SAN ANTONIO WATER SYSTEM
CHILLED WATER PLANT IMPROVEMENTS PROJECT

SAWS JOB NUMBER 15-7502

ADDENDUM NO. 1
December 11, 2015

To Respondent of Record:

This addendum, applicable to work referenced above, is an amendment to the bidding documents and as such will be a part of and included in the Contract Documents. Acknowledge receipt of this addendum by entering the addendum number and issue date in the space provided in submitted copies of the proposal.

A. Modifications to the Specifications

1. TABLE OF CONTENTS
   Delete specification section 09 30 00 Tiling.

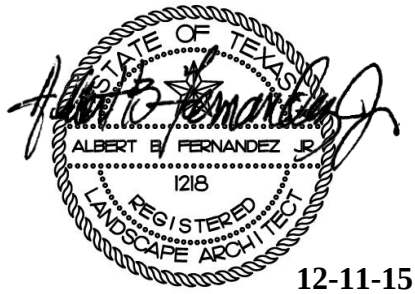
2. TECHNICAL SPECIFICATIONS
   Replace all preliminary technical specifications with the attached final signed and sealed technical specifications.

B. Modifications to the Drawings

1. Replace all preliminary drawings with the attached final signed and sealed drawings.

ACKNOWLEDGMENT BY BIDDER

Each respondent is requested to acknowledge receipt of this Addendum No. 1 by his/her signature affixed hereto and to file same with and attach to his/her proposal.



Albert Fernandez
#1218
CFZ Group, LLC
Landscape Architect

12-11-15

The undersigned acknowledges receipt of this Addendum No. 1 and the proposal submitted herewith is in accordance with the information and stipulations set forth.

_____ _____

Date Signature of Bidder

CONSTRUCTION SPECIFICATIONS FOR:

SAWS Chilled Water Plant Improvements
December 11, 2015

San Antonio Water System

C•F•Z Group LLC
Coltrane • Fernandez • Zavala
Landscape Architecture
& Planning

Alderson & Associates, Inc.

LANDSCAPE ARCHITECTURAL TECHNICAL SPECIFICATIONS
TABLE OF CONTENTS

SECTION 00 41 00
UNIT PRICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to both priorly approved additional Work and Work deducted from scope performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

A. Take all measurements and compute quantities. Measurements and quantities will be verified by Owner and Landscape Architect.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

C. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

E. Measurement by Area: Measured by square dimension using mean length and width or radius.

F. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

G. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed or deducted item or unit of the Work.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work which is incorporated in or made necessary by the Work and accepted by the Design Consultant, multiplied by the unit sum/price.

B. Payment will not be made for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.06 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct one of the following remedies:
   1. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of Owner.
   2. The defective Work will be partially repaired to the instructions of the Owner, and the unit sum/price will be adjusted to a new sum/price at the discretion of Owner.

C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

D. The authority of Owner to assess the defect and identify payment adjustment is final.

1.07 SCHEDULE OF UNIT PRICES

See attached Unit Price Form

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 02 40 00
DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alterations purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED SECTIONS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Sequencing and staging requirements.

C. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

D. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 01 57 50 - Temporary Erosion and Sedimentation Control.

F. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

G. Section 01 70 00 - Execution Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

H. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.

I. Section 31 22 00 - Grading: Topsoil removal.

J. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

K. Section 31 23 23 - Fill and Backfill: Filling holes, pits, and excavations generated as a result of removal operations.

L. Section 32 93 00 - Plants: Pruning of existing trees to remain.

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements relating to unit prices for this work.

B. Measurement

1. Concrete removal

a. Measurement method: by the square foot

b. Includes: removing concrete and accompanying reinforcing and base material

2. Concrete paver removal

a. Measurement method: by the square foot

b. Includes: concrete pavers, sand layer (if present) and base and related reinforcing,

3. Carefully remove and demolish Saltillo tile and concrete benches attached to circular water features and planters. Replace caps to match.

4. Asphalt removal

   a. Measurement method: by the square yard

   b. Includes: asphalt paving (all courses, including base) and any deteriorated or contaminated subgrade.

4. Existing vegetation

   a. Measurement method: by the square foot

   b. Includes: shrubs, perennials, groundcovers, turf grass, branches, roots 1” and larger and haul-off

5. Existing trees

   a. Measurement method: each

   b. Includes: trunks, limbs, roots 1” and larger, and haul-off

6. Existing irrigation

   a. Measurement method: by the square foot

   b. Includes: abandoned pipes, valves, and other appurtenances; capping lines to remain; and haul-off

7. Miscellaneous landscape items

   a. Measurement method: by the square foot

   b. Includes: steel edging, stakes, wire, burlap, other miscellaneous items found buried with planting, and haul-off

1.5 REFERENCES

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; current edition.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.7 PROJECT CONDITIONS

A. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

B. Comply with other requirements specified in Section 01 70 00.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fill Material: As specified in Section 31 23 23 - Fill and Backfill

PART 3 - EXECUTION

3.1 SCOPE

A. Remove paving and curbs as required to accomplish new work.

B. Remove concrete slabs on grade as indicated on drawings.

D. Carefully remove Saltillo tile

C. Remove plantings (trees, shrubs, groundcovers, turf, etc.) as indicated.

D. Remove other items indicated, for salvage, relocation and recycling.

E. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.

E. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

F. If hazardous materials are discovered during removal operations, stop work and notify Design consultant and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

G. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

H. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Dismantle existing construction and separate materials.
   2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
   1. Contractor shall be responsible to notify Texas One Call (800-245-4545) a minimum of 72 hours prior to initiation of any demolition of excavation activity.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
   1. Note dimensioned locations of underground abandoned items left in place on record drawings.

3.4 SELECTIVE DEMOLITION

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Design Consultant before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions.

B. Separate areas in which demolition is being conducted from other areas that are still occupied.
   1. Provide, erect, and maintain temporary construction fencing specified in Section 01 50 00.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

E. Protect existing work to remain.
   1. Prevent damage to existing features.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Removal and storage of topsoil.

B. Rough grading the site for site structures.

C. Rough grading the site for site structures and paving.

D. Topsoil and finish grading.

1.2 RELATED SECTIONS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 23- Fill and Backfill: Filling and compaction.

D. Section 32 93 00 – Landscape Planting: Seeding/Sodding

E. Section 32 93 00 –Landscape Planting: Topsoil in beds and pits.

F. Section 32 93 45 - Treatment of Existing Trees: Protection of existing trees.

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements relating to unit prices for this work.

B. Topsoil:
1. Measurement Method: By the cubic yard.
2. Includes: Excavating existing topsoil or supplying topsoil; stockpiling, scarifying substrate surface, placing where required, and compacting.

1.4 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect plants, lawns, rock outcroppings and other features not indicated to be removed from excavating equipment and vehicular traffic.

C. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil: See Section 32 93 00.

B. Other Fill Materials: See Section 31 23 23.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

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

B. Stake and flag locations of known utilities.
   1. Contractor is to notify Texas One Call (800-245-4545) 72 hours in prior to any excavation. Contractor shall be responsible for making himself familiar with all underground utilities, pipes and structures.
   2. Contractor shall take sole responsibility for any cost incurred due to damage of said utilities whether or not Texas One Call is notified.

3.3 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, marked areas; entire site; or to prevent mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded; marked areas; entire site; or as directed.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 02300 for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 SOIL REMOVAL and STOCKPILING

A. Stockpile excavated topsoil on site for reuse.

B. Stockpiled topsoil to be re-used on site.

C. Remove excess excavated topsoil from site.

D. Stockpile excavated subsoil on site for reuse.

E. Stockpiled subsoil to be re-used on site.

F. Remove excavated subsoil from site.

G. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.
   1. Area(s) to be determined on site with approval of Owner.

3.5 FINISH GRADING

A. All areas disturbed by grading are to receive topsoil and finish grading.

B. Before Finish Grading:
   1. Verify trench backfilling has been inspected.
   2. Verify building and trench backfilling have been inspected.
   3. Verify subgrade has been contoured and compacted.

C. At subgrade, remove debris, roots, branches, and stones in excess of 2 inch in size. Remove soil contaminated with petroleum products.

D. Where topsoil is to be placed, scarify surface to depth of 3 inches.

E. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.

F. Place topsoil in areas where seeding, sodding, and planting are indicated.

G. Place topsoil to establish finish grade and where required to level grade.

H. Place topsoil where required to level finish grade.

I. Place topsoil to the following compacted thicknesses in areas disturbed by grading unless directed otherwise in field by Landscape Architect:
   1. Areas to be Seeded with Grass: 6 inches.
   2. Areas to be Sodded: 6 inches.
   3. Shrub Beds: 18 inches.

J. Place topsoil during dry weather.

K. Remove roots, weeds, rocks, and foreign material while spreading.

L. Near plants spread topsoil manually to prevent damage.

M. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
   1. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
   2. Applies to areas not disturbed by grading.

N. Lightly compact placed topsoil by rolling.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

B. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.7 FIELD QUALITY CONTROL

A. See Section 31 23 23 for compaction density testing.

3.8 CLEANING AND PROTECTION

A. Protect plants, lawns, rock outcroppings, existing boundaries, fences, sidewalks, paving, and curbs not indicated to be removed from excavating equipment and vehicular traffic.

B. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Excavating for footings, slabs-on-grade and site structures.

B. Trenching for utilities outside the building to utility main connections.

1.2 RELATED SECTIONS

A. Section 31 22 00 - Grading.

B. Section 31 23 23 - Fill and Backfill: Fill materials, filling, and compacting.

C. Section 32 93 45 - Treatment of Existing Trees: Protection of existing tree and vegetation.

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements applicable to unit prices for excavation.

B. Excavating Soil Materials:
1. Measurement method: By the cubic foot.
2. Includes: Excavating to required elevations, loading and placing materials in stockpile or removing from site.

C. See Section 31 23 23 - Fill and Backfill, for measurement and payment provisions related to fill.

1.4 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, rock outcroppings and other features to remain, paving, and site structures.

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

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

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

B. See Sections 31 00 00 for additional requirements.

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

3.2 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

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

C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

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

E. Hand trim excavations. Remove loose matter.

F. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yd measured by volume. See Section 31 23 23 for removal of larger material.

G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 00 00.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation.

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

J. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

K. Remove excess excavated material from site.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.4 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 23 23
FILL AND BACKFILL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Filling, backfilling, and compacting for footings.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

D. Topsoil placement in landscape areas.

1.02 RELATED SECTIONS

A. Section 31 22 00 - Grading: Site grading.

B. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

C. Section 32 14 16 - Brick Pavers: Leveling bed placement under pavers.

D. Section 32 14 13 - Concrete Pavers: Leveling bed placement under pavers.

E. Section 32 93 45 - Treatment of Existing Trees: Preservation of existing trees.

G. Section 32 13 13 - Cast-in-Place Concrete.

1.03 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. General Fill:
1. Measurement Method: By the cubic yard.
2. Includes: Excavating existing soil, supplying fill; stockpiling, scarifying substrate surface, placing where required, and compacting.

C. Structural Fill:
1. Measurement Method: By the cubic yard.
2. Includes: Excavating existing soil, supplying fill; stockpiling, scarifying substrate surface, placing where required, and compacting.

D. Granular Fill:
1. Measurement Method: By the cubic yard.
2. Includes: Excavating existing material, supplying fill; stockpiling, scarifying substrate surface, placing where required, and compacting.

E. Aggregates:
1. Measurement Method: By the cubic yard.
2. Includes: Excavating existing material; supplying fill; stockpiling, scarifying substrate surface, placing where required, and compacting.

1.04 REFERENCES

A. ASTM C 33 - Standard Specifications for Concrete Aggregates; 2003.

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2005.

C. ASTM D 448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction; 2003a

D. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil

Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2000a.

E. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2000.

F. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2002.

G. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994(R 2001).

H. ASTM D 2940 - Standard Specification for Graded Aggregate Material fir Bases or Subbases for Highways or Airports; 2003.

I. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2000.

J. ASTM D 4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2000.

1.05 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: As required to establish finish grade elevations.

1.06 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Samples: 10 lb. sample of each type of fill; submit in air-tight containers to testing laboratory or as required by testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.07 PROJECT CONDITIONS

A. Provide sufficient quantities of fill if needed to supplement material obtained from the site 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 by Owner's Representative.
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.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.

B. General Fill- Backfill and fill materials ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM: free from rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter and having a

plasticity index (PI) of less than 30.

1. Unsatisfactory soil materials include ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
2. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

C. Structural Fill: Subbase and base material naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D2940, with at least 95 percent passing a 1-1/2 inch sieve and not more than 8 percent passing a No. 200 sieve.

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

E. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a number 8 sieve.

F. Concrete for Fill: Lean concrete.

G. Subbase and Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95 percent passing a 1-1/2 inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Sand - ASTM C 33; fine aggregate, natural or manufactured sand.

I. Topsoil (stripped from site): Topsoil stripped from site for use in landscape work shall be screened to remove all stone debris and undesirable matter 1/2 inch in size or greater.

J. Topsoil (supplemental): Topsoil to be furnished, when required to supplement topsoil stripped from site, shall be secured from an approved off-site location. It shall be fertile, friable, natural loam containing a liberal amount of humus and shall be capable of sustaining vigorous plant growth. It shall be free of stone, lumps and clods of hard earth 1/2 inch diameter and greater, plants or their roots, sticks and other extraneous matter. Under no circumstances will topsoil be accepted unless it is free of the aforementioned contaminants. Use of non-cohesive "sandy loam" shall not be acceptable.

K. Topsoil (weed free): Landscape Soil (composted topsoil, orange sand and compost) manufactured by Gardenville, San Antonio, Texas (210) 651-6115 or approved equal.

L. Infield Soil Mix: Clay and Poteet sand soil mix as manufactured by Keller Materials, San Antonio, Texas, (210) 648-4221,or approved equal; ratio 40 (clay):60 (sand).

M. Planting Soil Mix: Landscape Soil (composted topsoil, orange sand and compost) manufactured by Gardenville, San Antonio, Texas (210) 651-6115 or approved equal.

2.02 ACCESSORIES

A. Filter Fabric: Water pervious type, polyester non woven geotextile fabric; provide Mirafi 140n or approved equivalent.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.01 EXAMINATION

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

B. See Sections 31 22 00 and 31 23 16 for additional requirements.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

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

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

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

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

B. Fill up to subgrade elevations unless otherwise indicated.

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

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

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

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from structures and improvements minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Fill with concrete.
   2. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   3. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade and similar construction; 95 percent of maximum dry density.
   2. At other locations: 90 percent of maximum dry density.

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

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill:
   1. Use structural fill.
   2. Fill up to subgrade elevations.
   3. Maximum depth per lift: 6 inches, compacted.

4. Compact to minimum 95 percent of maximum dry density.

C. Pervious Structural Fill:
1. Use granular fill.
2. Fill up to subgrade elevations.
3. Maximum depth per lift: 8 inches, compacted.
4. Compact to minimum 95 percent of maximum dry density.

F. At Lawn Areas:
1. Use general fill.
2. Fill up to 6 inches below finish grade elevations.
3. Compact to 95 percent of maximum dry density.
4. See Section 02310 for topsoil placement.

G. At Planting Areas Other Than Lawns:
1. Use general fill.
2. Fill up to 12 inches below finish grade elevations.
3. Compact to 95 percent of maximum dry density.
4. Finish with planting soil mix to 12" depth minimum compacted unless indicated otherwise.
   a. Compact to 80% maximum dry density.

H. Under Pavers Set on Sand Leveling Bed:
1. Use Fill Type base material.
2. Fill up to bottom of sand leveling bed.
3. Compact to 95 percent of maximum dry density.
4. See unit pavers sections 02781; 02783; 02785 for leveling bed placement.

J. Under Monolithic Paving:
1. Compact subsoil to 95 percent of its maximum dry density before placing fill.
2. Use general fill.
3. Fill up to subgrade elevation.
4. Compact to 95 percent of maximum dry density.
5. See Section 02721 for aggregate base course placed over fill.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

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

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest. See Section 01 40 00 for procedures.

E. Frequency of Tests: _____.

F. Proof roll compacted fill at surfaces that will be under slabs-on-grade, pavers, and paving.

3.07 CLEAN-UP

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water. Unused material may be distributed on site at approval of Owner's Representative.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 - GENERAL

1.1 SPECIAL SPECIFICATION INCLUDES

A. Concrete formwork.

B. Concrete footings.

C. Concrete curb wall and retaining wall.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Abrasive blast finish.

G. Concrete curing.

1.2 RELATED SECTIONS

A. Section 31 23 23 - Fill and Backfill: Compacted fill for concrete.

B. Section 32 13 13.26 – Concrete Color Stain

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Measurement method: by the square yard

1.4 REFERENCES

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

B. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.

E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 1988.

F. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001.

G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2005.

H. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2004b.

I. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003.

J. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2004a.

K. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2004a.

L. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2003.

M. ASTM C 150 - Standard Specification for Portland Cement; 2004a.

N. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2001.

O. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2001.

P. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2003.

Q. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 2004.

R. ASTM C 685/C 685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2001.

S. ASTM C 881/C 881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2002.

T. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999.

U. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2002.

V. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 1998 (Reapproved 2003).

W. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004.

1.5 QUALITY ASSURANCE

A. Perform work of this special specification in accordance with ACI 301 and ACI 318.

B. Acquire cement from same source and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

PART - 2 PRODUCTS

2.1 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
2. Form Facing for Exposed Finish Concrete: Steel; Steel. Fiberglass; MDO plywood.
3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
4. Form Ties: Removable type, outside of formwork, which will not mar finish of concrete.

2.2 REINFORCEMENT

A. ASTM A 615/A 615M Grade 60 (420).
1. Deformed billet-steel bars.
2. Unfinished.

B. Joint Dowel Bars:
1. Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

C. Reinforcement Accessories:
1. Tie Wire: Annealed, minimum 16 gage.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Water: Clean and not detrimental to concrete.

2.4 CHEMICAL ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260.

B. Air Entrainment Admixture: ASTM C 260.

C. Chemical Admixtures: ASTM C 494, Type A - Water Reducing.
1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.5 ACCESSORY MATERIALS

A. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.

B. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.

C. Epoxy Bonding System: ASTM C 881, type as required by project conditions.

D. Non-Shrink Grout: ASTM C 1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Minimum Compressive Strength at 48 Hours: 2,400 psi.
2. Minimum Compressive Strength at 28 Days: 7,000 psi.

E. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

F. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.

2.6 BONDING AND JOINTING PRODUCTS

A. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, 1/2 inch thick and full depth of slab less 1/2 inch; tongue and groove profile.

B. Sealant and Primer: As specified in the City of San Antonio Standard Specifications for Construction (June 2008).

2.7 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to Design Consultant for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

D. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3000 psi.
2. Cement Content: Minimum of 480 pounds of cement per cubic yard. of concrete.
3. Water-Cement Ratio: Maximum 50 percent by weight.

