Coordinate the location of switches to insure locations at the strike side of doors.
   3 Furnish and install engraved legend of each switch that controls exhaust fans, motors, equipment systems, etc. not located within sight of the controlling switch.

4 Ganging of Switches - provide barriers for switches of difference phases and voltages. Otherwise switches shall be gauged in one faceplate.

C. Receptacles
   1 Mount receptacles vertically with U-shaped ground position on bottom.
   2 Do not combine GFCI protected circuits with other circuits in the same raceway. Limit number of GFI protect circuits in any one raceway to a maximum of one (1) circuit.

D. Identification
   1 Label all outlets and switches. Mark each wiring device where circuits and panel supply is derived from.
   2 All identification shall be legible and readable after completion of installation

3.07 INSTALLATION OF FUSES AND DISCONNECT SWITCHES

A. Fuses shall be installed where noted on plans. Sizes are based on design data provided by air conditioning mfg. Listed or labeled equipment must be in accordance with instructions included in the listing or labeling. Be sure to observe maximum branch circuit fuse size labels.

B. Disconnect switches shall be mounted on the units. Coordinate with mechanical contractor to ensure switches are not mounted on a removable access panel.

C. Label each disconnect fuse with equipment tag as indicated in the single line diagram, or as directed.

3.08 ELECTRICAL EQUIPMENT GROUNDING

A. Ground non-current carrying metal parts of electrical equipment enclosures, frames, conductor raceways or cable trays to provide a low impedance path for line-to-ground fault current and to bond all non-current carrying metal parts together. Install a ground conductor in each raceway system in addition to conductors shown. Equipment ground conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size ground conductors per NEC 250-95 unless larger conductors are shown on the drawings.

B. Grounding conductors shall be identified with green insulation, except where a bare ground conductor is specified. Where green insulation is not available, on larger sizes, black insulation shall be used and suitably identified with green tape at each junction box or device enclosure.

C. Install metal raceway couplings, fittings and terminations secure and tight to insure good ground continuity. Provide insulated grounding bushing and bonding jumper where metal raceway is not directly attached to equipment metal enclosure and at concentric knock-outs.

D. Motors shall be connected to equipment ground conductors with a conduit grounding bushing and with a bolted solderless lug connection on the metal frame.

E. Conduit terminating in concentric knockouts at panelboards, cabinets and gutters shall have insulated grounding bushings and bonding jumpers installed interconnecting all such conduits and the panelboard cabinet, gutter, etc.

F. Performance: Measure ground resistance, 25 Ohms or less.

3.09 BONDING

A. Bonding shall be provided to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed.

B. Bonding shall be in accordance with NEC Article 250, Part G.

3.10 WORKMANSHIP

A. Preparation, handling, and installation shall be in accordance with manufacturer's written instructions and technical data particular to the product specified and/or accepted equal except as otherwise specified. Coordinate work and cooperate with others in furnishing and placing this work. Work to reviewed shop drawings for work done by others and to field measurements as necessary to properly fit the work.

B. Conform to the National Electrical Contractor's Association "Standard of Installation" for general installation practice.

3.11 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 16540 SPORTS FIELD LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lighting for Soccer Fields.

B. Poles, Luminaire Mounting Crossarm.

C. Control System, and Accessories.

1.02 REFERENCES

A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low Pressure Sodium Lamps (Multiple-Supply Type); 1992.

B. NECA/IESNA 501 - Recommended Practice for Installing Exterior Lighting Systems; 2000.

C. NFPA 70 - National Electric Code; National Fire Protection Association; 2002.

1.03 SCOPE OF WORK

A. Provide a complete and working lighting system with poles, fixtures, footings, underground raceways, lighting control panels, etc. to illuminate a primary soccer field.

B. Provisions for a sports field lighting system on a secondary soccer field. Installation of underground raceways to secondary soccer field.

1.04 SUBMITTALS

A. Manufacturer's Product Data and Materials: Include technical specification information, photometric data, fixture efficiency, ballast information, lamp information, weights, accessories, etc.

B. Faxed bids will not be accepted. Owner must notify all bidders of any approved alternate by addendum only Bidders requesting to use equipment other than that specified shall submit 10 days prior to bid opening.

C. If fixtures, poles, and accessories supplied differs from specified, contractor shall submit structural calculations for entire fixture installation assembly. Submittal must be stamped by a registered structural engineer and DSA approved. Additional costs shall also be the responsibility of the contractor.