4. Total Air Content: 4 percent, determined in accordance with ASTM C 173/C 173M.
5. Maximum Slump: 51/2 inches.
6. Maximum Aggregate Size: 1-1/2 inch.

2.8 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C 685. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C 94, except as may be modified by the following:
1. Delete references for allowing additional water to be added to batch for material with slump. Addition of water to the batch will not be permitted.
2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
3. When air temperature is in between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this special specification.

3.2 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Provide chamfer strips on all exposed external corners and edges.

3.3 INSTALLING REINFORCEMENT

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Notify Design Consultant not less than 24 hours prior to commencement of placement operations.

C. Ensure reinforcement; inserts; embedded parts; formed construction joint devices will not be disturbed during concrete placement.

D. Separate slabs on grade from vertical surfaces with joint filler.

E. Place joint filler in slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

F. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to the City of San Antonio Standard Specifications for Construction (June 2008) for finish joint sealer requirements.

G. Install joint devices in accordance with manufacturer's instructions.

H. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

I. Apply sealants in joint devices in accordance with the City of San Antonio Standard Specifications for Construction (June 2008).

J. Place concrete continuously between predetermined expansion, control, and construction joints.

K. Do not interrupt successive placement; do not permit cold joints to occur.

L. Place slabs in saw cut pattern indicated.

M. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness.

N. Screed slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.5 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Aggregate Finish:
1. Sand blast concrete finish shall be light abrasive blast to expose fine aggregate with exposure of course aggregate (maximum 1/16" reveal). Sand blasting shall not affect the color of the finished surface.
2. Prepare a mock-up of no less than 10 square feet separate from the proposed work.
3. Abrasive shall be graded blasting sand or abrasive and shall be of gradation, size and sharpness to produce an acceptable finish on the field condition mock-up.
4. Contractor shall have on hand for the blasting of the mock-up, several various abrasives, which shall include sharp type abrasive of medium and fine gradation.
5. Apply finish in presence of the Owner and Design Consultant. Receive approval prior to applying finish to any concrete work. Maintain continuity of finish throughout the job.
6. Perform abrasive blasting after not less than seven (7) days of curing and before 30 days of curing time has elapsed.
    a. Ensure the surfaces to be blast finished are blasted at the same age for uniform results.
    b. Blast prior to sealing joints.
7. Protect adjacent materials during blasting operations. Maintain control of concrete chips, dust and debris.
    a. Clean up and remove such material at completion of each day of operation.
    b. Prevent migration of airborne materials with containing devices.

3.6 CURING AND PROTECTION

A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
1. Normal concrete: Not less than 7 days.
2. High early strength concrete: Not less than 4 days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:
1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Begin final curing after initial curing but before surface is dry.
a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.
b. Curing compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.7 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in the City of San Antonio Standard Specifications for Construction (June 2008).

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design to testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 75 cu yd or less of concrete placed.

F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.

3.8 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Design Consultant and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Design Consultant. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Design Consultant for each individual area.

END OF SECTION

SECTION 32 13 13.26
CONCRETE COLOR STAIN

PART 1 - GENERAL

1.1 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's specifications and instructions for pigment stains.

C. Samples for Pigment Color Selection: Pigment manufacturer's color chart or sample chip set; indicate pigment number and required dosage rate.

1.2 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Measurement method: by the gallon

PART 2 - PRODUCTS

2.1 CHEMICAL STAIN

A. Color Chemical Stain: Lithochrome Chemical Stain manufactured by L.M. Schofield Company, (713) 859-3987 or approved equal. Color to be selected by Design Consultant from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 FLOORS AND PAVING

A. Concrete paving shall be power washed to provide surface free from oil, grease and any foreign matter which would prevent necessary penetration and subsequent reaction of the stain solution with the concrete surface.

B. Apply chemical stain material per the manufacturer's recommendations.

C. Apply stain with broom-type, medium stiff bristle brush to provide a consistent color over the area involved.

D. Apply a second coat and subsequent coats if required at least 8 hours after the previous application. After last coat of stain has dried, remove all residue and salts by wet scrubbing and flushing with clean water. Control run-off of flushing water to prevent damage to the surrounding area.

3.2 TOLERANCES

A. Minor variations in appearance of colored concrete, which are similar to natural variations in color and appearance of unpigmented concrete, are acceptable.

END OF SECTION

SECTION 32 14 16
UNIT PAVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following:

1. Clay pavers set on mortar bed on concrete footing edge restraint.

2. Cap on raised planters and reflecting pool.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Clay pavers to match existing pavers on concrete slab and mortared and grouted in place

1.3 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

1. Product data for the following:

b. Clay pavers- ACME Elgin Blend 7480 Modular Solid to match existing pavers and caps

c. Mortar and grout materials.

B. Samples for verification in full-size units of each type of unit paver indicated; to match existing color, texture, and pattern specified, showing the full range of variations expected in these characteristics. Provide samples that match existing paver..

1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced Installer who has completed unit paver installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Single-Source Responsibility: Obtain each color, type, and variety of unit pavers, joint materials, and setting materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties without delaying the Work.

C. Mockup: Prior to installing unit pavers, construct mockups for each form and pattern of unit pavers required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work, including same base construction, special features for expansion joints, and contiguous work as indicated.

D. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.

E. Notify Architect one week in advance of the dates and times when mockups will be constructed.

F. Demonstrate the proposed range of aesthetic effects and workmanship.

G. Obtain Architect's acceptance of mockups before start of final unit of Work.

1. Accepted mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Protect unit pavers, aggregate and sand during storage and construction against soilage or contamination from earth and other materials.

B. Wrap pavers in plastic or use other packaging materials that will prevent rust marks from steel strapping.

C. Protect grout and mortar materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed. Protect liquid components from freezing.

1.6 PROJECT CONDITIONS:

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Mortar and Grout: Comply with the following requirements:

1. Cold-Weather Requirements: Protect unit paver work against freezing when atmospheric temperature is 40 deg F and falling. Heat materials to provide mortar and grout temperatures between 40 deg F and 120 deg F. Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40 deg F, cover with weather-resistant membrane; below 25 deg F, cover with insulating blankets; below 20 deg F, provide enclosure and temporary heat to maintain temperature above 32 deg F.

2. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

B. Concrete Pavers:
1. ACME BRICK COMPANY

C. Latex-Portland Cement Mortars and Grouts:

1. American Olean Tile Co.
2. Bostik.
3. Custom Building Products.
4. DAP Inc.
5. Laticrete International, Inc.
6. Southern Grouts & Mortars, Inc.

2.2 COLORS AND TEXTURES:

A. Provide materials and products that result in colors and textures of exposed unit paver surfaces and joints complying with the following requirements:

B. Match color and texture indicated of existing pavers on site.

2.3 UNIT PAVERS:

A. Building Brick used as paver and end caps.

B.

C. Clay Pavers-Acme Elgin Blend 7480 Modular Solid

1. Clay paver should match existing paver in color, texture and pattern as seen on site in court yard in same pattern. Color to match existing pavers and shall be approved by the Owner=s representative.

E. Concrete for Job-Built Edge Restraints: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with minimum 28-day compressive strength of 3000 psi.

F. Bituminous Fiber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:

1. Asphalt saturated fiberboard.

2.4 AGGREGATE SETTING-BED MATERIALS:

A. Graded Aggregate for Subbase: Quality-controlled, graded aggregate complying with ASTM D 2940 for subbase material.

B. Sand for Leveling Course: Fine, sharp, nonplastic aggregate complying with ASTM C 33.

C. Sand for Joints: Fine, sharp, masonry sand with 100 percent passing the No. 16 (1.18 mm) sieve and no more than 10 percent passing the No. 200 sieve.

2.5 PORTLAND CEMENT MORTAR SETTING-BED MATERIALS:

A. Portland Cement: ASTM C 150, Type I or II.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate: ASTM C 144 with a fineness module of 2.25, plus or minus 0.10.

2.6 GROUT MATERIALS:

A. Latex-Portland Cement Grout: ANSI A118.6, composition as follows:

1. Packaged, dry grout mix composed of portland cement, graded aggregate, and ethylene vinyl acetate in the form of a reemulsifiable powder to which only water is added at Project site.

2. Dry Grout Mixture: Factory-mixed, sanded grout complying with ANSI A118.6 and recommended by latex manufacturer, in color indicated. Use latex additive without retarder with dry-set grout.

   a. Colored Aggregate: Ground marble, granite, or other sound stone; selected as required to produce mortar color matching mortar on site,
   b. Colored Mortar Pigments for Grout: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar and grout mixes. Use only pigments that have proved through testing and experience to be satisfactory for use in portland cement grout.

B. Water: Potable.

2.7 MORTAR AND GROUT MIXES:

A. General: Comply with referenced standards and with manufacturers' instructions relative to mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grout when they have reached their initial set.

B. Cement-Paste Slush Coat: Mix slush coat to a consistency similar to that of thick cream and consisting of either neat cement and water or cement, sand, and water.

C. Portland Cement/Lime Setting-Bed Mortar: Type M complying with ASTM C 270, Proportion Specification.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Proof-roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction. Do not proceed with installation of unit pavers until deficient subgrades have been corrected and are ready to receive subbase for unit pavers. Subgrade surface must be graded to be parallel with finished grades.

3.2 INSTALLATION, GENERAL:

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

D. Joint and Color Pattern: As indicated on plans.

E. Tolerances: Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.

F. Expansion and Control Joints: Provide for joints at locations in rolok edge paver and concrete footing, and of widths indicated. Provide joint filler for joints where indicated. Install joint filler before setting pavers.

G. Install job-built concrete edge footings to comply with requirements of Division 3 Section "Concrete. Work."

3.3 AGGREGATE SETTING-BED PAVER APPLICATIONS:

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.

B. Place aggregate base and subbase in thicknesses indicated. Compact by tamping with plate vibrator and screed to depth required to allow setting of pavers. Repeat compaction and screeding until the subbase is smooth, uniformly compact, and parallel with finish grade

C. Place sand for leveling course and screed to a thickness of 1 inch, taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

D. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.

E. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Perform at least 3 passes across paving with vibrator. Vibrate under the following conditions:

F. After rolok edge pavers are installed and there is a completed surface or before surface is exposed to rain.

G. Before ending each day's work, fully compact installed concrete pavers within 36 inches (900 mm) of the laying face. Cover the open layers with nonstaining plastic sheets overlapped 48 inches (1200 mm) on each side of the laying face to protect it from rain.

H. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

I. Do not allow traffic on installed pavers until sand has been vibrated into joints.

J. Repeat joint-filling process 30 days later.

3.4 MORTARED APPLICATIONS:

A. Saturate concrete footing with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply cement-paste slush coat over surface of concrete subbase about 15 minutes prior to placing setting bed. Limit area of slush coat to avoid its drying out prior to placing setting bed. Do not exceed 1/16-inch thickness for cement slush coat.

C. Apply mortar setting bed over cement-paste slush coat immediately after latter has been applied.

Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

D. Mix and place only that amount of mortar setting bed that can be covered with pavers prior to initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set prior to placing pavers.

E. Place pavers before initial set of cement occurs. Immediately prior to placing pavers on green or wet setting bed, apply uniform 1/16-inch thick slurry bond coat to bed or to back of each paver with a flat trowel.

F. Tamp and beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation prior to initial set of mortar; do not return to areas already set and disturb pavers for purposes of realigning finished surfaces or adjusting joints.

G. Spaced Joint Widths: Provide joints with no gaps, pavers with full contact to adjacent pavers.

3.5 REPAIR AND PROTECTION:

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.

B. Provide final protection and maintain conditions in a manner acceptable to Installer that ensures that unit paver work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION

SECTION 32 15 40
DECOMPOSED GRANITE PATH

PART 1 - GENERAL

1.1 DESCRIPTION:

A. The work of this section consists of rehabilitating and constructing a universally accessible decomposed granite path on a prepared subgrade.

1.2 SUBMITTALS:

A. As specified in Section 01300 and as follows:

1. Submit sample of crushed aggregate for approval to ensure color will be compatible with project site. Sample shall be sufficiently large to illustrate clearly the functional characteristics, and full range of color and texture of the material.

1.3 PROJECT CONDITIONS:

A. Use Lightweight hauling equipment. Exercise care in using equipment, avoiding damage to adjacent tree growth.

PART 2 - PRODUCTS

2.1 CRUSHED AGGREGATE SCREENINGS:

A. Clean, hard, durable particles or fragments of 1/4 inch minus select brown/gray crushed granite. Fines shall be evenly mixed throughout the aggregate. When produced from gravel, 50 percent by weight of the material retained on a No. 4 sieve shall have one fractured face. Color to be approved by Owner's Representative.

B. The portion retained on the No. 4 sieve shall have a maximum percentage of wear of 50 at 500 revolutions as determined by AASHTO T96-77.

C. The portion passing as No. 40 sieve shall have a maximum liquid limit of 25 and a maximum plasticity index of 7, as determined by AASHTO T89-81 and AASHTO T90-81, respectively.

D. The crushed aggregate screenings shall be free from clay lumps, vegetable matter, and deleterious material.

2.2 GRADING REQUIREMENTS:

PERCENTAGE OF WEIGHT PASSING A SQUARE MESH SIEVE
AASHTO T11-82 and T27-82

Sieve Designation	Percent Passing	Sieve Designation	Percent Passing
3/8-inch	100	No. 30	40-50
No. 4	95-100	No. 40	25-35
No. 8	75-80	No. 100	20-25
No. 16	55-65	No. 200	5-15

2.3 FORMS:

A. See Section 03300.

2.4 WEED CONTROL FABRIC:

A. Typar #3401 thermally spun-bonded polypropylene, non-woven, thin geotextile weed control fabric, 4.0 oz/lineal yard weight, as manufactured by American Excelsior Co., 609 South Front Street, Yakima, Washington, 98901, 509-575-5794 (tel.), or equal. Needle punched material is **not** acceptable.

PART 3 - EXECUTION

3.1 SITE CLEARING:

A. Section 02110.

3.2 GROUND SURFACE PREPARATION:

A. Excavate ramp area as required to depths shown on details. Stockpile at on-site location designated by the Owner's Representative.

3.3 SUBGRADE PREPARATION:

A. Prior to placing crushed aggregate screenings, shape, fill, grade, and compact the subgrade. Refer to in place Concrete Paving, Section 03300, for placement of aggregate base.

3.4 FORMS:

A. See Section 03300.

3.5 WEED CONTROL FABRIC:

A. Fabric shall be installed between the compacted subgrade and crushed aggregate screenings to prevent weeds from growing up through the crushed stone trail; pre-emergent chemicals may not be used. Place fabric across the entire width of trail surface to receive aggregate; overlap ends of rolls a minimum of 12 inches.

3.6 PLACING CRUSHED AGGREGATE SCREENINGS:

A. Place the stabilized crushed aggregate screenings (CAS) on existing walk areas, and rake smooth using a steel tine rake to meet existing top of curb heights. Place to avoid segregation in one layer of 2 inches minimum thickness.

3.7 WATERING:

A. Water heavily to achieve full depth moisture penetration of the trail mix. Apply water to achieve moisture level as recommended by the manufacturer.

3.8 COMPACTION:

A. While the trail mix is still thoroughly moist, roll with a heavy lawn roller (minimum 225 pounds and maximum 30-inch width), to achieve finish grade and initial compaction. Hand tamp edges around concrete curb. Use a heavy (1-ton minimum) small rider, after having initially used the lawn roller, to obtain the desired final dense, smooth, uniform texture. Do not use wackers or vibratory rollers.

3.9 FINISHING

A. After finished compacted trail surface has been achieved, finish adjacent shoulders backfilling back of edging with stockpiled topsoil, compacting to match existing undisturbed ground, and slope to required grade and cross section.

3.10 INSPECTION:

A. Finished surface of trail shall be smooth, uniform, and solid, with no evidence of chipping or cracking. Dried, compacted trail material shall be firm all the way through with no spongy areas. Loose material shall not be present on the surface.

B. Rework loose gravel on the surface of unconsolidated crushed aggregate screenings. Unconsolidated areas shall be dug out, and be replaced with new crushed aggregate screenings with a high proportion of fines meeting the grading requirements of Section "Grading Requirements" above. Patched areas then shall be wetted thoroughly and rolled smooth. Patching shall be completed prior to any trail smoothing required.

C. Any significant irregularities shall be smoothed out prior to final acceptance of work. Smoothing shall be accomplished by rewetting/saturating rough areas thoroughly, and then rolling the trail again with a heavy roller (100-1500 lbs. powered walk-behind or small rider). Wackers are not acceptable.

D. Final thickness of completed trail shall not be less than the compacted dimension indicated. Measurements may be taken by means of test holes taken at random in finished trail surface. Correct any variations in the thickness by repeating the procedures listed under sections above.

E. Final width of completed trail shall not vary more than 1/2 inch from typical dimension indicated. Measurements may be taken at random cross sections in the finished trail surface.
F. No edges of weed control fabric shall be exposed.

END OF SECTION

SECTION 32 84 23
IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work specified in this section: Provide all labor, materials, transportation, and services necessary to furnish and install the irrigation system as shown on the drawings and described herein.

B. Underground irrigation system shall include, but is not limited to, pipe sleeves where required, valves and fittings, controller and wire, testing, sprinkler heads, excavating and backfilling irrigation system work, associated exterior plumbing and accessories to complete the system.

1.2 RELATED SECTIONS

A. The requirements of the "General and Supplementary Conditions of the Contract" and Division 1 specification sections shall apply to all work of this Section with the same force and effect as though repeated in full herein.

B. General Scope of Work and Requirements: Section 01 0000.

C. Site Grading: See Specifications.

D. Landscape Planting: Section 32 9300.

E. Treatment of Existing Trees: Section 32 9345.

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements relating to unit prices for this work.

B. Method of measurement

1. PVC pipe (1/2”-3”): by the linear foot
2. Purple PVC pipe (1/2”-3”): by the linear foot
3. Flexible PVC tubing: by the linear foot
4. Drip distribution tubing: by the linear foot
5. Fittings: each
6. Valves (manual, quick coupling, electric control): each
7. Wiring (EMS, control): by the linear foot
8. Controllers: each
9. Weather sensors: each
10. J boxes: each
11. Valves boxes: each
12. Sleeves (SCH 40): by the linear foot
13. Fill: by the cubic yard
14. Filter fabric: by the square foot
15. Sand: by the cubic yard

1.4 REFERENCES

A. ASTM D 2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2000.

B. ASTM D 2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 1996a.

C. Texas Water Code, Chapter 34, Chapter 344 Rules for Licensed Irrigators (TCEQ).

D. National Fire Protection Association, (NFPA); National Electrical Code.

E. National Sanitation Foundation (NSF).

F. City of San Antonio Code.

G. San Antonio Water System Code.

1.5 SUBMITTALS

A. Certifications/Material List/Shop Drawings:

1. The Contractor shall submit copy of irrigator's license on company letterhead.
2. The Contractor shall submit letter of certification of on-site water pressure.
3. The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior approval by the Landscape Architect.
4. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
5. Submit copy of the Irrigation Installation Certification Letter. Original copy to be issued to City inspector.
6. Contractor Shop Drawings:
   a. Wire Routing Plan: Contractor shall submit full size drawing showing in color the routing of wires from valves to controller. Contractor shall show where wires leave mainline to controller.
7. Equipment or materials installed or furnished without prior approval of the Landscape Architect may be rejected and the Contractor required to remove such materials from the site at his own expense.
8. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
9. Manufacturer's warranties shall not relieve the Contractor's liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Record and As-Built Drawings:

1. The Contractor shall provide and keep up-to-date an "as-built" set of Oce prints which shall be corrected daily and show every change from the original drawings and specifications. The drawings shall show exact "as-built" locations, sizes and kinds of equipment installed. This set of drawings shall be kept on the site and shall be used only as a working set.
2. These drawings shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. These drawings shall be available at all times for inspection. Should drawings not be available, no inspection will take place.
3. The Contractor shall make neat and legible notations on the as-built progress sheets daily as the work proceeds, showing the work as actually installed.
4. Before the date of the final inspection, the Contractor shall transfer all information from the "as-built" prints to an Oce print or 3 mil mylar or similar material. All work shall be in pen to allow proper printing of original.
5. The Contractor shall dimension from two (2) permanent points of reference i.e. building corner, sidewalk, or road intersections, etc., the location of the following items:
   a. Connections to potable water lines.
   b. Location of new and existing backflow preventer.
   c. Connections to electrical power.
   d. Location of new controller.
   e. Routing of pressure lines.
   f. Irrigation control valves.
   g. Quick-coupling valves.
   h. Other related equipment as directed by the Landscape Architect.
6. On or before the date of the final inspection, the Contractor shall deliver the completed as-builts on Oce print or 3 mil mylar or similar material and on compact disc to the Landscape Architect. Delivery of the as-builts will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the as-builts.

C. Controller Charts:
1. On the inside door of controller, provide a reduced copy of the irrigation plan colored coded area of coverage per each zone and location of main line, manual valves and taps. Chart shall be laminated. Securely fasten chart to controller door.

D. Operation and Maintenance Manuals:
1. Prepare and deliver to the Owner within ten calendar days prior to completion of construction, three hard cover binders with three rings containing the following information:
   a. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local sources of equipment installed. Manuals and/or catalog and parts sheets on all material and equipment installed under this contract.
   b. Guarantee statement.
   c. Complete operating and maintenance instructions on all major equipment.
   d. Copy of the Irrigation Installation Certification Letter.
   e. Water Schedule: Water schedule shall state watering times and frequencies of each irrigation zone. Water schedule shall be based on the local ET (evapotranspiration) rate.
2. In addition to the above mention maintenance manuals, provide the Owner's maintenance personnel with instructions for major equipment.

E. Equipment to be Furnished:
1. Supply as part of this contract the following tools:
   a. Two (2) quick coupling keys with hose swivels, hose bibs/garden valves to match size installed.
   b. Two (2) valve keys each for operating cast iron and brass gate valves.
   c. Two keys for automatic controller lock.
2. The above mentioned equipment shall be turned over to the Owner at the conclusion of the project. Before final inspection, verification that materials have been provided will occur.

1.6 QUALITY ASSURANCE AND REQUIREMENTS
A. Installer’s Qualifications: Minimum of 5 years experience installing irrigation systems of comparable size. Irrigation contractor shall be licensed in the State of Texas and bonded.
1. The Irrigation Contractor shall have in his employ a representative holding a valid irrigation license as issued by the Texas Commission on Environmental Quality, P.O. Box 13087, Austin, Texas 78711, on site at all times during the performance of this contract.
2. A working foreman will be required on site at all times during construction. This foreman will remain on this project throughout the duration of the contract. In the event of his illness, or other extenuating circumstances, notify and advise the Owner's Representative immediately as to what remedial action will be taken.

B. Permits and Fees: The Contractors shall obtain and pay for any and all permits and all inspections as required. Contractor shall also be responsible for all fees and costs involved for irrigation tap with the City main, water and related work.
1. Irrigation Contractor shall comply with City inspector directions with agreement from Landscape Architect without extra cost to Owner.

C. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of the article used in this contract furnishes directions covering points not shown in the drawings and specifications.

D. Ordinances and Regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

1. Installer Certification Letter: City of San Antonio requires a letter from the Licensed Irrigator certifying that the irrigation system was installed in accordance with the approved irrigation plan. Original copy shall be placed with the Test & Measure report in a weatherproof bag that will be collected by the building official. Irrigation contractor is to submit a copy of his conformity letter in the submittal package.

E. Statement of Area of Coverage: Drawing does not provide 100% coverage of the site. See plans and these specifications for areas to be irrigated.

F. Explanation of Drawings:

1. Due to the scale of drawings, it is not possible to indicated all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigations systems, planting and architectural features.
2. The words “Landscape Architect” as used herein shall refer to the Owner's authorized representative. The word “Contractor” shall herein refer to the Irrigation Contractor unless stated otherwise.
3. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver irrigation system components in manufacturer’s original undamaged and unopened containers with labels intact and legible.
B. Handling of PVC pipe and fittings: The Contractor is cautioned to exercise care in handling, loading, unloading and storing of PVC pipe and fittings.
C. Store and handle materials to prevent damage and deterioration. Do not store PVC pipe in direct sunlight for more than 7 days.

1.8 SUBSTITUTIONS

A. If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect for approval ten days prior to bid date:

1. Provide a statement indicating the reason for making the substitution. Use a separate sheet of paper for each item to be substituted.
2. Provide descriptive catalog literature, performance charts and flow charts for each item to be substituted.
3. Provide the amount of cost savings if the substituted item is approved.

B. The Landscape Architect shall have the sole responsibility in accepting or rejecting any substituted item as an approved equal to those equipment and materials listed on the irrigation drawings and specifications.

1.9 GUARANTEE

A. The guarantee for the sprinkler irrigation system shall be made in accordance with the attached form.

B. A copy of the guarantee form shall be included in the operations and maintenance manual.

C. The guarantee form shall be re-typed onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defects in material or workmanship which may develop during the period of two years from date of acceptance and also to repair or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT:_____
LOCATION:_____
SIGNED:_____
ADDRESS:_____
PHONE:_____
DATE OF ACCEPTANCE:_____

1.10 PROJECT CONDITIONS

A. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary and at no additional cost to the Owner.

B. The Contractor shall verify on-site pressure is not less than design pressure. Contractor shall submit letter certifying that on-site pressure exceeds design pressure by 10%. If on-site pressure does not exceed design pressure by 10%, contact Landscape Architect for resolution. If construction work is started prior to receiving certification letter, the Contractor assumes all costs for changes required to meet on-site pressure.

1. If on-site pressure exceeds design pressure by more than 10%, Contractor shall install a pressure regulator.

C. Site Utilities:

1. Determine locations of underground utilities, especially site lighting, cable, telephone, and irrigation lines. Perform all work in a manner which will avoid possible damage. Do not permit heavy equipment or trucks to damage utilities. Hand excavate, as required to minimize possibility of damage to underground utilities.
2. Coordinate work with the irrigation contractor to prevent damage to underground wire and other obstruction work located in landscape areas.

3. Known underground and surface utility lines are indicated on the utility survey. Contractor shall verify location of all known underground and surface utilities by contacting the appropriate utility companies.
4. Any damage to utilities shall be repaired by contractor.

D. Contractor is responsible for protecting all existing trees, plants, lawns, and other features designated to remain.

E. Contractor shall repair/replace any damage to adjacent facilities caused by irrigation system work operations at no additional cost to Owner.

F. Provide and install a dedicated irrigation meter and backflow preventer for the irrigation system water supply.

G. Design Pressure:
1. Design Static Pressure: See plans.
2. Drip Zone: 20 PSI

1.11 SCHEDULES

A. The Contractor shall begin exterior landscape work upon acceptance of the Contract by the Owner. Landscape Contractor shall submit a schedule for the work to be performed to the Landscape Architect for approval.

1.12 PROTECTIONS

A. All items required to complete this contract remain the property and responsibility of the Contractor until final acceptance. Take adequate precautions to protect all work and materials against damage. Cooperate fully with other trades to insure a satisfactory completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use only new materials of brands and types noted on drawings, specified herein, or approved equals.

B. PVC Pressure Mainline Pipe and Fittings:
1. Pressure mainline piping for sizes 1" inch and larger, shall be PVC Schedule 40.
2. Pipe shall be made from an NSF approved Type I, Grade II, PVC compound conforming to ASTM resin specification D1785-68. All pipe must meet requirements as set forth in Federal Specification PS-21-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld pipe).
3. Purple Non-Potable Pipe shall be made from an NSF approved Type I, Grade II, PVC compound conforming to ASTM resin specification D1785-68. All pipe must meet requirements as set forth in Federal Specification PS-21-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld pipe).
4. PVC solvent-weld fittings shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
5. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
6. All PVC pipe must bear the following markings:
   a. Manufacturer's name
   b. Nominal pipe size
   c. Schedule or Class
   d. Pressure rating in P.S.I.
   e. NSF (National Sanitation Foundation) approval
   f. Date of extrusion
7. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Piping:
1. Lateral piping for ½" pipe shall be PVC Class 315, SDR 13.5. Pipe 3/4" inch and larger, shall be PVC Class 200, SDR-21.Both class pipe shall be with solvent-weld joints.
2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
3. Purple Non-Potable Pipe shall be made from an NSF approved Type I, Grade II, PVC compound conforming to ASTM resin specification D1785-68. All pipe must meet requirements as set forth in Federal Specification PS-21-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld pipe).
4. Except as noted in paragraphs 1 and 2 of Section 2.1B, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure mainline pipe and fittings as set forth in Section 2.1B of these specifications.

D. Flexible PVC Tubing: All flexible PVC tubing shall be I.P.S. heavy wall hose made from rigid PVC material. Hose shall meet or exceed schedule 80 wall thickness and shall comply with ASTM D2287 and tested in accordance with ASTM D1598. Hose shall be tested at 200 psi static pressure for 2 hours and a quick burst rating of a minimum of 400 psi. Hose shall be as manufactured by AG-Products, Winter Haven, Florida.

E. Drip Irrigation:
1. Valve: Netafim pre-assembled valve, filter and pressure regulator control zone kit.
   a. Pressure Regulator: Pressure Regulator shall be Low flow for valves less than 4.5 gpm and High Flow for valves greater than 4.5.
2. Drip Emitters:
   a. Rainbird: XBT-10 emitter.
3. Distribution Tubing:
   a. Rainbird: XFD-100 Blank Dripline

F. Fittings:
1. Schedule 40 PVC molded fittings meeting ASTM D224. Fittings shall be suitable for solvent weld or slip joint ring tight seal. Threaded fittings shall be Schedule 80 PVC. Fittings for plastic to metal connections shall be PVC male adapters.
2. Ductile Fittings:
   a. For mainline 3" and larger provide push on, deep socket joint, ductile iron fittings, ASTM Grade 70-50-05, as manufactured by Harco, Lynchburg, Va.
   b. For remote section valves and quick coupler valves installed at the mainline 3" and larger provide Harco ductile iron and stainless steel strap saddle where applicable.

G. Manual Valves:
1. Gate valves 3.0 inches and smaller shall be USA made, 200 lb. WOG, highest grade cast bronze gate valve with screw-in bonnet, nonrising stem and solid wedge disc, threaded ends and a cast iron handwheel, manufactured by Nibco or approved equal.
2. Gate valve 4.0 inches and larger shall be USA made, 200 lb. WOG, iron made body, bronze mounted, double disc with parallel or inclined seats, non-rising stem type turning counter clockwise to open.
3. Isolation Valves shall be Nibco schedule 80 PVC ball valves with union connection at both ends of valve sized same main line or approved equal.

H. Quick coupling Valves:
1. Quick coupling valves shall have a brass one-piece body designed for working pressure of 150 PSI operable with quick coupler key. Key size and type shall be as shown on plans.
2. Non-potable quick coupling valves shall have a brass one-piece body designed for working pressure of 150 PSI operable with purple locking rudder cover and quick coupler key identifying quick coupler as part of a non-potable system. Key size and type shall be as shown on plans.

I. Backflow Prevention Units: Backflow prevention units shall be of size and type indicated on the irrigation drawings. Install backflow prevention units in accordance with irrigation construction details and/or city code.
1. Backflow preventer shall be a reduced pressure zone valve assembly, bronze body, erosion resistant internal parts, with ball valve test locks and gate valves.

J. Wye Strainer: Wilkins Strainer, Model YB, Brass, 20 mesh stainless steel screen or approved equal.

K. Pressure Reducing Valve: Bronze water pressure regulating valve with 300 lbs. max rating with adjustment between 25- 75 lbs.

L. Control Wiring:
1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire #14, AWG-U.F. 30 volt, using a National Electric Code Class II circuit. Install in accordance with valve manufacturer's specifications and wire chart.
2. For runs greater than 2000 feet, larger wire may be used provided it conforms to controller manufacturer’s specifications for both material specification and installation.
3. Underground splice kit shall be 3M DBY water-tight, dry splice connector or approved equal. All wire splices shall be protected by a valve box. No splices shall be installed on runs less than 500 feet.
4. Common wire shall be white.
5. Station control power wire shall be solid color.
6. Tracer Wire shall be green color, 12 AWG, UF Classification, UL approved for direct burial. Wire shall be set above all mainlines in sand layer, routed to controller, labeled, and terminated with red (color code) electrical spring connector (wire nut).
7. Where control wire leaves mainline, install in Schedule 40 PVC conduit.

M. Automatic Controllers:
1. Automatic controllers shall be of size and type shown on the plans. Final location of automatic controllers shall be approved by the Landscape Architect.
2. Unless otherwise noted on the plans, the 120 volt electrical power for the controller is available at the site. The final electrical hook-up shall be the responsibility of the Irrigation Contractor.

N. Weather Sensors:
1. Rain sensor: Hunter Mini-Clik 502 model.
2. Freeze sensor: Hunter Freeze-Clik 401 model.
3. Wireless will be rejected.

O. J-Boxes: J-boxes with accessible pull points for rigid conduit shall be LB box, pulling L (SLB), or J-box.

P. Electrical Control Valves:
1. All electric control valves shall be as called for on the plans.
2. Non-potable control valves shall have purple non-potable alert solenoid identifying valve as part of a non-potable system.

Q. Valve Boxes:
1. Manual Valves: 10" inch box, Carson Industries or Ametek, with green bolt down cover. Use extensions where required.
2. Non-potable manual valves: 10" inch purple box, NDS Pro Series, with purple bolt down cover. Use extensions where required.
3. Electrical Control Valves: Standard rectangular box, Carson Industries or Ametek, with green bolt down cover or approved equal. Install extension sleeves as required.
4. Non-potable electrical control valves: Standard rectangular purple box, NDS Pro Series, with purple bolt down cover or approved equal. Install extension sleeves as required.
5. Backflow Preventer: Pump Guard Box or approved equal. Box shall have hinged lockable section. Box shall be sized to fit required backflow preventer by minimum of 6” on each end.

R. Sleeves:
1. Definition: a pipe with in another pipe for carrying water will be installed.
2. Wire sleeve: a pipe used to carry low voltage irrigation wires for operation of electric control valves.
3. All sleeves shall be SCH 40. Size shall be equal to twice the diameter of the pipe or combination of pipes enclosed within the sleeve.

2.2 ACCESSORIES
A. Primers, cements, solvents, and joint compounds:
1. General: All primers, cements, solvents, and joint compounds shall be approved for use by the Uniform Plumbing Code; ASTM D 2564 for PVC pipe and fittings. Utilize appropriate type for application required.
a. Primer: Weld-On #P70 purple primer.
b. PVC: IPS Weld-On #721 solvent cement.
c. Flexible PVC: Weld-On #795 solvent cement .
d. Schedule 80 PVC: Weld-On #705 solvent cement.
2. Connections for PVC and Metal Pipe: For all threaded connections between PVC and metal pipe use Heavy Duty Rectorseal thread sealing paste with virgin Teflon No. 100 as manufactured by Rectorseal Corp. Apply in accordance with manufacturer’s instructions.
B. Drainage fill: ½" washed pea gravel.
C. Filter Fabric: Dewitt’s weed barrier or approved equal.
D. Sand Layer: Washed sand.

PART 3 - EXECUTION

3.1 INSPECTION
A. Site Conditions:
1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and inform Landscape Architect of his approval prior to proceeding with work under this section.
2. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his

operations or neglect. Check existing utilities drawings for existing utility locations.

3. Coordinate installation of sprinkler irrigation materials including pipe, so there shall be not interference with utilities or other construction or difficulty in planting trees, shrubs and groundcovers.
4. The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler irrigation system.

3.2 PREPARATION

A. Physical Layout:
1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
2. All layout shall be approved by Landscape Architect prior to installation.
3. Remove existing paving for sleeve installation if required. Saw cut existing paving to provide uniform straight transition at new to existing paving. Replace paving to equal or better conditions.

B. Water Supply:
1. Irrigation system shall be connected to water supply points as indicated on the drawings.

C. Electrical Supply:
1. Electrical service is available at the general locations of all controllers. The Contractor shall make the final wiring of the controller consistent with the city code.
2. Connections shall be made at approximated locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

3.3 INSTALLATION

A. Trenching:
1. Prior to trenching, verify the location of all underground site utilities and protect in place.
2. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.
3. Provide for a minimum of eighteen (18) inches cover for all pressure supply lines.
4. Provide for a minimum cover of twelve (12) inches for all non-pressure lines.

B. Backfilling:
1. The trenches shall not be backfilled until all required inspections and/or tests are performed.
2. Trenches shall be backfilled with sand bed to 3 inches below pipe and 3 inches above pipe. The remainder of trench shall be backfilled with cleaned excavated material, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Compact trenches to match surrounding soil. Backfill will conform to adjacent grades without dips, sunken areas, jumps or other surface irregularities.
3. If settlement occurs and subsequent adjustments in grade, pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:
1. Trenches located under areas of paving, asphaltic concrete or concrete will be installed shall be backfilled with 3" of sand above and below pipe. The balance

of the trench is to be backfilled with flowable fill 1-2 sack cement to the bottom level of finished paving.

2. Compact backfill in layers to 95% compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The Irrigation Contractor shall set in place, cap and pressure test all piping under paving.
3. General piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as a part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Landscape Architect.