D. Lighting design indicating light levels on and off the field.

E. Lighting design showing vertical spill light levels along the boundary line.

F. Identify energy costs for operating the luminaries, maintenance cost for the system including spot replacement, and group relamping costs. All costs should be based on 5,000 hours of operation.

G. Pole structural calculations and foundation design stamped by a licensed Structural Engineer.

H. Aiming angle summary of each luminaire based on pole identification and luminaire type.

I. Provide photometric report for a typical luminaire used in the lighting design.

J. Schematics for automated control system to including monitoring. Control System Summary - Shows switching schedule and circuits that are grouped together. Typical Wiring Diagrams - Typical wiring diagrams showing component connections.

1.05 SUBSTITUTION

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Each item listed below shall be provided in the form of clear and concise statements and/or plans and drawings which can be easily read and clearly interpreted. Each item shall also be clearly lettered to correspond with the following list. All items shall be assembled in the order indicated and secured or bound in a neat and orderly fashion for easy use and reference.

1 Lighting layout design showing luminaires mounting heights, aiming focus points, reflector types, number of luminaries per pole and kilowatt consumption.
2 A drawing of the Sports Lighting Structure.
3 Model number and manufacturer for all equipment.
4 Warranty from the manufacturer covering entire structure as outlined in specifications.
5 Certified engineer, independent of manufacturer, shall verify and stamp wind load test of luminaires assembly to meet or exceed structural strength as described in specifications. EPA test does not constitute miss-alignment verification.
6 UL Listing – Bidder shall supply, in advance of bid, a page summarizing the Underwriters Laboratory listing numbers covering the entire luminaires assembly and pole lighting structure being bid for the owner's review and retention.
7 Manufacturer shall submit a minimum of five similar lighting projects in the State of California. Include the project name, contact person, and telephone numbers.
8 Manufacturer shall submit, guaranteeing that footcandles levels and uniformities will be met.
9 There shall be provided by the pole supplier, data and calculations to show that the specified criteria will be met.
10 Manufacturer shall submit a test report confirming that capacitors operate at 70 degrees Celsius, refer to Ballast Type under Section Electrical Component Enclosure.
11 A complete Independent Testing Report on all NEMA types being proposed must be submitted. Test reports shall be for owner's retention and be used to qualify the performance of all proposed lighting fixtures.
12 There shall be provided by the pole supplier sufficient data and calculations to show that the specified criteria will be met, including a foundation design certified by an engineer in the State of California.
13 Other information as required by project engineer.

C. Failure to provide any of the above described documentation will be grounds for immediate rejection.

1.06 LIGHTING PERFORMANCE

A. The manufacturer shall supply lighting equipment and computer generated point-by-point analysis to meet the following:

1. Performance Criteria
    a. The performance criteria requires lighting equipment which will provide initial average light levels, after adjustment for an average lamp tilt factor. Average Light Levels shall meet or exceed the following:
        1) Area of lighting: Primary Soccer Field
            (a) Average footcandles level: 50fc. Light levels shall be held constant for 5000 hours. Measured average illumination level shall be +/- 10% of predicted mean in accordance with IESNA RP-6-01, and measured at the first 100 hours of operation.
        2) Area of lighting: Secondary Soccer Field
            (a) Average footcandles level: 30fc. Light levels shall be held constant for 5000 hours. Measured average illumination level shall be +/- 10% of predicted mean in accordance with IESNA RP-6-01, and measured at the first 100 hours of operation.
    b. Uniformity Ratio: The footcandles level shall have a uniformity ratio of maximum to minimum ratio of not greater than the following:
        1) Area of lighting: Primary Soccer Field
            (a) Max. to Min. ratio: 2.0:1.0.
        2) Area of lighting: Secondary Soccer Field
            (a) Max. to Min. ratio: 2.0:1.0.
    c. The manufacturer guarantees field light intensity levels and uniformity ratios at initial start-up or within the first fifteen (15) hours of operation. Light level readings shall be completed as detailed in the point-by-point analysis specification.

1.07 SPILL/GLARE LIGHT

A. Beam Definition: The approved lighting fixture shall not exceed the candlepower or the specified degrees above the maximum candlepower in the vertical plane. 12,000 candlepower is the unit of luminous intensity that often begins to cause discomfort and interfere with vision.

B. Maximum Spill Light Values: Maximum vertical footcandles taken with the meter aimed at the brightest light bank at a distance of 150 feet from the field perimeter shall not exceed 1.73. (or) Average vertical footcandles at a distance of 150 feet from the perimeter of the field shall not exceed 0.851. (or) Maximum horizontal footcandles at a distance of 150 feet from the perimeter of the field shall not exceed 0.31. (or) Average horizontal footcandles at a distance of 150 feet from the perimeter of the field shall not exceed 0.16. Values given at 3 ft above grade.