D. Sleeves:
1. Extend sleeves a minimum of one foot past edge of pavement or walls. Drive a 24" stake at the location of sleeve. Maintain stake for irrigation contractor.
2. Required sleeving will be provided by the General Contractor or Irrigation contractor as shown on plans.
3. Size of sleeves shall be equal to twice the diameter of the pipe or combination of pipes enclosed within the sleeve.
4. Provide for a minimum cover of eighteen (18) inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic paving.
5. Install sleeves at all areas where piping crosses paving or through walls and as required. All sleeves may not be shown on plans.
6. Galvanize pipe sleeves installed under building shall be installed with clamps and hangers as necessary to support the weight of pipes and water. Freeze proof sleeves with freeze protection tape.
7. Drainage structures shall not be used as sleeves.

E. Assemblies:
1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with the details per plans.
2. No multiple assemblies shall be installed in plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawing or specifications pertaining to specific items required to complete work, perform such work in accordance with industry's best standard practice.

F. Piping:
1. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.
2. Remove burrs and shavings at cut ends prior to installation. Remove all scrap PVC pipe and fittings from site.
3. Make plastic to plastic joints with solvent weld joints or slip seal joints. Use solvent recommended by manufacturer. Install pipe fittings in accordance with manufacturer's instructions.
4. Install pipe with markings facing to the top of trench for ease of observation.
5. Allow joints to set at least 24 hours before water/compaction pressure is applied to the piping.
6. Do not use crosses in pipe connections.

7. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon paste shall be used on all threaded PVC to metal joints. Hand-tighten male adapters plus one turn with a strap wrench. Where threaded PVC connectors required, use threaded PVC adapters into which the pipe may be welded.
8. Line Clearance: All lines shall have a minimum clearance of three (3) inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another, space minimum of 6" apart. Do not place more than three lines in a single trench.

G. Drip Assembly:
1. Install pipe providing for expansion and contraction as recommended by Manufacturer.
2. Cut tubing square and remove burrs at cut ends.
3. Space drip line tubing four inch (4") maximum from perimeter of planting bed, edge of paving or structure; spacing of laterals shall not exceed distance noted on drawing. Number of laterals indicated on the drawing is the minimum number required; Contractor shall install number of laterals as needed to insure specified spacing between laterals is not exceeded. Comply with the manufacturer's installation guidelines.
4. Distribution tubing shall be between 14 inches minimum and 48 inches maximum long. Layout PVC lateral lines as necessary to keep distribution tubing lengths within specified tolerances.
5. Locate drip emitter on uphill side of plant within rootball zone.
6. Layout in-line tubing for shrubs and groundcovers so plants receive water within rootball zones.
7. Layout in-line tubing for trees as indicated on Drawings. Layout in-line tubing for shrubs and groundcovers so plants receive water within rootball zones.
8. Locate in-line tubing on top of soil but under bark mulch and filter fabric.
9. Staple in-line tubing to ground at 6 foot maximum intervals and within 12 inches of ends and intersections.
10. Assembly Using Solvent Weld Joints:
    a. Do not make solvent weld joint if ambient temperature is below 35 deg F.
    b. Clean mating pipe and fitting with clean, dry cloth. Apply uniform coat of Weld-On PVC 721 solvent to outside of pipe and inside socket of fitting. Give joint quarter turn and make certain pipe is inserted to full depth of fitting socket.
    c. Allow joints to set 24 hours minimum before applying pressure to pipe.
11. Assembly Using Distribution Pipe Joints:
    a. Connect distribution tubing to lateral line using barbed ell fitting.
    b. Connect fitting to distribution tubing using straight barbed fitting with 1/2 inch threaded end.
12. Drip Line:
    a. Install drip line in existing tree area underneath mulch layer. Do not trench in RPZ’s of existing trees.
13. Before installation of sprinkler heads and drip emitters, open control valves and use full head of water to flush out system

H. Wiring:
1. Provide for a minimum cover of eighteen (18) inches for all control wiring.
2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply wherever possible.
3. Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.
4. An expansion curl shall be provided within three (3) feet of each wire connection and each electric control valve. Expansion curls shall be a minimum of 3' in

length at each splice connection so that in case of repair, the splice may be brought above the finish grade without disconnecting the control wires.

5. Control wires shall be laid loosely in trench without stress or stretching. Provide expansion joints at 100' intervals by making 5-6 turns around a piece of ½" pipe.
6. All splices shall be made with approved wire connector. Use one connector sealing pack per splice.
7. Field splices between the automatic controller and electrical control valves will not be allowed.
8. Install two (2) extra control wires from controller to the remote control valves located the greatest distances from the controller in all directions and label as spare wires. Spare wires shall be a different color than the common and valve wires. Provide a minimum 6' length of wire coiled up in valve box.
9. Where wires leave mainline, install in Schedule 40 PVC conduit. Size as required.
10. Where wires are installed under building, all wires shall be in galvanized steel conduit. Hang conduit with metal straps and hangers as necessary to prevent sagging.

I. Automatic Controller: Install as per manufacturer's instructions. Remote control valves shall be connected to controller in sequence as shown on the drawings. Watertight seal all wall penetrations.

1. Provide rigid conduit from controller to below finished grade to accommodate valve wires. Wires to weather sensors shall also be in rigid conduit. All 90 turns shall have J-boxes installed. Clamp conduit securely to wall. Final approval will be given by Owner.
2. Wiring for Automatic Controller:
   a. 120 volt power provided to the automatic controller shall be the responsibility of the General Contractor.
   b. Wire controllers per city code. Install wires in liquid tight conduit when wire must be run above the ground. If outdoor mounting is required, all wiring to controller and to power supply will be hard-wired.
3. Contractor shall install controller map.

J. Weather Sensors: Install weather sensors on weatherproof J-Box fitted with ½" diameter galvanized thread steel nipple to extend 12" minimum beyond fascia/gutter. Install wires to controller in ½" rigid conduit. Clamp conduit securely to wall. All 90 degree turns shall have J-boxes installed. Final approval of location will be given by Owner. Coordinate with other trades as required to complete work. Do not attach to gutter.

K. Electrical Control Valves: Install where shown on drawings and details. When grouped together, allow at least eighteen (18) inches between valves. Install each electric control valve in a separate valve box. Provide unions on both sides of valve.

L. Manual Valves: Install manual valves per detail. Provide unions on both sides of valve.

M. Quick Coupler Valves: Install quick coupler valves per detail.

N. Valve Boxes: Install valve boxes over remote control valves with unions showing. Use box extensions and brick supports to raise valve boxes to be level with finished grade.

O. Dielectric Protection: Use dielectric fittings at connection where pipes and products of dissimilar metal are joined.

P. Thrust Blocks: All mainline pipe 3" and larger shall have thrust blocks installed at all fittings installed on the main line. Care shall be taken by the Contractor to keep all concrete on the fittings and from joints of pipe. Control, power and valve wires must be

kept free of concrete by the Contractor and placed outside of the thrust. Thrust blocks shall be poured against undisturbed ground. No precast thrust blocks will be allowed.

Q. Flushing of System:
1. After all new sprinkler pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and full head of water used to flush out the system.
2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Landscape Architect.

R. Installation for Re-use water:
1. Irrigation practices shall be installed so as to prevent incidental ponding or standing water.
2. Irrigation application rates and application times shall be developed so as to minimize "wet grass" conditions in unrestricted landscaped areas during the periods the area could be in use.
3. Irrigation systems shall be designed so that the irrigation spray does not reach any privately-owned premises outside the designated irrigation area or reach public drinking fountains.
4. There shall be no application of effluent when the ground is water saturated or frozen.
5. **Irrigation operations shall be managed in a manner to minimize the inadvertent contact of reclaimed water with humans.**
6. Low-head controls shall be provided to preclude discharge of reclaimed water from irrigation site.
7. All quick couplers shall have purple covers. Quick couplers shall be located in locked, below grade valve boxes which shall be clearly labeled as being of non-potable quality.
    a. At each quick coupler, the following sign shall be installed:
        (1) Signs having a minimum size of eight inches by eight inches, as shown in Figure 1, shall be posted at all storage areas and on all hose bibs and faucets reading, in both English and Spanish, "Recycled Water, Do Not Drink" or similar warning. (Figure 1: 30 TAC §210.25(b)(1)). See attached drawing. Each sign shall be on a 4"x4" cedar post, 5' above grade, with a 2' deep concrete footing.
        (2) Figure 1: 30 TAC §210.25(b)(1)

RECYCLED WATER
DO NOT DRINK THE WATER
NO TOMAR EL AGUA

8. Reclaimed water piping shall be separated from potable water piping by a horizontal distance of at least nine feet. Where the nine foot separation distance cannot be achieved, the reclaimed water piping must meet the line separation requirements of Chapter 290 of TCEQ Public Drinking Water (relating to Water Hygiene). See Attachment No. 5.
9. Where a reclaimed water line parallels a sewer line, the reclaimed water line shall be constructed in accordance with subsection (e) or (f) of Chapter 210 of TCEQ Use of Reclaimed Water. The horizontal separation distance shall be three feet (outside to outside) with the reclaimed water line at the level of or above the sewer line. Reclaimed water lines which parallel sewer lines may be placed in the same benched trench. Where a reclaimed water line crosses a sewer line, the requirements of §290.44(e)(4)(B) of this title (relating to Location of Water Lines) shall be followed, with “reclaimed water line” substituted in §290.44(e) of this title (relating to Location of Water Lines) for “water line.”
10. All exposed piping (purple) should be stenciled in white with a warning reading "NON-POTABLE WATER." All exposed or buried reclaimed water piping constructed at a wastewater treatment facility is exempt from the color coding requirements of this section.
11. All ground level and elevated storage tanks shall be designed, installed, and constructed in accordance with current AWWA standards with reference to materials to be used and construction practices to be followed, except for health-based standards strictly related to potable water storage and contact practices, where appropriately less restrictive standards may be applied.
12. Location of water lines:
    a. The following rules apply to installations of potable water distribution lines and wastewater collection lines, wastewater force mains and other conveyances/appurtenances identified as potential sources of contamination. Furthermore, all ratings specified shall be defined by ASTM or AWWA standards unless stated otherwise.

b. When new potable water distribution lines are constructed, they shall be installed no closer than nine feet in all directions to wastewater collection facilities. All separation distances shall be measured from the outside surface of each of the respective pieces. Install green plastic tape with letter " Potable Water" over domestic water line.

c. Potable water distribution lines and wastewater collection lines or force mains that form parallel utility lines shall be installed in separate trenches.

d. No physical connection shall be made between a drinking water supply and a sewer line. Any appurtenance shall be designed and constructed so as to prevent any possibility of sewage entering the drinking water system.

e. Where the nine foot separation distance cannot be achieved, the following criteria shall apply:

(1) New Waterline Installation - Parallel Lines.

(a) Where a new potable waterline parallels an existing, non-pressure or pressure rated wastewater line/force main and the licensed professional engineer is able to determine that the existing line is not leaking, the new potable waterline shall be located at least two feet above the existing line, measured vertically, and at least four feet away, measured horizontally, from the existing line. Every effort shall be exerted not to disturb the bedding and backfill of the existing wastewater line.

(b) Where a new potable waterline parallels an existing pressure rated wastewater line and it cannot be determined by the licensed professional engineer if the existing line is leaking, the existing wastewater line shall be replaced with a 150 psi pressure rated pipe. The new potable waterline shall be located at least two feet above the new wastewater line, measured vertically, and at least four feet away, measured horizontally, from the replaced wastewater line.

(c) Where a new potable waterline parallels a new wastewater line/force main, the wastewater line shall be constructed of 150 psi pressure rated pipe. The new potable waterline shall located at least two feet above the wastewater line, measured vertically, and at least four feet away, measured horizontally, from the wastewater line.

(2) New Waterline Installation - Crossing Lines

(a) Where a new potable waterline crosses an existing, non-pressure rated wastewater line, one segment of the waterline pipe shall be centered over the wastewater line such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater line. The potable waterline shall be at least two feet above the wastewater line. Whenever possible, the crossing shall be centered between the joints of the wastewater line. If the existing wastewater line is disturbed or shows signs of leaking, it shall be replaced for at least nine feet in both directions (18 feet total) with 150 psi pressure rated pipe.

(b) Where a new potable waterline crosses an existing, pressure rated wastewater line, one segment of the

waterline pipe shall be centered over the wastewater line such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater line. The potable waterline shall be at least six inches above the wastewater line. Whenever possible, the crossing shall be centered between the joints of the wastewater line. If the existing wastewater line shows signs of leaking, it shall be replaced for at least nine feet in both directions (18 feet total) with 150 psi pressure rated pipe.

(c) Where a new potable waterline crosses a new, non-pressure rated wastewater line and the standard pipe segment length of the wastewater line is at least 18 feet, one segment of the waterline pipe shall be centered over the wastewater line such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater line. The potable waterline shall be at least two feet above the wastewater line. Whenever possible, the crossing shall be centered between the joints of the wastewater line. The wastewater pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The wastewater line shall be embedded in cement stabilized sand (see §290.44(e)(4)(B)(vi) of this title) for the total length of one pipe segment plus 12 inches beyond the joint on each end.

(d) Where a new potable waterline crosses a new, non-pressure rated wastewater line and a standard length of the wastewater pipe is less than 18 feet in length, the potable water pipe segment shall be centered over the wastewater line. The materials and method of installation shall conform with one of the following options:

i) Within nine feet horizontally of either side of the waterline, the wastewater pipe and joints shall be constructed with pipe material having a minimum pressure rating of 150 psi. An absolute minimum vertical separation distance of two feet shall be provided. The wastewater line shall be located below the waterline.

ii) All sections of wastewater line within nine feet horizontally of the waterline shall be encased in an 18 foot (or longer) section of pipe. Flexible encasing pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The encasing pipe shall be centered on the waterline and shall be at least two nominal pipe diameters larger than the wastewater line. The space around the carrier pipe shall be supported at 5 foot (or less) intervals with spacers or be filled to the springline with washed sand. Each end of the casing shall be sealed with water tight non-shrink cement grout or a manufactured water tight seal. An absolute minimum separation distance of six inches between the encasement pipe and the waterline shall be provided. The wastewater line shall be located below the waterline.

iii) When a new waterline crosses under a wastewater line, the waterline will be encased as described for wastewater lines in section (II) above or constructed of ductile iron or steel pipe with mechanical or welded joints as appropriate. An absolute minimum separation distance of one foot between the water line and the wastewater line shall be provided. Both the waterline and wastewater line, must pass a pressure and leakage test as specified in AWWA C600 standards.

iv) Where a new potable waterline crosses a new, pressure rated wastewater line, one segment of the waterline pipe shall be centered over the wastewater line such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater line. The potable waterline shall be at least six inches above the wastewater line. Whenever possible, the crossing should be centered between the joints of the wastewater line. The wastewater pipe shall have a minimum pressure rating of 150 psi. The wastewater line shall be embedded in cement stabilized sand for the total length of one pipe segment plus 12 inches beyond the joint on each end.

v) Where cement stabilized sand bedding is required, the cement stabilized sand shall have a minimum of 10% cement per cubic yard of cement stabilized sand mixture, based on loose dry weight volume (at least 2.5 bags of cement per cubic yard of mixture). The cement stabilized sand bedding shall be a minimum of six inches above and four inches below the sewer pipe. The use of brown coloring in cement stabilized sand for wastewater line bedding is recommended for the identification of wastewater force mains during future construction.

3.4 TEMPORARY REPAIRS

A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.5 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.
3. Lowering raised sprinkler heads by the Contractor shall be accomplished within ten (10) days after notification by Owner.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans.
5. The Contractor shall make minor adjustments in moving or capping of heads as directed in the field by Owner or Landscape Architect as part of this work. Additional cost to Owner will not be accepted.

B. Testing of Irrigation System:
   1. The Contractor shall schedule with the Landscape Architect a time for the testing of the system.
   2. After installation of electric control valves, test all pressure lines under hydrostatic pressure of 150 lbs per square inch, and prove watertight.
   3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs per square inch, and proved watertight prior to repaving.
   4. Sustain pressure in lines for not less than four (4) hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.
   5. All hydrostatic tests shall be made only in the presence of the Landscape Architect, or other representative of the Owner. No pipe shall be backfilled until it has been inspected, tested and approved.
   6. Furnish necessary force pump and all other test equipment.
   7. When the irrigation system is completed, perform a coverage test in the presence of the Landscape Architect, to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans, or where the system has been willfully installed as indicated on the drawing when it is obviously inadequate, without bringing this to the attention of the Landscape Architect. This test shall be accomplished before any planting operations begin.
   8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.
   9. Test and demonstrate the irrigation system running from the controller.
   10. Backflow device shall be tested and certified before substantial completion is issued.

3.6 MAINTENANCE
A. The entire irrigation system shall be under full automatic operation for a period of two days prior to any planting.
B. The Landscape Architect reserves the right to waive or shorten the operation period.

3.7 CLEAN-UP
A. Clean-up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be swept or washed down, and any damage sustained on the work of others shall be repaired to original conditions.

3.8 FINAL OBSERVATION PRIOR TO ACCEPTANCE
A. The Contractor shall operate each system in its entirety for the Landscape Architect at time of final observation. Any items deemed not acceptable by the Landscape Architect shall be reworked to the complete satisfaction of the Landscape Architect.

B. The Contractor shall show evidence to the Architect that the Owner has received all accessories, charts, record drawings, and equipment as required before final inspections can occur.

3.9 OBSERVATION SCHEDULE
A. Contractor shall be responsible for notifying the Landscape Architect in advance for the following observation meetings:
   1. Pre-Job Conference.
   2. Pipe and sleeving under paving installation.
   3. Pressure supply line installation and testing.
   4. Automatic controller installation.
   5. Control wire installation.
   6. Lateral line and sprinkler installation.

7. Coverage test.
8. Final inspection.

B. When observations have been conducted by other than the Landscape Architect, show evidence in writing of when and by whom these observations were made.

C. No site observations will commence without as-built drawings. In event the Contractor calls for a site visit without as-builts drawings, without completing previously noted corrections, or without preparing the system for said visit, he shall be responsible for reimbursing the Landscape Architect at his current billing rates per hour portal to portal (plus transportation costs) for inconvenience. No further site visits will be scheduled until this charge has been paid and received.

END OF SECTION

SECTION 32 93 00
LANDSCAPE PLANTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work specified in this section: Provide all labor, materials, transportation, and services necessary to furnish and install all landscape planting, complete in place, as shown and specified on drawings.

B. Landscape work shall include, but is not limited to, fine grading, soil preparation, planting, seeding, sodding, pruning, fertilizing and pest/disease control.

1.2 RELATED WORK

A. The requirements of the "General and Supplementary Conditions of the Contract" and Division 1 specification sections shall apply to all work of this Section with the same force and effect as though repeated in full herein.

B. Section 01 00 00 - General Scope of Work and Requirements

C. Section 31 22 00 - Site Grading

D. Section 32 84 23 - Irrigation System

E. Section 32 93 45 - Treatment of Existing Trees

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements relating to unit prices for this work.