C. Plot maximum footcandles along fence line, show max. reading every 30 ft.

1.08 ANALYSIS

A. Submitted computer models shall depict the measurements of light shall be demonstrated on a computer generated model which consists of a grid of a specified number of points covering a stated area on an equally spaced grid.

B. Submitted spill/glare computer models shall depict the field test stations as being on a line 150' from the boundary of the playing field, and the test stations shall be shown every 30' along the line. Bidder shall submit two (2) different models, as described below:
    1 Horizontal footcandles: Models shall represent readings taken with the meter

positioned horizontal 36 inches above grade.

2 Maximum footcandles: Models shall represent readings taken with the test cell positioned 36 inches above grade and aimed at the brightest light source.

1.09 INSPECTION AND VERIFICATION

A. Test and Measurement Procedures:

1 All testing will be done with entire facility illuminated.

2 Horizontal footcandles readings shall be measured with the test cell positioned horizontal 36 inches above grade.

3 Maximum footcandles shall be measured with the test cell positioned 36 inches above grade and aimed at the brightest light source from the tested field.

4 Ambient light levels shall be measured at the specified test stations. Maximum ambient footcandles level explored in all planes for each test station shall be recorded.

5 Testing equipment for measurement of footcandles levels shall be a Gossen Panalux Electronic 2 or an approved equal, calibrated and certified within the previous 12 months.

6. For final approval of the project, the manufacturer shall provide a final report from the test results that shall provide the following items:

a. Identification of number and location of the test stations.

b. Actual horizontal footcandles readings taken at each test station.

c. Actual maximum footcandles readings taken at each spill/glare test station.

d. Number of hours of operation.

PART 2 PRODUCTS

2.01 LUMINAIRE ASSEMBLY

A. Pole Mounted Luminaires

1. Musco, or approved equal.

B. Ballasts

1. High Intensity Discharge (HID) Ballasts: ANSI C82.4, metal halide lamp ballast, suitable for lamp specified.

C. Performance

1 ANSI C82.1 high power factor type electromagnetic ballast, suitable for lamps provided.

2 Cold Weather start.

2.02 LAMPS

A. Musco Light Structure Green System, or approved equal.

2.03 POLE

A. Manufacturers: Galvanized steel poles.

1 The structural design of the poles must be demonstrated to be based on the Uniform Building Code, latest adopted version (UBC) criteria for pole stress allowances. Lighting system must comply with CBC Building Code edition 2001 and wind speed of

80. Luminaire, visor, and crossarm shall withstand 150 mph winds and maintain luminaire aiming alignment. Foundation design will be based on 2001 CBC 80 MPH.

2 The pole shall be designed to provide a mounting height above the surface at its foundation of enter mounting height, tab and to be of sufficient strength to supports the effective projected area (EPA) of the pole and all of the attached devices including, as applicable, light fixtures, crossarms, mounting brackets, ballast boxes and any other devices which are to be attached to the pole.

B. Foundation.

1 The foundation must be designed based on UBC design for foundations. No direct steel burial poles will be permitted.

2 Foundation to be designed to withstand 80 MPH based upon BOCA C Building Code Standards or SFBC utilizing 50 year recurrent isotach wind map data.

3 Any concrete portions of the pole in which steel components that provide tension strength are contained, shall be allowed to harden for a minimum of 28 days before stress loads of pole attachment are applied.

4 The foundation of the pole shall be constructed of not less than 9,500 psi pre-stressed centrifically cast concrete, such that the steel reinforcement within the concrete shall be protected from slippage and exposure to oxidation through voids in the concrete or exposure of the steel through porous concrete material.

5. The design criteria for these specifications are based on geotechnical report dated January 2004. It shall be the contractor's responsibility to notify the owner of soil conditions other than described in geotechnical report. The owner shall then be responsible and absorb the additional costs associated with:

a. Providing engineered foundation embedment design by a registered engineer in the State of California for soils other than specified soil conditions.

b. Additional materials required to achieve alternate foundation.

c. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

6. Lighting Protection

a. All structures shall be equipped with lightning protection meeting standards established by NFPA 780 (National Fire Protection Association).

b. There shall be provided at each structure at least one copper-clad steel ground rod of not less than 3/4" in diameter and not less than 10’ in length. An 10’ ground rod would be permissible provided it extends vertically into the earth at least 10’.

c. The ground rod(s) shall be connected to the structure by a copper main down conductor. This conductor shall be not less than a #2 conductor if the structure is 75’ or less above grade. If the structure is greater than 75’ above grade the conductor shall be not less than a #2/0 conductor.

d. For steel poles, the main down conductor shall extend from the base of the steel pole to the ground rod(s) and shall be bonded to the steel pole and the equipment ground. All metal components on the pole shall be bonded to the pole.

e. All main down conductors and all bonding conductors shall maintain a horizontal or downward coursing path, free from "U" or "V" (down and back up) pockets. Such pockets, often formed by metal components mounted below the pole top bond location, shall be provided with a down conductor from the base of the component to ground or to an adjacent main down conductor.

f. No bend of any conductor shall form an included angle of less than 90 degrees nor shall it have a radius bend of less than 8".

C. Structural Strength
   1. Fixture assembly structural strength: Manufacturer's submittal shall be wind tunnel tested and withstand forces equal to 125 MPH wind levels with 1.3 gust factor without structural damage or misalignment of the fixture assembly.

2.04 LIGHTING CONTROL

A. The manufacturer shall supply a factory assembled lighting control cabinet and be fully covered under the manufacturer warranty and assembled by a UL listed panel builder. The cabinet shall contain a lighting contactor assembly to meet the requirements of the lighting system and any future requirements so designated by the specifications. The cabinet shall be factory assembled and pre-wired utilizing UL listed products and 14 AWG MTW or better.

B. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum NEMA 3R enclosures mounted approximately 10' above grade. The enclosures shall include ballast, capacitor and fusing for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.

C. System shall include lighting contactors. System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

D. The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields, to only having permission to execute "early off" commands by phone.

E. On site equipment shall include Manual Off-On-Auto Switches to allow for maintenance, and shall accept and store 7-day schedules. The controller shall be protected against power outages / memory loss and shall reboot once power is regained and execute any commands that would have occurred during outage.

F. Management Tools: Manufacturer shall provide a web-based database of actual field usage and provide reports by facility and user group.

G. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 10 years.

H. Remote Lighting Control System:
   1. This section includes the remote lighting control system suitable for control of remote equipment using a nationwide communication network. Software features are tailored to control equipment in parks and recreation facilities but not limited to these applications. The remote equipment controllers shall be suitable for control of electrical equipment in multiple locations.
      a. Musco Control-Link Series, or approved equal.
   1 The lighting control system shall be UL Listed under UL508 - Industrial Control Equipment.
   2 All lighting control equipment shall be in compliance with FCC Emission Standards specified in Part 15 Subpart J for Class A applications. Each element of the lighting control system is subject to FCC rules and will comply with the rules prior to delivery.
   4. The lighting control manufacturer shall provide a factory assembled, wired, and tested control and monitoring cabinet(s) with the following features at a minimum:

a. Onsite memory - The controller must accept and store 7-day schedules.
b. Zone capabilities.
c. Manual Off-On-Auto Switch and contactor status feedback - The controller must be able to determine the switch position (Manual or Auto) and the contactor status (open or closed) and report these two items back to the central command hub.
    1) Onsite manual control switches - Three position selector switches (Off-On-Auto) shall be mounted in a separate NEMA 3R rated enclosure. The switches shall be keyed and maintain position, with make-before-break contacts and mounted on a swing-out sub-panel. A legend plate shall clearly identify the zone and position of each switch. Switches shall be factory-wired. The back panel shall include fusing to protect the switches and plug-in connectors for the wire harnesses.
    2) Operation - The OFF-ON-AUTO switches shall operate as follows: The three position switch will control each lighting zone which controls the contactor(s) directly. In the OFF position all contacts are open. In the ON position the ON set of contacts close, closing the contactor. In the AUTO position, the AUTO contacts are closed, and the Controller will operate the contactor. The Controller will operate the contactor. The ON contacts are open in this position. The contacts on the OFF-ON-AUTO switch are make-before-break so that the switch may be moved between ON and AUTO without de-energizing the circuit.
d. Power outage recovery - The controller firmware shall protect against power outages and memory loss. Once power is regained, the controller shall reboot and execute any on/off commands that would have occurred during the outage.
e. Contactor modules: Contactors - Contactors shall be UL Listed for lighting applications. They shall be rated at full capacity, be electrically held, utilize a 120 volt coil and be rated for operation in an ambient temperature range of -20 degrees C to +60 degrees C.
f. Web-based scheduling - Scheduling shall be performed by the customer via a manufacturer maintained web site. Access to the web site shall be protected by a customer defined users list and individual passwords.