B. Method of measurement

1. Shade and ornamental trees: each
2. Shrubs/perennials/groundcovers (5 gallon, 1 gallon, 4” pots): each
3. Solid sod: by the square yard
4. Seed: by the square foot; includes mulching agents and all appurtenances
5. Topsoil: by the cubic yard
6. Mulch: by the cubic yard
7. Soil amendment: by the cubic yard
8. Turf fertilizer: by the cubic yard
9. Tree and shrub fertilizer: by the box; includes any required mixing agents and all appurtenances
10. Herbicides
    a. Pre-emergent herbicide: by the pound; includes mixing agent and all appurtenances
    b. Post-emergent herbicide: by the gallon; includes required mixing agents and all appurtenances
11. Pesticides: by the gallon; includes any required mixing agents and all appurtenances
12. Filter fabric: by the square foot
13. Steel edging: by the linear foot
14. Stakes: each
15. Wire for tree staking: by the linear foot
16. Hose for tree staking: by the linear foot
17. Gravel: by the cubic yard; includes compaction of subgrade (if required)
18. Decomposed granite: by the cubic yard; includes compaction of subgrade (if required)

1.4 REFERENCES

A. ANSI Z60.1, American Standard for Nursery Stock Edition, 2004.

B. ANSI A300 - American National Standard for Tree Care Operations -- Tree, Shrub and Other Woody Plant Maintenance -- Standard Practices; 2001.

C. Hortus third, 1976 - Cornell University - Plant Nomenclature.
D. Grades and Standards for Nursery Stock," Texas Association of Nurserymen.
E. Turfgrass Producers International (TPI) - Guideline Specifications to Turfgrass Sodding.
F. U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act and the Texas Seed Law.

1.5 SUBMITTALS

A. General Requirements:
1. The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior approval by the Landscape Architect.
2. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, description of all materials to be used and samples as outlined below.
3. Submit contractor qualifications per 1.5 Quality Assurance and Requirements.

B. Plant Selection:
1. Submit plant schedule on contractor letterhead naming quantities and supplier of each tree for Landscape Architect's approval.
2. Submit certification of sod species and location of sod source.
3. Submit certification of seed and mulching agent.
4. If material is to be approved on-site, tag and maintain plant material as representative samples. Samples may be use to complete installation, provided they remain tagged until final acceptance of entire installation.

C. Miscellaneous Materials:
1. Submit for approval 1 gallon quantities and product information of topsoil, prepared soil, mulch and granite gravel.
2. Submit topsoil analysis with recommendations of amendments required to support plant growth. See paragraph 2.4 Source Quality Control And Tests, D.
3. Submit for approval product information on packaged materials, edger, tree stakes, tree boots, fabric and fertilizer, herbicide and insecticide. Samples shall be approved by the Landscape Architect before use on the project.
4. All samples shall be delivered in a box. Clearly mark samples with job name and contractor name.

D. Record Drawings:
1. The Contractor shall provide and keep up-to-date an "as-built" set of blue line ozalid prints which shall be corrected daily and show every change from the original drawings and specifications and the exact "as-built" locations, sizes of plant material installed. This set of drawings shall be kept on the site and shall be used only as a working set.
2. Before the date of the final inspection, the Contractor shall transfer all information from the "as-built" prints to a mylar or similar material. All work shall be in pen to allow proper printing of original.
3. On or before the date of the final inspection, the Contractor shall deliver the completed mylars to the Owner. Delivery of the record drawings will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.

E. Maintenance Schedule: Submit maintenance schedule identifying procedures to be accomplished during the year. The schedule shall be typewritten and specify procedures to be accomplished month by month.
F. Submit 3 copies of written guarantee, in the terms specified under "Guarantee" provisions of these specifications, and signed by the Contractor.

1.6 QUALITY ASSURANCE AND REQUIREMENTS

A. Permits and Fees: The Contractors shall obtain and pay for any and all permits and all inspections as required. Contractor shall also be responsible for all fees and costs involved for work.

1. Landscape Contractor shall comply with City inspector directions with agreement from Landscape Architect without additional cost to Owner.

B. Ordinances and Regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

C. Personnel: Personnel shall be supervised by a Certified Landscape Professional Contractor (CLPC) as administered by Texas Association of Landscape Contractors (TALC) or hold a college degree relating to the landscape industry or an approved equivalent. Employ only experienced personnel who are familiar with the required work. Provide adequate supervision by a qualified foreman with minimum of five years experience.

D. Plant Material: Plants shall be subject to inspection and approval of Landscape Architect at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Inspection and tagging of plant material by the Landscape Architect is for design intent only and does not constitute the Landscape Architects' approval of the plant materials in regards to their health and vigor as specified in Part 2, Section 2.1 Plant Material. The health and vigor of the plant material is the sole responsibility of the Contractor.

1. General: Comply with applicable federal, state, county, and local regulations governing, landscape materials and work.
2. Any plant material in shock, decline or not meeting specified planting size, height and caliper shall be rejected by the Landscape Architect at any time during the project.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver plant material to site in containers. Protect plant material from sun-scald and wind burn during transport to site. Prune only limbs that have broken in transport. Keep plants watered as required.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

C. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

1.8 SUBSTITUTIONS

A. Submit proof to Landscape Architect if plant material is not available 30 days prior to plant installation. Substitution will be approved by Owner or Landscape Architect by Architect’s Supplemental Instructions.

1.9 GUARANTEE

A. Guarantee plants and trees for two years after final acceptance. Replace dead materials and materials not in vigorous, thriving condition as soon as weather permits and on notification by Owner. Replace plants, including trees, which have partially died thereby damaging shape, size or symmetry.

B. Replace plants and trees with same kind and sizes as originally planted, at not cost to Owner. Provide one year guarantee on replacement plants. At direction of the Landscape Architect, trees may be replaced at the start of next year's planting or digging season. In such cases, remove dead trees immediately. Protect irrigation system and any other piping, conduit, or other work during replacement. Repair any damage

immediately.

C. Guarantee excludes replacement of plants because of injury by storm, drought, hail, freeze, insects or diseases, and other acts of God contacted after final acceptance.

1.10 PROJECT CONDITIONS

A. Site Utilities:

1. Determine locations of underground utilities, especially site lighting, cable, telephone, and irrigation lines. Perform all work in a manner which will avoid possible damage. Do not permit heavy equipment or trucks to damage utilities. Hand excavate, as required to minimize possibility of damage to underground utilities.
2. Coordinate work with the irrigation contractor to prevent damage to underground wire and other obstruction work located in landscape areas.
3. Any damage to utilities shall be repaired by contractor.

B. Condition of Surfaces: All shrub and groundcover planting areas will be left at finished grade.

C. Water will be provided on site by the Owner. Landscape contractor will provide hoses, other watering equipment and labor necessary for the work.

1.11 SCHEDULES

The Contractor shall begin exterior landscape work upon acceptance of the Contract by the Owner. Landscape Contractor shall submit a schedule for the work to be performed to the Landscape Architect for approval.

1.12 PROTECTIONS

All items required to complete this contract remain the property and responsibility of the Contractor until final acceptance. Take adequate precautions to protect all work and materials against damage. Cooperate fully with other trades to insure a satisfactory completion.

1.13 MAINTENANCE SERVICE

A. Maintain plant material until Date of Substantial Completion.

B. Maintain plant material immediately after placement and until plants are well established and exhibit a vigorous growing condition.

C. Maintenance to include:

1. Cultivation and weeding plant beds and tree pits.
2. Applying herbicides for weed control of all areas and plant materials in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
3. Applying insecticides for insect control and fungicides for fungus control of all areas and plant materials in accordance with manufacturer's instructions. Remedy damage from use of chemicals. Remedy damage resulting from use of chemicals.
4. Irrigating sufficiently to saturate root system of all plant material and sustain live and promote growth.
5. Pruning, including removal of dead or broken branches, and treatment of pruned areas or other wounds.
6. Disease control. Provide chemicals as required to control any disease that may occur during the maintenance period. Notify Owner and Landscape Architect for any problems.
7. Maintaining guys and tree stakes. Adjust to keep guy wires firm. Repair or replace accessories when required.
8. Replacement of mulch.
9. Watering, mowing, edging, weeding and fertilizing of lawn areas.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. General:

1. Plants shall be in accordance with the latest edition of "American Standard for Nursery Stock" sponsored by the American Association of Nurserymen, Inc. (A.A.N.). All plants shall have a normal habit of growth and shall be sound, healthy, vigorous and free of insect infestations, plant diseases, sunscalds, fresh abrasions of the bark, excessive abrasions, in shock or other objectionable disfigurements. If the sample plants inspected are found to be defective, the Landscape Architect reserves the right to reject the entire lot or lots of plants represented by the defective samples. Any plants rendered unsuitable for planting because of this inspection will be rejected and will be the responsibility of the Contractor and removed from site.
2. The size of the plants will correspond with that normally expected for species and variety of commercially available nursery stock or as specified on drawings. The minimum acceptable size of all plants measured before pruning with the branches in normal position, shall conform with the measurements, specified on the drawings in the plant list. Plants larger in size than specified may be used with no change in contract price. If the use of larger plants is approved, the rootball for each plant will be increased proportionately.
3. Under no conditions will there be any substitutions of plants or sizes listed on the accompanying plans, except with the express consent of the Landscape Architect.
4. Plant material shall be true to botanical and common name and variety as specified in "American Standard for Nursery Stock Editions" and "Standardized Plant Names."
5. Plant materials shall be in conformance for rootball depth and width per ANSI Z60.1, American Standard for Nursery Stock Edition, 2004.
6. Plants shall be hardy under climatic conditions similar to those in locality of project.

B. Shade and Ornamental Trees:

1. Healthy, vigorous, full-branched, well-shaped, trunk diameter and height requirements as specified. Trees shall be in containers unless otherwise noted on plans.
2. Specified B&B shall be uniform in appearance.
3. Specified B&B trees shall have rootballs that are firm, neat, slightly tapered, heeled for a period of one (1) year.
4. Trees with loose or broken rootballs at time of planting shall be rejected.
5. Trees in grow bags, grow liners will be rejected.
6. Trees will be individually approved by the Landscape Architect.
7. Rootballs shall be 10" in diameter for each 1" caliper measured 6" above the tree rootball.

C. Shrubs and Perennials: Nursery grown, healthy, vigorous, bushy, well branched, of normal habit of growth for species, free from disease, insect eggs and larvae. Specified sizes shall be before pruning, and plants shall be measured with their branches in normal position.

D. Turf Materials:

1. Sod: TPI, Certified Turfgrass Sod quality; cultivated grass sod; with strong fibrous root system, rich green in color, free of stones, burned or bare spots, free of foreign grasses, weeds and nut grass; Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
    a. Common Bermuda (Cynodon dactylon).
    b. Deliver to site on pallets. Do not stack for more than 24 hours between time of cutting and time of delivery.

2. Seed: Seed mix shall be hulled Common Bermuda (Cynodon dactylon) - 2#PLS/1000SF. If seed is applied after September 15, Winter Rye Grass (Lolium perenne) - 4#PLS/1000SF.

2.2 SOIL PREPARATION MATERIALS

A. Sandy Loam Topsoil: Fertile, dark sandy loam topsoil free of rubble, stones, lumps, plant roots and reasonably free of weeds. Loam shall have a minimum pH value of 5.4 to maximum of 7.0. Loam containing high clay content, rock or debris greater than ½" diameter, Nut grass or Dalisgrass will be rejected and Contractor will be responsible for removing it from site.

B. Soil Amendment: Garden-Ville 4-way landscape mix, as manufactured by Garden-Ville Materials, (210) 651-6115.

C. Fertilizer:

1. Turf Fertilizer: Complete fertilizer with an organic base, uniform in composition, dry and free flowing. Deliver fertilizer to site in original unopened containers, each bearing manufacturer's guaranteed statement of analysis. Fertilizer shall contain 12% nitrogen, 12% phosphoric acid, 12% potash, unless otherwise approved.
2. Tree and Shrub Fertilizer: Agriform 20-10-5 planting tablets 21 gram.

D. Herbicide:

1. Pre-emergent herbicide shall be Eptam Granules by Green Light Company, San Antonio, Texas, or approved equal.
2. Post-emergent herbicide shall be Round-Up by Monsanto Corp., or approved equal.

E. Pesticides:

1. Fungicides: Mancozeb, Armada
2. Insecticides: Dursaban, Sevin, Volck Oil
3. Other chemicals: Submit information as required.

2.3 MISCELLANEOUS MATERIALS

A. Seed Mulching Material: Wood cellulose fiber, dust form, free of growth or germination inhibiting ingredients.

B. Mulch: Mulch shall be double shredded hardwood mulch. Submit sample for approval.

C. Water: Water will be available on site.

D. Filter Fabric: Dewitt's Pro-5 Weed Barrier, 5 oz. woven, needle punched, polypropylene fabric.

E. Steel edger: Pro-steel or Ryerson edger, 1/4" x 4" and stakes.

F. Stakes: Metal T-posts, 6' ht., green in color.

G. Wire: Minimum 10 gauge wire, provide 2 strands of pliable galvanized iron wire.

H. Hose: 3/4" diameter, 2 ply, green rubber hose. Cut in sufficient length to protect tree from wire damage. Thread wire through hose.

I. Tree Boot: Deep Root ArborGard+, Model AG9-4 or approved equal. Tree trunk protector to prevent damage from trimmers and mowers. 9" ht. with a 4" diameter. Made of polyethylene 0.060" (1.52 mm) thickness.

J. Gravel: Gravel shall be 2"-4" diameter scale Texas Blend gravel and shall be clean, washed, hard, sound, durable, uniform in quality, and free of any detrimental matter. Available from Keller Material, Inc., San Antonio, Texas, (210) 648-4221.

K. Decomposed Granite: Hard, durable particles or fragments of Texas Hill Country decomposed granite gravel with fines evenly mixed throughout the aggregate. Available from Keller Material, Inc., San Antonio, Texas, (210) 648-4221.

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Section 01400 - Quality Requirements: If existing, excavated, on-site soil is to be reused, provide a chemical analysis of existing topsoil.

B. Soil analysis will ascertain the percentage of nitrogen, phosphorus, potash, soluble salt, organic matter and pH value.

C. Submit minimum 1 gallon sample of topsoil proposed. Forward another sample to approved testing laboratory in sealed containers to prevent contamination.
D. Testing is not required for imported soil if recent tests are available. Submit these test results to the Landscape Architect for approval. Contractor is to indicate, by test results, information (amendments both organic and inorganic) necessary to amend soil to support plant growth.
E. Soils analysis must be dated within 45 days of installation of topsoil.

PART 3 - EXECUTION

3.1 INSPECTION
A. Observe site prior to construction and accept site when satisfied with conditions. Landscape Contractor shall be responsible for shaping all planting areas as indicated on plans or as directed by Landscape Architect.
B. Inspect trees, shrubs and liner stock plant material for injury, insect infestation and trees and shrubs for improper pruning.
C. Do not begin planting until deficiencies are corrected or plants replaced. Do not start work until grading is complete and approved by Engineer or Architect.

3.2 SOIL PREPARATION
A. Preparation of Subgrade:
1. Prepare subgrade to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
2. Remove foreign materials, rocks, base materials, weeds and undesirable plants and their roots. Remove contaminated subgrade.
3. Scarify subgrade to a depth of 4 inches where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.
B. Placing Topsoil:
1. Spread topsoil to a minimum depth of 4 inches over entire area to be planted. Rake smooth.
2. Place topsoil during dry weather and on dry unfrozen subgrade. Remove organic matter and foreign non-organic material from topsoil while spreading. Break up soil clods as possible, remove those that cannot be broken.
3. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
4. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches.
C. Soil Preparation for Bed Areas:
1. Final grades by the General Contractor are expected to be at finished grade. After approximate finished grades have been established, soil shall be conditioned and fertilized in the following manner. Existing soil shall be excavated or regraded to allow for the addition of soil amendments and mulch. Amendments shall be uniformly spread and cultivated thoroughly by means of mechanical tiller into the top 6" of soil.
2. At time of planting, the top two inches of all areas to be planted shall be free of stones, stumps, or other deleterious matter 1" diameter or larger, and shall be free from all wire, plaster, or similar objects that would be a hindrance to planting or maintenance.
D. Final Grades:
1. Minor modifications to grade may be required to establish the final grade.
2. Finish grading shall insure proper drainage of the site as determined by the Landscape Architect. Surface drainage shall be away from all building pads.
3. All areas shall be graded so that the final grades will be 1" below adjacent paved areas, sidewalks, valve boxes, edging, concrete headers, clean-outs, drains, manholes, etc., in lawn areas and in bed areas.

4. Eliminate all erosion scars prior to mulching and commencing maintenance period.

E. Disposal of Excess Soil: Dispose of any unacceptable soil or debris offsite. Excess soil may be spread on site.

3.3 PLANTING INSTALLATION

A. General:
1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practices.
2. All planting beds shall be free of any deleterious materials, including but not limited to concrete debris, trash, buried organic material, and base material from drive and building construction.

B. Pre-Plant Weed Control:
1. Eliminate all existing bermuda grass in lawn areas by spraying with a non-selective systemic contact herbicide. Follow manufacturer's directions for applications.
2. Clear and remove existing weeds by grubbing weeds over the entire area to be planted.
3. Prior to planting install pre-emergent per manufacturer’s recommendations.

C. Planting of Shade and Ornamental Trees:
1. Protect all areas from excessive compaction when trucking plants or other material to the planting site.
2. All excavated holes shall have vertical sides with roughened surfaces and shall be of a size that is twice the diameter of the rootball and the same depth as the rootball for all trees.
3. Face plants with fullest growth to most visible direction.
4. Trees shall be backfilled with:
   a. 2 parts existing soil/topsoil
   b. 1 part landscape amendment (or manure or peat moss)
   c. 1 part sand
   d. 1 lb. fertilizer per c.y. of mix
   e. Agriform tablets
5. All plants which settle deeper than the surrounding grade shall be raised to the correct level. Additional backfill shall be added as necessary.
6. If B&B is specified, remove any polyethylene rope from rootballs and trunks. Bend 1/3 of wire down away from trunk and rootball.
7. Tamp soil as backfilling occurs to minimize settling of soil.
8. After backfilling, an earthen basin shall be constructed around each plant. Each basin shall be 4" depth. Basins shall be constructed of amended backfill materials, or existing soil.
9. Install 4" layer of mulch at 4' diameter at each tree.
10. Pruning shall be limited to the minimum necessary to remove injured twigs and branches.