2.05 ADDITIONAL EQUIPMENT

A. There shall be provided within the system a means of disconnecting electrical power to all equipment at the pole served by the feeder circuit. Power shall be disengaged by the operation of one switch, fused or non-fused, and be located in an enclosure as provided by the lighting manufacturer and covered under the manufacturer's warranty.

PART 3 EXECUTION

3.01 INSTALLATION

A. The pole base shall be installed in an excavation as prescribed by the UBC standards

for foundation design. Concrete backfill is required.

B. The pole base shall be separate from the pole such that the base may be installed, properly plumbed, and enlarged as to the bearing surface by concrete backfill allowing for inspection prior to the attachment of the steel pole.

C. The pole and the luminaries shall be designed such that all wiring remains underground before entering the base of the pole and that no wiring shall be exposed to sun or weather as it transitions through the pole and to the ballast, and onto each lamp. There shall be provided a non-threaded hot-dip galvanized steel or concrete enclosed raceway for transition of the pole feeder conductors from the trench to the ECE.

D. All field electrical connections on the pole shall be achieved by UL listed plug-in or lug method of attachment from the load side of the breaker/disconnect to the lamp socket. The feeder and grounding conductors from the service entrance to the pole shall be connected at the pole by landing lugs.

E. When service is necessary, by placement of ballast, fuses, capacitors, along with disconnect, near ground level. Wiring harness shall be designed with abrasion protection sleeving, proper suspension support, etc.

3.02 SAFETY SPECIAL CONDITIONS

A. There shall be provided a listing for all electrical components from its connection to the feeder conductors, to its completion at the lamp socket including all connections. This listing shall be based upon testing and evaluation of the compatibility of the enclosures and the components for use in combination in this application in addition to the individual components being listed or recognized.

B. Supply, a page summarizing the Underwriters Laboratory listing numbers covering the entire luminaires assembly and pole lighting structure.

C. Sports Lighting Structure shall meet National Electrical code.

3.03 WARRANTY AND ACCOUNTABILITY

A. Preventative and Spot Maintenance - Manufacturer shall provide preventative and spot maintenance as needed to maintain operation of the sports lighting equipment.

B. Durability - All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed steel shall be hot dip galvanized per ASTM A123. All exposed hardware and fasteners shall be stainless steel of at least 18-8 grade, passivated and polymer coated to prevent possible galvanic corrosion to adjoining metals. All exposed aluminum shall be powder coated with high performance polyester. All exterior reflective inserts shall be anodized, coated with a clear, high gloss, durable fluorocarbon, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All wiring shall be enclosed within the crossarms, pole, or electrical components enclosure.

C. Each manufacturer will supply their own specific written warranty covering lamp replacements, parts, labor and performance as specified above for 10 years. Warranty may exclude storm damage, vandalism, abuse and unauthorized repairs or alterations. Manufacturer shall provide owner with a signed Certificate of Insurance that guarantees the commitment for the entire 10 years. The insurance policy must be fully funded on an

actuarially sound basis and underwritten by a top-rated insurance company. Manufacturer shall guarantee constant light levels specified above for 5000 hours.

D. Life Cycle Cost
   1 Energy Consumption: Based on a 5000 hour operating cycle, the average kWh consumption for the field lighting system shall be 81.12 or less.
   2 Complete Lamp Replacement: Manufacturer shall include one group lamp replacement to be completed at end of the 5000 hours of operation. Manufacturer shall warrant the system to meet designed light levels upon completion of this relamp.
   3 Preventative and Spot Maintenance: Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 10 years from the date of equipment delivery. Individual lamp outages shall be repaired when more than 10% of the lamps are out on any one field, or when lamp outages materially impact the usage of any field. Owner agrees to check fuses in the event of a fixture outage.
   4 Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position (Manual or Auto) and contactor status (open or closed).

3.04 DELIVERY

A. The equipment must be on-site 6 weeks after submittal approval or release of order, if later. The manufacturer will be liable for a penalty of $500 per day if the delivery is not completed within this timeframe.

3.05 FIELD TECHNICIAN ON-SITE VISIT

A. Manufacturer shall provide an on-site visit by a factory technician during and after completion of the installation. The factory technician shall make any necessary adjustments to the aiming in order to ensure that specified maximum footcandles levels are not exceeded. This service shall be included at no additional cost to the owner or installing contractor.

END OF SECTION