D. Planting of Bed Areas:
1. Soil amendments shall be added to existing soil/topsoil for bed preparation. The soil mix shall be 2" of soil amendment and 1 lb. of fertilizer per 1 c.y. of mix or 1" of peat moss, 1" sand and 1 lb. of fertilizer per 1 c.y. of mix. Install agriform tablets per manufacturer’s recommendations.
2. Plants shall be grown in pots as indicated on the plans. Plants shall remain in those pots until transplanting.
3. Shrubs, perennials and groundcovers shall be planted in straight rows and evenly space, unless otherwise noted, and at intervals called out in the drawings. Triangular spacing shall be used unless otherwise noted on the drawings.
4. Plantings shall be watered by hose after planting until the entire area is soaked to the full depth of each hole.
5. Care shall be exercised at all times to protect the plants after planting. Any

damage to plants by trampling or other operations shall be repaired.

E. Installation of Lawn:

1. General:
   a. Contractor shall inspect final grade is free from ruts, uneven spots, and roughness. Final grade shall be smooth and free from large clods or debris. If this requirement is not met and lawn is installed, the grade shall be repaired to satisfaction of Landscape Architect and hydromulch or sod re-installed at no cost to Owner.
   b. Contractor is responsible for establishing a healthly and full stand of lawn of sod or seed. Contractor shall maintain lawn until established and approved by Landscape Architect.
   c. Winter rye grass installation shall be considered a temporary grass application. Should rye grass be installed, the contractor shall return to site after March 15 to apply bermuda grass hydromulch.
   d. Disturbed areas: All areas that are disturbed due to construction operations shall be hydromulched according to specifications. Any slopes 3:1 and greater shall be solid sodded per specifications. This will apply to areas on site whether or not identified on the plans.
2. Seeding:
   a. Apply seeded slurry with a hydraulic seeder at a rate of 2 lbs per 1000 sq. ft. evenly in two intersecting directions with following mixture:
      (1) Mixture 1 (Standard Mix):
         (a) 45#/1000 sq.ft. mulching agent
         (b) 20#/1000 sq.ft. water soluble fertilizer
      (2) Mixture 2 (for Slopes (over 6:1 or 17%) and Problem Areas):
         (a) 50#/1000 sq.ft. mulching agent
         (b) 20#/1000 sq.ft. water soluble fertilizer
         (c) 1.5#/1000 sq.ft. glue agent
   b. Do not hydroseed area in excess of that which can be mulched on same day.
   c. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
   d. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil. Water to prevent grass and soil from drying out.
   e. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
   f. Immediately reseed areas which show bare spots.
3. Sodding:
   a. Lay sod immediately after delivery to site to prevent deterioration.
   b. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
   c. Lay smooth. Align with adjoining grass areas. New finished grade and existing grade shall be flush.
   d. Place top elevation of sod 1 inch below adjoining edging and curb or paving.
   e. On slopes 4 inches per foot and steeper, sod shall be laid. Lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.
   f. Prior to placing sod, on slopes exceeding 6 inches per foot or where indicated, place wire mesh over topsoil. Securely anchor in place with wood pegs sunk firmly into the ground.
   g. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.
   h. After sod and soil have dried, roll sodded areas to ensure good bond

between sod and soil and to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 150 lbs.

4. Contractor is responsible for the establishment of lawn areas. Provide temporary irrigation as required for growth of a full stand of lawn.
   a. Should construction project last longer than 20 days beyond specified finish date with any area of lawn in disrepair or in an unacceptable state to Landscape Architect, Landscape contractor shall install solid sod in sod or seed areas to complete project with no additional cost to Owner.
5. Contractor is to leave a 3 to 5 foot diameter ring around each tree, whether newly planted or existing, free of turf material. Contractor is to install 4 inches of pine bark mulch in each tree ring as specified in this section.

3.4 INSTALLATION OF MISCELLANEOUS MATERIALS

A. Install steel edger 1" above finished grade. Steel edger shall be installed between all lawn and bed areas.
B. Mulch: All shrub, perennial, groundcover and seasonal color beds shall be dressed with 4" layer of mulch.
C. Tree stake: Install tree stakes per details. Install wire to 40-50% height of tree. Tighten wire to hold trees firmly. Do not pull wires extremely taut on trees. Install tree guards per manufacturer's recommendations. Join two tree guards together for larger caliper trees.
D. Pruning: At no time shall new trees or plant materials be pruned, trimmed or topped prior to delivery and any alteration of their shape shall be conducted only with the approval and when in the presence of the Landscape Architect.
E. Gravel: Install gravel over filter fabric. Install steel edger where gravel abuts lawn or bed areas. See detail.
F. Decomposed Granite: Install granite gravel over filter fabric. Install in 2" lifts. Compact to 90%

3.5 AREAS DISTURBED BY CONSTRUCTION

A. Recondition areas disturbed by construction operations including, but not limited to, graded areas, laydown areas, construction trailers and movement of vehicles. All compacted areas shall be tilled to 6" depth. Install 1-2" depth topsoil, rake smooth and free of any rock or other deleterious materials. Apply hydromulch seed as specified in these specifications. Solid sod all slopes 3:1 and greater. Install temporary irrigation as specified in Section 32 8423.

3.6 MAINTENANCE OF SITE (While under construction or until Date of Substantial Completion)

A. Until final acceptance, maintain all plant materials and trees by watering, cultivating, weeding, spraying chemicals, cleaning and replacing as necessary to keep landscape in a vigorous, healthy condition. Landscape contractor is responsible for maintenance of his work whether or not existing or new irrigation system is operational. Landscape contractor is to notify the Owner and Landscape Architect for any deficiencies in the irrigation system. Failure to do so does not relieve the Landscape Contractor from replacing plant materials that have died.
   1. Watering: As necessary to keep top 2" of soil moist.
   2. Watering Trees and Shrubs: Tree and shrub rootballs are to be kept moist to the depth of the rootball.
   3. Weeding: Remove weeds and foreign grass over bed and lawn areas at least once a week. Herbicides may be used only when approved by Landscape Architect. Rake bed areas as required. Work will not be accepted with a presence of weeds in landscape.
   4. Cultivating: Cultivate bed areas to a depth of approximately 3" at least twice a month. Care should be taken not to damage plant roots.
   5. Mowing and Edging: No mowing shall be allowed on site until temporary irrigation is completed removed from site.
   6. Fertilizer, Pesticides, Insecticides, and Fungicides: It is the responsibility of the

contractor to insure plant material is in vigorous, healthy condition. Application of chemicals per manufacturer requirements and state and local codes is required as necessary to control any pest, insect, or fungal problems.

3.7 CLEAN UP

A. After all planting operations have been completed, remove all trash, excess soil, empty plant containers from the property. All scars, ruts or other marks in the ground caused by this work shall be repaired and the ground left in a neat and orderly condition throughout the site. Contractor shall pick up all trash resulting from his work at the end of each working day. Dispose of trash properly.

B. The Contractor shall leave the site area broom-clean and shall wash down all paved areas within the contract area, leaving the premises in a clean condition. All walks shall be left in clean and safe condition.

3.8 OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following site visits.

1. Pre-job conference
2. Plant material review
3. Plant layout review
4. Soil Preparation and planting operations
5. Final walk-through

B. No site visits shall commence without all items noted in previous Observation Reports either completed or remedied.

END OF SECTION

SECTION 32 9345
TREATMENT OF EXISTING TREES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Work specified in this section: Provide all labor, materials, transportation, and services necessary to furnish tree protection fencing, tree armor, watering, pruning and fertilization to existing trees.

1.2 RELATED WORK

A. The requirements of the "General and Supplementary Conditions of the Contract" and Division 1 specification sections shall apply to all work of this Section with the same force and effect as though repeated in full herein.
   1. General Scope of Work and Requirements - Section 01 0000.
   2. Irrigation System: Section 32 8423.
   3. Landscape Planting: Section 32 9300.

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements relating to unit prices for this work.

B. Method of measurement
   1. Tree barricade fencing: by the linear foot
   2. Mulch: by the cubic yard
   3. Tree wound paint: by the gallon
   4. Fertilizer: by the gallon
   5. Tree armor: each; includes SPFA utility grade wood 2x4 and plywood, wire, and all appurtenances

1.4 REFERENCES

A. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1.	ANSI Z60.1	(1996)	Nursery Stock.
2.	ANSI Z133.1	(1994)	Tree Care Operations- Pruning, Trimming, Repairing, Maintaining, and Removing Trees and Cutting Brush.
3.	ANSI A300	(1995)	Tree, Shrub and Other Woody Plant Maintenance- Standard Practices.

1.5 GOVERNING STANDARDS:

A. Work procedures will be guided by the current provisions of the American National Standard Institute. Complete details of the provisions are to be found in the references listed. The two basic objectives of the pruning operation shall include:
   1. Hazard Reduction Pruning: Hazard reduction pruning shall be completed to remove visible hazards in a tree. Hazard pruning shall consist of one or more of the maintenance pruning types.
   2. Maintenance Pruning: Maintenance pruning shall be completed to maintain and improve tree health and structure and includes hazard reduction pruning.

B. Watering Restrictions
   1. General: Projects within the ETJ and city limits of City of San Antonio and SAWS customers shall observe watering ordinances. See www.saws.org for current requirements.
   2. Stage 1: See www.saws.org for current requirements.
   3. Stage 2: See www.saws.org for current requirements.
   4. Stage 3: See www.saws.org for current requirements.

1.6 DESCRIPTION OF WORK

A. Contractor shall employ a qualified Arborist to monitor construction activities that impact

trees, pruning and feeding. Arborist is to be acceptable to the Owner's Representative.

B. Arborist shall have the following minimum qualifications:
   1. Membership in:
      a. NAA - National Arborist Association
      b. ISA - International Society of Arborists
   2. Meet state requirements for insurance.
   3. Licensed for application and use of pesticides.
   4. Bonded.

1.7 SUBMITTALS

A. Contractor shall submit:
   1. Certification: Copy of Arborist qualifications.
   2. Mulch: Label from bag (Supplier's statement of analysis if bulk), and 1-gallon container of mulch sample.
   3. Fertilizer: Label from bag or Supplier's brochure.
   4. Tree Armor: Cut sheet of wood and plywood.
   5. Drip Irrigation: Cut sheet of dripline, valves, filters, air valves, and flush valves.

1.8 QUALITY ASSURANCE AND REQUIREMENTS

A. General: Comply with applicable federal, state, county, and local regulations governing, landscape materials and work.

B. Permits and Fees: The Contractors shall obtain and pay for any and all permits and all inspections as required. Contractor shall also be responsible for all fees and costs involved for work.
   1. Contractor shall comply with City inspector directions with agreement from Landscape Architect without additional cost to Owner.

C. Ordinances and Regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

D. Personnel: Personnel shall be supervised by a Certified Arborist. Employ only experienced personnel who are familiar with the required work. Provide adequate supervision by a qualified foreman with minimum of five years experience.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

1.10 PROJECT CONDITIONS

A. Inspection: Contractor, Arborist and Owner's Representative shall review pruning work to be completed prior to initiating work.

1.11 SCHEDULES

A. The Contractor shall begin pruning and tree protection work upon acceptance of the Contract by the Owner. Arborist shall submit a schedule for the work to be performed to the Landscape Architect for approval.

1.12 PROTECTIONS

A. All items required to complete this contract remain the property and responsibility of the Contractor until final acceptance. Take adequate precautions to protect all existing trees. Cooperate fully with other trades to insure a satisfactory completion.

1.13 MAINTENANCE SERVICE

A. All existing trees to remain within shall have 6" layer of mulch at Root Protection Zone (RPZ) and to dripline and tree protection fencing properly maintained throughout construction work period.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Tree Barricade Fencing: Fabric of square link orange 4' width, high density polyethylene with 5-7 year life. Posts of 6' height studded T-posts with painted on finish for rust protection.

B. Mulch:

1. Mulch shall be free of deleterious material and shall be stored as to prevent inclusion of foreign material. Mulch shall be native shredded hardwood mulch, manufactured by Gardenville Horticultural Products, San Antonio, Texas, (210) 651-6115.
2. On-site existing tree mulch: Existing trees that are scheduled to be removed and removed branches may be grinded/double shredded and debris free.

C. Tree Wound Paint: Bituminous based paint of standard manufacture specifically formulated for tree wounds.

D. Fertilizer for Trees: Davey Arbor Green 30-10-7 for liquid suspended application, distributed by The Davey Company in San Antonio, Texas (210) 698-0515.

E. Tree Armor:

1. Wood: SPFA utility grade, 2x4.
2. Plywood: SPFA utility grade, 3/4" nominal thickness.
3. Wire: Annealed steel wire, 16 gage minimum.

F. Drip Irrigation:

1. Rainbird XFS dripline as manufactured by Rainbird Irrigation , Inc. distributed by Longhorn Supply, San Antonio, Texas, (210) 340-3516. Contractor shall provide all necessary fittings and accessories as required by the manufacturer for the installation of the product. Drip line shall be XFS dripline, 12" o.c. emitters, 0.9 gph.
2. Valve: Rainbird pre-assembled valve, filter and pressure regulator control zone kit.
3. Pressure Regulator: Pressure Regulator shall be Low flow for valves less than 4.5 gpm and High Flow for valves greater than 4.5.
4. Air/Vacuum Relief Valve, provide one per zone.
5. Flush Valve, provide one per zone.

PART 3 – EXECUTION

3.1 PROTECTION FOR EXISTING TREES TO BE PRESERVED

A. All existing trees to remain within 30′ of work on the project site shall be protected against damage from construction operations. Only remove those trees which are scheduled to be removed per plans. Contractor shall flagged tree to remain for review by Landscape Architect.

B. Contractor shall erect fencing protection prior to beginning any clearing, demolition or construction activity, maintain in place until construction is completed.

C. All trees to remain are to be protected by barricade fencing and is subject to approval of the Landscape Architect. The tree protection barricade shall be placed before any excavating or grading is begun and maintained in good repair for the duration of the construction work. No material shall be stored or construction operation shall be carried on within the tree protection barricade.

D. Trees exposed to construction activity within the dripline or within twenty-five (25) feet of any construction activity are to have trunks protected with tree armor. See requirements per tree armor section of this specification.

E. Tree protection barricade shall be erected at the edge of the dripline where possible. In circumstances where site improvements and construction operations interfere with fencing, fencing may be located at the edge of the root protection zone. The minimum distance the

barrier shall be erected is five (5) feet from the trunk of tree or clump of trees.

F. Protect trees that are to remain, whether within barricade fencing or not, from the following:
   1. Compaction of root area by equipment or material storage; construction materials shall not be stored closer to trees than the farthest extension of their limbs (dripline).
   2. No vehicular traffic shall occur within the drip line of any tree.
   3. The proposed finished grade within the root protection zone of any preserved tree shall not be raised or lowered more than three (3) inches. Retaining methods can be used to protect and/or provide lateral support to the area outside the root protection zone. No soil shall be spread, spoiled or otherwise disposed of under any tree within the drip line.
   4. Cutting on roots by excavating, ditching, etc. Prior to excavation within the tree driplines or the removal of trees adjacent to other trees that are to remain, make a clean cut between the disturbed and undisturbed root zones with a rock saw or similar equipment to minimize root damage.
   5. Strangling by tying ropes or guy wires to trunks or large branches.
   6. Poisoning by pouring solvents, gas, paint, etc., on or around trees and roots.
   7. Trunk damage by moving equipment, material storage, nailing or bolting.
   8. Damage of branches by improper pruning.
   9. Drought from failure to water or by cutting or changing normal drainage pattern past roots. Contractor shall provide means as necessary to ensure positive drainage.
   10. Changes of soil pH factor by disposal of lime base materials such as concrete, plaster, lime treatment at pavement subgrade, etc. When installing concrete adjacent to the root zone of a tree, use a minimum 6 mil. plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.

G. Any damage done to existing tree crowns or root systems shall be repaired by the Arborist to the satisfaction of the Owner's Representative. Broken branches shall be cut cleanly. Any roots cut shall be cut cleanly with a saw other means approved by the Landscape Architect.

H. Repairs to the trees necessitated by damage caused through negligence of Contractor or his employees will be completed at the Contractor's expense. When trees other than those approved for removal are destroyed or killed, or badly damaged as a result of construction operations, the contract sum will be reduced by the value of the tree as determined by using the accepted International Society of Arboriculture's formula.

3.2 TREE ARMOR

A. Trees exposed to construction activity within the dripline or within twenty-five (25) feet of any construction activity are to have trunks protected with tree armor to a height of 8' or to the limits of the lower branching in addition to barricade fencing. Butt 2x4's side to side completely around trunk. Wire wrap, do not nail, around trees. Maintain armor the duration of construction operations.

B. Where existing trees will be Root Zone (RPZ) shall be protected by plywood. Install 6" of shredded bark mulch and cover with 3/4" plywood. Install both to dripline of tree(s).

C. Remove one week prior to Substantial Complete walk through.

3.3 ROOT PROTECTION ZONE

A. The root protection zone (RPZ) is measured with a radius from the trunk of 12" for each caliper inch of trunk measured at four and one-half (4-1/2') feet above grade or at the point where the smallest diameter closest to the branching occurs. No disturbance shall occur closer to the tree than one-half the radius of the RPZ or within five (5) feet of the tree whichever is greater.

3.4 ROOT PROTECTION ZONE IMPACTS

A. Those trees to remain which have some encroachment on their root protection zone shall have the following maximum allowable impacts:
   1. No disturbance of natural grade, e.g. trenching or excavation, can occur closer to the tree than one-half the radius of the RPZ or within five (5) feet of the tree whichever is greater.
   2. No cut or fill greater than three (3) inches will be located closer to the tree trunk than ½ the RPZ radius distance.

B. Existing trees to remain shall have a minimum of a six (6) inch layer of mulch placed and maintained over the root protection zone and to the dripline. Immediate pruning shall occur

per the pruning section of this specification.

3.5 ARBORIST'S REQUIREMENTS

A. General:

1. Arborist is to survey the condition of existing trees to remain. Notify Landscape Architect of any problems/conditions affecting the livability of trees to remain. Document site as necessary.
2. Arborist is to install and/or inspect tree protection barriers before start of demolition and excavation activities. Notify Landscape Architect of any problems/conditions that affect the livability of trees to remain.
3. Arborist is to observe excavation of site around existing trees from start of excavation until its conclusion. Arborist shall direct excavation which occurs near major root systems, relocation of roots, and installation of tree aeration systems as required to ensure livability and good health of trees. Arborist shall prescribe additional measures or protection required to provide optimal growth conditions at the construction site. Report any problems/conditions affecting the livability of trees to remain to Landscape Architect.
4. Arborist shall make periodic inspections of the construction site for possibly dangerous or damaging practices, in relation to the existing trees, occurring or developing at the site. Inform Landscape Architect of any problems/conditions and develop plan to repair damage that has occurred and prevent further damage.

B. Reports:

Arborist shall provide a monthly inspection report of the construction site to the Landscape Architect during the course of construction work.

3.6 EXCAVATION AT EXISTING TREES

A. Any excavation within the dripline of trees shall be under the direction of the Arborist. Excavate within the dripline of trees only where required and when absolutely necessary. Arborist shall be at site at all times while excavation is occurring within the dripline.

B. When excavation is required within dripline of trees, hand excavate to minimize damage to root systems. Use narrow tine spading forks and comb soil to expose roots. Relocate roots back into backfill areas wherever possible. If large main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking.

C. If root relocation is not practical, clean cut roots using sharp ax approximately three (3) inches back from new construction. Paint all exposed root cuts with tree paint.

D. Where existing grade is higher than new finish grade, carefully excavate within the dripline to the new finish grade. Carefully hand excavate an additional eight (8) inches below the finish grade. Use narrow tine spading forks to comb the soil to expose the roots, and prune the exposed root structure as recommended by the Arborist. Keep the exposed roots damp by watering and mulch cover. Treat the cut roots as specified and as recommended by the Arborist. After pruning and treatment of the root structure is complete, backfill to finish grade with eight (8) inches of approved plant mix.

E. Temporarily support and protect roots against damage until permanently relocated and covered with recommended landscape material.

F. Where trenching is to occur within hitting distance of equipment to tree trunk, install tree armor per tree armor section of this specification.

G. Where removal of existing trees comes in conflict with existing hardscape/utilities to remain, the contractor shall:

a. Coordinate with utility companies (if necessary)
b. Remove existing tree to grade.
c. Expose roots
d. Use chainsaw to cut roots
e. Grind stump 18" below grade
f. Use trencher 2'-3' deep to cut roots if necessary.

3.7 WATERING REQUIREMENTS

A. Drought is defined as a protracted period of deficient precipitation resulting in extensive damage to plants, trees and lawn, resulting in loss.

B. During construction operations, provide water in a slow drip manner to existing trees. Provide water to apply equivalent to 1 inch once per week to deeply soak in over the area within the

dripline of the tree. Spray tree crowns periodically to reduce dust accumulation on the leaves.

C. At Stage 2, 3 and 4 (Section 1.4, B. Watering Restrictions), install drip line (gallons per hour) within the dripline of the trees at grade. Install required drip valves with filters and pressure regulators with battery operated controllers. Install 6" of mulch over drip irrigation. Protect valves as required. All zones of temporary irrigation shall contain an isolation ball valve to separate from permanent irrigation system.

3.8 PRUNING

A. Pruning shall be required only at protected existing trees where the removal of limbs and branches is needed to provide clearance for work as approved by the Owner's Representative or to repair damage to trees. Pruning shall be done per 3.9 Schedule. Pruning shall be completed to the satisfaction of the Owner's Representative.

B. Pruning shall include but is not limited to removal of dead and broken branches, correction of structural defects or whenever the following conditions exist. Remove diseased wood, or structurally weak limbs that may cause a safety hazard. Remove branches that extend over buildings. Remove branches in front of windows and which obstruct traffic signs or street intersections. Provide clearance for emergency vehicles, buses, moving vans and similar vehicles along the streets. Prune trees according to their natural growth characteristics leaving trees well shaped and balanced.

C. Remove all ball moss, mistletoe, etc. from all existing trees.

3.9 SCHEDULE

A. Pruning shall be Class 1 Fine Pruning. All pruning shall be completed to accomplish the thinning of live branches. Thinning shall result in an even distribution of removal of branches on individual limbs and through-out the crown. Remove dead, dying, diseased and broken branches ½" in diameter or larger within the crown. No more than 25% of the crown shall be removed.

3.10 TREE CROWN PRUNING

A. Existing trees disturbed by construction shall have a maximum of 30 percent of the viable portion of a tree's crown removed as approved by the Owner's Representative. Removal of more than 30 percent of the viable portion of a tree's crown will necessitate the tree's removal and replacement at the Contractor's expense. Replacement shall be governed at the ratio of 1 inch of new tree per inch of tree removed up to trees of size less than 24" caliper. For trees 24" caliper and greater the ratio shall be 3 inches per new tree per inch of tree removed. Replacement trees shall have permanent irrigation bubblers and a one (1) year warranty. Refer to Section 02900.

3.11 STERILIZATION: All tools used will be sterilized with alcohol between trees.

3.12 PAINT CUTS: Paint cuts more than 1 inch in diameter with an approved tree wound paint on all Oak species trees.

3.13 DISPOSAL: Wood and debris shall become property of the Contractor and shall be removed from the site. Cost of disposal to be paid by Contractor.

3.14 FERTILIZATION OF PRESERVED TREES:

A. All existing trees that have root damage shall be fertilized. Feeding of existing trees shall be as follows:

1. Feeding shall be completed prior to construction of permanent improvements adjacent to all trees including site fill or paving including trenching operations.
2. Liquid tree fertilizer applied with a standard hydrant sprayer at a pressure of 100 to 200 psi shall be injected in slightly slanted holes approximately twelve (12) inches in depth.
3. Concentration of suspension to be forty (40) pounds of fertilizer for trees in each 100 gallons of water. Application rate: six (6) pounds of actual nitrogen per 1,000 square feet of area under drip-line.
4. Holes are to be made in concentric circles and 3' on center around the tree with the

last ring located at the dripline of the foliage of the trees.

5. Area beneath the dripline of the trees is to be well watered after the fertilization is placed.

3.15 MULCH:

A. Mulch base of all existing trees with 6" deep mulch layer to RPZ or dripline which ever one is larger. If existing trees are grouped, the entire area is to be mulched in between the trees.

B. If acceptable to Owner, wood from tree removal and pruning activities can be grinded/ double shredded and used on site as mulch at locations as approved by Owner's Representative. Mulch shall be less than 6" in length. All mulch shall be free of any debris.

3.16 CLEANUP:

A. Wood and debris shall become property of the Contractor and shall be removed from the site. Cost of disposal to be paid by Contractor.

END OF SECTION

SECTION 07 16 14
ACRYLIC MODIFIED (FLEXIBLE) CEMENT WATERPROOFING (FOR WATER FEATURES)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, tools and equipment as necessary to perform Acrylic Latex Modified Cement Waterproofing on new and existing structures as shown on drawings and as specified in this section.

1.2 RELATED SECTIONS

A. See section 32 13 13 – Concrete Paving

B. See section 32 13 13.26 – Concrete Color Stain

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Measurement method: by the gallon

1.4 REFERENCES

A. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

B. ASTM C 348 - Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.

C. ASTM C 321 - Standard Test Method for Bond Strength of Chemical-Resistant Mortars.

D. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials.

E. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; U.S. Army Corps of Engineers or similar.

1.5 SUBMITTALS

A. General: Submit manufacturer's certification that proposed materials, details and systems as indicated and specified fully comply with manufacturer's details and specifications. If any portion of Contract Documents do not conform to manufacturer's standard recommendations, submit notification of portions of design that are at variance with manufacturer's specifications.

B. Product Data:
1. Submit manufacturer's literature and installation instructions for each product.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Company specializing in marketing or manufacturing products specified in this Section with minimum 10 years documented experience.

B. Installer Qualifications:
1. Acceptable to manufacturer with documented experience on at least 5 projects of similar nature in past 5 years and/or training provided by the product manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver and store in a dry area between 40oF (5oC) and 90oF (32oC). Handle and protect from freezing and direct sun light in accordance with manufacturer's instructions.

B. Deliver materials in manufacturer's unopened containers, fully identified with brand, type, grade, class and all other qualifying information. Provide Material Safety Data Sheets for each product.

C. Take necessary precautions to keep products clean, dry and free of damage.

1.8 SYSTEM REQUIREMENTS

A. Coordinate waterproofing installation with other trades.

B. Provide materials and accessories in timely manner so as not to delay Work.

1.9 PROJECT CONDITIONS

A. Maintain surfaces to be waterproofed and surrounding air temperature at not less than 40°F (5°C). Apply only when temperatures are steady or rising.

B. Do not apply materials to frozen or frost-filled surfaces.

C. Exercise caution when temperatures exceed 90°F (32°C).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approved Manufacturers: AQUAFIN, Inc. 505 Blue Ball Road, #160. Elkton, MD, 21921. Phone (800) 394-1410, or (410) 392-2300, Fax (410) 392-2324; e-mail info@aquafin.net.

B. Substitutions: Equal products will be considered

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS

A. Waterproofing Material - Acrylic Modified Cement Waterproofing: Cementitious, two-component, acrylic emulsion based, highly flexible, crack bridging waterproof membrane barrier against positive water pressure, with the following characteristics:

1.	Product:	AQUAFIN-2K/M
2.	Color:	to be selected by Landscape Architect
3.	Dry Component-A:	Precise blend of cementitious material
4.	Liquid Component-B:	White acrylic emulsion and admixtures
5.	Working Time:	Approximately 45 minutes
6.	Shore A Hardness:	> 90
7.	Bond/Adhesion: (ASTM C-321)	215 psi (1.5 MPa) @ 28 days
8.	Tear Resistance:	190 psi (1.3 MPa) at 68^{o}F (20^{o}C)
9.	Elongation: (%)	60 (gray); 40 (white) at 68^{o}F (20^{o}C)
10.	Elongation: (mils)	40 (gray); 25 (white)
11.	Crack bridging capacity: (inch)	1/16 (gray) (1.5 mm)
12.	Vapor Permeability: (US Perms)	1.2 (ASTM E-96)
13.	Waterproofing:(CRD C 48-92)	Withstands 200 psi = 460 feet (14 bar = 140 m) hydrostatic pressure (positive side) at 3/32” (2.4 mm) thickness.

2.3 ACCESSORY MATERIALS

A. Patching Compound: Pre-blended, cementitious waterproofing and repair mortar recommended or approved by waterproofing manufacturer for patching honeycombs, installing coves, etc.

1.	Product:	AQUAFIN MORTAR-LN
2.	Color:	Gray
3.	Aggregate:	Powder
4.	Compressive Strength: (ASTM C-109)	6000 psi (41.3 MPa) @ 28 days

5. Flexural Strength: (ASTM C-348) 1160 psi (8.0 MPa) @ 28 days

B. Crack and joint sealing tape: Elastomeric, tear resistant, breathable waterproofing tape.
1. Product: AQUAFIN JOINT SEALING TAPE-2000
2. Thickness: approx. 14 mils (0.35 mm)
3. Width: 4.75" (120 mm) or 8" (200 mm)
4. Elongation: 60%
5. Tear Strength: 725 psi (5.0 MPa)

C. Reinforcement mesh: Polypropylene non-woven fleece, reinforces tear resistance of waterproofing material, for zones posed to cracking.
1. Product: AQUAFIN-2K-FABRIC
2. Thickness: 10 mils (0.25 mm)
3. Tear Strength: longitudinal 24 lbs (10.9 kg)
diagonal 28 lbs (12.7 kg)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all construction substrates and conditions under which waterproofing materials are to be installed. Do not proceed with the waterproofing application until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Substrate preparation:
1. Remove oil, grease, dirt, loose particles, remains of form oils, water repellents, rust or other coatings by high-pressure water blasting (>3000 psi), wet or dry sand blasting, or other mechanical means to produce surfaces suitable for application of waterproofing.
2. Follow manufacturer's instructions to clean and prepare surfaces and seal cracks and joints.
3. Voids in concrete substrates: 1/4-inch (6 mm) diameter and larger, pre-treat with a cementitious mortar. Less than 1/4-inch (6 mm) diameter can be filled with a scratch coat of two-component waterproofing material.

C. Rinse surfaces to be waterproofed (excluding drywall or similar) with clean water to saturated surface dry (SSD) condition, with no standing water on horizontal surfaces.

3.3 INSTALLATION

A. Mix two-component waterproofing material in proportions recommended by manufacturer.

B. Taping:

1. Apply two-component waterproofing material by brush in a six to seven inch (15 – 18 cm) wide strip coat centered over all joints, cracks, penetrations and changes of plane to be taped.

2. While this coat is still wet, unroll joint sealing tape into the coating and apply a coat of two-component waterproofing material over the tape, smoothing out wrinkles and fish mouths.

C. Positive Side Waterproofing:
Apply two-component waterproofing material in quantities as per manufacturer's specifications and recommendations:

1. Apply at 60 mils or 1/16” (1.5 mm) total thickness for water levels up to 2-feet (0.60 m).

2. Apply at 90 mils (2.4 mm) total thickness for water depth greater than 2-feet (>0.60 m).

D. Application considerations:

1. Apply, using stainless steel trowel, tampico brush, short nap roller, or appropriate compressed-air spray equipment.

2. If needed, such as in zones posed to movement or cracking, plaza decks, the waterproofing material can be additionally reinforced with a reinforcing mesh (supplied by waterproofing manufacturer), embedded between two waterproofing layers.

3. Apply only when surface and ambient temperatures are 40oF (5oC) and rising. At high temperatures (i.e. 86oF (30oC) and above) protect application from direct sun and wind to prevent premature surface drying and shrinkage cracks. Apply material in two coats minimum.

4. Application thickness should not exceed 1/8-inch (120 mils (3 mm)).

5. Do not bridge cracks greater than 1/16-inch (1.5 mm).

6. Bridge dynamic cracks or joints with elastomeric joint sealing tape, as supplied by waterproofing manufacturer.

7. Do not overcoat waterproofing material with solvent-based materials.

8. Prime and protect alkali sensitive metals such as copper, aluminum, galvanized or zinc treated metal before over-coating with waterproofing material. Follow manufacturer’s recommendations for primer material.

3.4 CURING

A. Follow manufacturer's general instructions for curing and hardening of waterproofing material. Do not use water for curing. Waterproofing material is self-curing.

B. Protect surfaces from rain, frost and premature dehydration.

3.5 ACCEPTANCE

A. Remove left over materials and any foreign material resulting from the work from the site.

B. Clean adjacent surfaces and materials.

END OF SECTION

SECTION 13 12 13
WATER FEATURE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes renovation and complete installation of new plumbing, electrical, mechanical equipment to existing decorative fountains complete as shown on Drawings and as specified, including:

1. Equipment and accessories indicated on Drawings.

2. Mechanical, electrical, and plumbing work.

B. Related Sections include:

1. Division 03 Section “Cast-in-Place Concrete” for cast-in-place concrete substrates and foundations.

2. Division 04 Sections for material and setting requirements to repair cap clay brick, stone, and CMU components.

3. Divisions 22 and 26 Sections for plumbing and electrical requirements including connections to gray water supply, sanitary sewer, and electrical power at SAWS Chiller Plant.

1.2 DEFINITIONS

A. Fountains, pools, and water features include restoration of concrete fountains and linings, unit masonry basins, grinding weir as needed to make level, cast stone trim, decorative rock work, replacing clay pavers as needed, removing benches a repair cap as needed, waterproofing, water pump and filters, sensors and controllers, valves, nozzles, drains, piping, valve and junction boxes, electrical power and lighting, wind sensors and other incidental work.

1.3 UNIT PRICES

A. See Section 00 41 00 - Unit Prices, for general requirements applicable to unit prices for excavation.

B. Measurement method: by each

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide capable of withstanding the effects of gravity loads under conditions indicated.

B. Operational Performance:

1. Restore fountain with appropriate overflow drains that prevent water from flowing over pool wall onto adjacent areas.

2. Provide waterproofing restoration for pools that prevents the passage of water from the pool to surrounding areas.

3. Design systems and select components to achieve indicated effects with reliable operation and minimal maintenance.

4. Design for satisfactory operation in ambient temperatures from 35 deg F to 110 deg F.

1.5 SUBMITTALS

A. Product Data: For each type of product required. Where applicable, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. For pumps and light fixtures, include wiring diagrams, power requirements, rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

1. Include piping layout for plumbing work indicating location of valves, pumps, piping, and nozzles.

2. Include wiring diagrams indicating connections to electrical service and type of service required for electrical components including pumps, sensors, controllers, and lighting.

C. Samples for Initial Selection: For each type of finish material required.

D. Samples for Verification: For each type of finish material required.

E. Maintenance Data: For operating components of fountains, pools, and water features to include in maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer of decorative fountains and pools with not less than five (5) years experience executing work of fountain restoration and new projects and has at least five (5) local fountain projects of equal or greater size and has a local presence.

1. Installer's responsibilities include restoring fountains, pools, and water features and providing professional engineering services needed to assume engineering responsibility.

2. Approved Installer:

a. Fountain Works or approved equal.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Landscape Architect, except with Landscape Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section “Project Management and Coordination.”

1. Review locations for pools, fountains, and water features.

2. Review required coordination with other Work.

3. Review locations and sizes for required utilities including service requirements.

1.7 PROJECT CONDITIONS

A. Field Measurements:

1. Indicate measurements on shop drawings.

2. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating without field measurements. Coordinate plaza construction to ensure that actual dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Installer's standard form in which Installer agrees to repair or replace fountain and pool components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

b. Structural failures including cracking in concrete and liner repair.

c. Leaking of pools through fountain and pool structure, piping, or waterproof membranes.

d. Faulty operation of nozzles, pumps, filters, and electrical lighting.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Special Warranty for Operating Components: Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.

1. Components:

a. Pumps.

b. Filters.

c. Electrical light fixtures.

2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Basis of Design: Design intent of fountains, pools, and water features is based on products as listed in unit pricing. Subject to compliance with requirements, provide products by named manufacturer or comparable products approved by the Landscape Architect.

2.2 PIPES, TUBES, AND FITTINGS

A. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedule 40.

1. PVC Socket Fittings, Schedule 40: ASTM D 2466.

B. PVC, Pressure-Rated Pipe: ASTM D 2241, PVC 1120 compound, SDR 26.

1. PVC Socket Fittings, Schedule 80: ASTM D 2467.

C. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 MASONRY

A. Provide natural stone and rock approximating sizes indicated for selection by the Landscape Architect as needed for repair of existing stone work.

B. Provide brick to match existing brick for repair.

C. Remove attached Saltillo benches and repair exposed cap to match existing cap.

2.4 DEVOE PAINT

A. Devoe Bar-rust 233H-For inside of basin below bowl and apply as specified by manufacturers.

2.5 AQUAFIN

A. Aquafin Cement Sealant-For inside of upper bowl and apply as specified by manufacturers.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Earthwork Sections for excavating, trenching, and backfilling.

3.2 PREPARATION

A. Remove pavers and concrete to expose existing electrical, plumbing and pump locations.

B. Carefully remove existing concrete and Saltillo tile benches so as not to damage Water basin sides or rim. Repair cap to match existing cap around basin and planters.

3.3 INSTALLATION

A. General: Restoration of surface and masonry in locations indicated in accordance with approved shop drawings. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated.

B. Utility Connections: Make water, electrical, and storm sewer connections from lines indicated on the Drawings to equipment and fixtures required for fountains, pools, and water features.

C. In-Ground Vault and Box Installation: Install in approved locations and at approved elevations.

D. Piping Installation:

1. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

2. Install piping free of sags and bends.

3. Install fittings for changes in direction and branch connections.

4. Install unions adjacent to valves and to final connections to other components with NPS 2 or smaller pipe connection.

5. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.

6. Install underground thermoplastic piping according to ASTM D 2774.

7. Lay piping on solid sub-base, uniformly sloped without humps or depressions.

8. Install PVC piping in dry weather when temperature is above 40 deg F 5 deg C. Allow joints to cure at least 24 hours at temperatures above 40 deg F 5 deg C before testing unless otherwise recommended by manufacturer.

9. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

   a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

   b. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

   c. PVC Non-pressure Piping: Join according to ASTM D 2855.

E. Stone Installation: Install selected natural stone, brick and Saltillo tile in locations indicated and as approved by the Landscape Architect. Where required for proper operation or safety, securely attach stones with mechanical fasteners or mortar/grout.

F. Equipment Installation:

1. Install equipment level and plumb, unless otherwise indicated.

2. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

3. Install equipment to allow right of way to piping systems installed at required slope.

G. Weir Repair:

1. Grind concrete weir rim down as needed to make level to allow for even flow of water over bowl rim.

H. Color Selection/Epoxy:

1. Use Devoe paint for interior of bowl and basin. Color to be selected by landscape architect and owner SAWS project manager.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain pumps, filters, programmable components, and lighting. Refer to Division 1 Section “Closeout Procedures.”

END OF SECTION

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DIVISION 22 - PLUMBING

DIVISION 26 - ELECTRICAL

END OF SECTION

SECTION 22 05 00
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Applicable provisions of General Conditions, Special Conditions, and Special Instructions to Bidders govern work under this section and all of Division 22.

B. This section is in particular reference to and shall be considered a part of all Plumbing specifications sections following. It is intended that comments in this section be applicable to all parts of Division 22. Work described hereinafter shall be included as though written within each specific section of the specification.

C. The Contractor shall provide all items, articles, materials, operations, or methods listed, mentioned, or scheduled on the Drawings and/or herein, including all labor, materials, equipment, and incidentals necessary and required for their completion.

D. All work shall conform to requirements of all local construction codes, applicable sections of the National Fire Protection Association, Public Health Agencies and the Texas Accessibilities Standards, latest editions of all publications.

1.2 SECTION INCLUDES

A. Mechanical Sleeve Seal.

B. Sleeves.

C. Escutcheons.

D. Grout.

1.3 SCOPE

A. Requirements specified in this section shall govern applicable portions of all plumbing sections including paragraphs on related electrical work, whether so stated therein or not.

B. Where items specified in the specific plumbing sections conflict with requirements in this section, the former specific sections shall govern.

C. The Contractor shall furnish all labor, plant, equipment, and materials, complete in connection with the installation of the plumbing systems in strict accordance with this specification and accompanying plans. The Contractor shall submit his bid based on performing all work hereinafter specified or indicated on applicable plans. The Contractor shall furnish and install all connections and appurtenances necessary and usually furnished in connection with such work and systems even though not specifically mentioned or shown on the plans.

D. These requirements cover information, work, equipment and accessories listed under the following headings:

1. References, Definitions, Procedures
2. Permits and Fees
3. Utility Connections and Inspections
4. Workmanship
5. Mechanical Provisions
6. Electrical Provisions

E. Work of Other Sections:

1. Requirements given within this Section apply to the Work of all Sections of this Division.

F. Finish painting is specified in other Divisions. Prime and protective painting shall be provided under this Division.

G. Electrical interlock apparatus and other electrical apparatus, which is not an integral part of equipment specified under this Division, are specified under Division 26. Necessary conduit, wiring, boxes, and fittings are specified under Division 26.

1.4 REFERENCES

A. References to standards, codes, specifications and recommendations shall mean the latest edition of such publications adopted and published at date of invitation to submit Proposals.

B. References to technical societies, trade organizations and governmental agencies is made in mechanical work sections in accordance with the following abbreviations:

1.	ANSI	American National Standards Institute
2.	ASME	American Society of Mechanical Engineers
3.	ASTM	American Society for Testing and Materials
4.	AWWA	American Water Works Association
5.	FM	Factory Mutual
6.	NFPA	National Fire Protection Association
7.	NEC	National Electrical Code (NFPA Pamphlet No. 70)
8.	NEMA	National Electrical Manufactures Association
9.	UL	Underwriters' Laboratories, Inc.

1.5 DEFINITIONS

A. Definitions of terms and expressions used in mechanical work are:

1. "Provide" shall mean "furnish and install" or "furnish labor and material required for installation of."

2. "Herein" shall mean the contents of a particular section where this term appears.

3. "Indicated" shall mean "indicated on contract drawings."

4. "Section" shall mean one of the portions of plumbing work sections indexed in Division 22.

5. "Concealed" where used in connection with insulation and painting of piping and accessories, shall mean that they are hidden from sight as in chases, furred spaces and underground.

6. "Exposed" where used in connection with insulation and painting of piping and accessories shall mean that they are not "concealed" as defined herein above.

7. "Piping" includes in addition to pipe, also fittings, valves, hangers and other accessories, which comprise a system.

C. Drawings and Instructions

1. Contract drawings for plumbing work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment piping

and approximate sizes and locations of equipment and outlets. Plumbing trade shall follow these drawings in laying out their work, consult other trades and general construction drawings to familiarize themselves with all conditions affecting their work, and shall verify and coordinate spaces in which their work will be installed. The contract drawings shall be considered as a part of these specifications. It is intended that any Contractor making proposal to execute any work should study the drawings for his own particular trade, as well as all drawings of all other trades in order to fully understand the work he is expected to perform. As a qualification for bidding, the contractor shall visit the site and be responsible for determining all existing conditions in as far as it affects his work prior to submitting a proposal.

1.6 DRAWINGS

A. General:

1. The Drawings are schematic in nature and indicate approximate locations of the plumbing equipment and piping systems, except where specific locations are noted and dimensioned on the Drawings. All items are shown approximately to scale. The intent is to show how these items shall be integrated into the building. Locate all items by on-the-job measurements and in accordance with the Contract Documents. Cooperate with other trades to ensure project completion as indicated.

B. Unless otherwise expressly agreed to in writing, all rights to the specifications and drawings prepared by Alderson & Associates, Inc. shall belong to Alderson & Associates, Inc. The sole exception is that the specifications and drawings may be used for construction of the project for which the specifications and drawings were prepared if all other contractual obligations have been complied with, including the payment of fees. Each page of the drawings, if prepared in whole or in part by Alderson & Associates, Inc., and all pages of specifications of Division 22 are covered by copyright and may not be reproduced, published or used in any way without the permission of Alderson & Associates, Inc.

C. Location:

1. Prior to locating plumbing equipment and items, obtain the Architect/Engineer's approval as to exact location. Locations shall not be determined by scaling drawings. Contractor shall be responsible for costs of redoing work of trades necessitated by failure to comply with this requirement.

1.7 DISCREPANCIES

A. Clarification:

1. Clarification shall be obtained before submitting a proposal for the Work under this Division as to discrepancies or omissions from the Contract Documents or questions as to the intent thereof.

B. Contractor Agreement:

1. Consideration will not be granted for misunderstanding of the amount of work to be performed. Tender of a proposal conveys full Contractor agreement of the items and conditions specified, shown, scheduled, or required by the nature of the project.

C. The drawings intend that all equipment and piping be arranged as shown with necessary minor rearrangements to suit the equipment approved and to comply with the requirements of the various equipment manufacturers' recommendations. Some minor rearrangements are expected to best fit the structural conditions. It shall be the responsibility of the Contractor to make known his desires in such change, by shop

drawings as required, to obtain agreement of the Architect/Engineer before proceeding with any change or variation. Changes required by job conditions, equipment employed, or structural conditions of the building shall be at no cost to the Owner.

1.8 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for Substitutions. Architect/Engineer shall receive such requests a minimum of 10 days prior to scheduled bid date.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that Bidder:

1. Has investigated proposed product and has determined that it meets or exceeds quality level of specified product.

2. Will provide same warranty for Substitution as for specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:

1. Submit two copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.

3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

1.9 GENERAL INSTALLATION

A. Existing Services:

1. Active Services: When encountered in work, protect, brace and support existing active piping and other services where required for proper execution of the work. If existing active services are encountered that require relocation, make request in writing for determination. Do not proceed with work until written directions are received. Do not prevent or disturb operation of active services that are to remain. Outages shall be kept to a minimum and allowed only as arranged with the Architect/Engineer.

2. Inactive Services: When encountered in work, remove, cap, or plug inactive services.

3. Interruption of Services: Where work makes temporary shutdowns of services unavoidable, shut down at night or at such times as approved by Owner, which will cause the least interference with established operating routine. Arrange to

work continuously, including overtime, if required, to assure that services will be shut down only during time actually required to make necessary connection to existing work.

B. Equipment Design and Installation:

1. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ASME, AIEE or other applicable technical standards, be suitable for maximum working pressure and shall have neat and finished appearance.

2. Installation: Erect equipment in neat and workmanlike manner; align level and adjust for satisfactory operation; install so that connecting and disconnecting of piping and accessories can be made readily, and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation from indicated arrangements may be made, as approved.

C. Protection of Equipment and Materials:

1. Responsibility for care and protection of plumbing work rests with the Contractor until it has been tested and accepted.

2. After delivery, before and after installation, protect equipment and materials against theft, injury or damage from all causes.

D. Adjustments:

1. It shall be the responsibility of the Contractor to adjust properly any and all equipment and devices and to run reasonable operating tests together with more specific tests indicated in the separate sections of the specifications. If for some reason any piece of equipment does not function satisfactorily after the first adjustments are made, the Contractor shall continue on the job until satisfactory corrections and adjustments have been made. The Contractor is responsible for the proper performance, functioning, integration, and balance of all equipment. Where tests are required by the Architect/Engineer to ascertain equipment capacities in the installed condition, it shall be the responsibility of the Contractor to run approved tests, to provide all required instruments and apparatus and to submit certified statements of test results. All such instruments shall be in proper calibration and shall meet approval of the Architect/Engineer.

E. Completeness:

1. The Contractor shall be responsible for the absolute completeness of his work, including all adjustments and all final balancing to obtain proper operation in all respects. Balancing is in reference to proper water flow, control calibration or balancing to eliminate objectionable vibrations, noises, or surges.

2. Each system is intended to be complete and functional in performance. All such items as piping trim, electrical work, controls, accessories and appurtenances required shall be installed at no extra cost.

1.10 PERMITS AND FEES

A. All building permits and their required fees, extension of utilities together with applicable meters, and all inspection fees for all plumbing work shall be arranged and paid for by the Plumbing trade involved in the particular work for which the permit is taken, and for the pertinent inspection fee for the work involved by the Contractor.

1.11 UTILITY CONNECTIONS AND INSPECTIONS

A. Extensions:

1. The Contractor shall provide or obtain and pay for all utility connections, utility extensions, and/or relocations and shall pay all costs and inspection fees for all work included therein.

B. Compliance:

1. The Contractor is required to comply in every respect with all requirements of local inspection departments, local ordinances and codes, and utility company requirements.

C. Utilities:

1. The Contractor shall check with the various utility companies whose services are required for this project and shall provide, complete in all respects, the required utility relocations, extensions, modifications, and/or changes.

D. Certifications:

1. Prior to final acceptance, the Contractor shall furnish without additional charge a certificate of acceptance from the inspection departments having jurisdiction over the work for any and all work installed under this Contract.

E. Ordinances, Rules and Regulations:

1. All installations shall comply with applicable codes; ordinances and regulations except where drawings require a higher degree of work as indicated on the plans or specified hereinafter.

F. Installations and equipment shall comply with applicable requirements of the National Fire Protection Association, Texas State Board of Insurance Underwriters, or other local, State or Federal agencies having jurisdiction. Compliance with these requirements shall be done at no additional cost to the Owner.

G. Any changes to the contract required by the aforementioned requirements shall be submitted to the Architect/Engineer in writing for approval prior to execution.

1.12 WORKMANSHIP

A. All materials and equipment shall be installed in accordance with the approved recommendation of the manufacturer, and workmen skilled in the trade involved shall accomplish the installation.

1.13 FLAME SPREAD PROPERTIES OF MATERIALS

A. Materials and adhesives incorporated in this project shall conform to ASTM Standard E84, "Test Method of Surface Burning Characteristics of Building Materials" and NFPA 90. The classification shall not exceed a flame spread rating of 25 for all materials, adhesives, finishes, etc., specified for each system, and shall not exceed a smoke developed rating of 50.

1.14 ASBESTOS ABATEMENT

A. In the event the Contractor encounters at the site material reasonably believed to be asbestos which has not been abated, the Contractor shall immediately stop work in the area affected and report the condition to the Owner. If in fact the material is asbestos and the asbestos has not been abated, the Contractor shall not resume the non-asbestos-related work in the affected area until the asbestos has been abated. The abatement action may be done in two ways, as the Owner may decide. The Owner may

perform the abatement by its own forces, or the Owner may contract with a third party to perform the abatement.

PART 2 - PRODUCTS

2.1 MECHANICAL SLEEVE SEALS

A. Description:

1. Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

2. Manufacturers:

a. Advance Products & Systems, Inc.

b. Calpico, Inc.

c. Metraflex Co.

d. Pipeline Seal and Insulator, Inc.

3. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

4. Pressure Plates: Carbon steel. Include two for each sealing element.

5. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.2 SLEEVES

A. Galvanized-Steel Sheet:

1. 0.6-mm minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe:

1. ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron:

1. Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.3 ESCUTCHEONS

A. Description:

1. Manufactured wall and ceiling escutcheons, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. Split-Casting, Cast-Brass Type with concealed hinge and set screw.

1. Finish: Polished chrome-plated.

2.4 GROUT

A. Description:

1. ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

2. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

3. Design Mix: 34.5-MPa, 28-day compressive strength.

4. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SPACE REQUIREMENTS

A. General:

1. Determine in advance of purchase that the equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearances for adjustment, repair or replacement.

B. Clearance:

1. Allow adequate space for clearance in accordance with the Code requirements and the requirements of the local inspection department.

C. Responsibility:

1. Since space requirements and equipment arrangement vary for each manufacturer, the responsibility for initial access and proper fit rests with the Contractor.

D. Review:

1. Final arrangements of equipment to be installed shall be subject to the Architect/Engineer's review.

E. Equipment, Spaces and Clearances:

1. All equipment and accessories shall be new and standard models of a type that has been in satisfactory use for two (2) years. All major components of any given system shall be of the same manufacturer and shall have a manufacturer's nameplate stating address, catalog model number and capacity.

F. Materials and equipment shall be installed in accordance with manufacturers' recommendations and best standard practice for the type of work involved.

G. All equipment shall be continuously protected, using temporary shelters, etc., from dirt, dust, moisture, damage, etc., and will not be accepted otherwise. All necessary supports, frames and foundations shall be provided for all equipment.

H. The responsibility for the furnishing of the proper plumbing equipment rests entirely upon the Contractor who shall request advice and supervisory assistance from the representatives of specific manufacturers during the installation.

I. It shall be the responsibility of the Contractor that the combination of proposed equipment will fit into the allotted space shown on the plan with adequate clearances for maintenance and servicing.

J. Machinery Accessories:

1. Lubricating Devices: Provide oil level gages, grease gun fittings for machinery bearings as recommended by machinery manufacturer; where these lubricating means are not easily accessible, extend to locations as directed. Furnish all grease gun fittings of uniform type.

2. Sleeve Bearings: Where sleeve bearings are specified for equipment, use self-aligning type, Randall Graphite Bearings, Inc., or approved equal.

3. Equipment Supports, Foundations, Stands: Where supports, foundations, stands, suspended platforms for machinery, tanks or vessels, and other equipment are indicated or specified in plumbing work sections, perform as follows:

a. Design and construct supporting structures of strength to safely withstand stresses to which they may be subjected and to distribute properly the load and impact over the areas.

b. Conform to applicable technical societies' standards, also to codes and regulations of agencies having jurisdiction.

c. Locate supports for vessels to avoid interference with pipe connections to vessel outlets.

d. Mount power-driven equipment on common base with driver unless otherwise indicated, specified or approved.

e. Submit detailed shop drawings of all supports; obtain approval before fabricating or constructing.

K. Install escutcheons for penetrations of walls and floors according to the following:

1. New Piping:

a. Bare Piping at Wall and Floor Penetrations: Split casting, cast-brass type with polished chrome-plated finish.

L. Sleeves are not required for core-drilled holes.

M. Install sleeves for pipes passing through concrete and masonry walls and concrete floor slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 50 mm above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

3. Install sleeves in new walls and slabs as new walls and slabs are constructed.

4. Install sleeves that are large enough to provide 6.4-mm annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than DN 150.

b. Steel Sheet Sleeves: For pipes DN 150 and larger, penetrating gypsum-board partitions.

5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

N. Aboveground, Exterior-Wall Pipe Penetrations:

1. Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 25-mm annular clear space between pipe and sleeve for installing mechanical sleeve seals.

2. Install steel pipe for sleeves smaller than 150 mm in diameter.

3. Install cast-iron "wall pipes" for sleeves 150 mm and larger in diameter.

4. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Fire-Barrier Penetrations:

1. Maintain indicated fire rating of walls at pipe penetrations. Seal pipe penetrations with firestop material.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.3 RELATED ELECTRICAL PROVISIONS

A. Electrical Contractor To Provide:

1. Line Voltage and hook-up to all Plumbing (Division 22) Equipment

B. Plumbing Contractor to Provide:

1. All motor starters (with heaters as required).

2. All Plumbing Equipment.

3. All relays, contactors, and switches required to start/stop Plumbing Equipment other than switches shown on and required by Division 26.

C. The Electrical plans are based on the equipment and devices scheduled shown on the drawings or as called for in the specifications. Should any plumbing equipment or device associated devices be changed or accepted from those which are shown or noted, all electrical and/or plumbing changes shall be made at the expense of the trade or contractor initiating the change with no expense to the Owner, Engineer or their representatives.

D. All conduit and boxes for thermostats and/or sensors shall be provided by Electrical Contractor.

E. General:

1. All electrical equipment, control components and circuits not specifically covered herein shall conform to the requirements in Division 26, Electrical.

F. Motor driven equipment and its installation shall be provided complete with motors, wiring, motor starters, interlocks, and operating and/or safety controls. Their electrical characteristics shall conform to that indicated. Motor starters shall be provided complete with properly sized thermal-overload protection in all phases and other appurtenances necessary for motor control. Motors shall be of adequate size to drive equipment at specified capacity without exceeding nameplate rating of the motor.

G. Such items as electric control, motors, relays, terminal or limiting switches on equipment, etc., shall be furnished as part of the equipment involved. All of these electrical controls, interlocks, and devices shall be installed and wired into the system to conform to Division 26. They shall be complete with all required conduit, condulets, boxes, wire, grounds, power disconnect switches, etc. The electrical trades doing Division 26 work shall provide all power wiring of 115 volt or higher including interlocks. All temperature control wiring shall be the responsibility of the mechanical trades, who shall furnish all wiring and diagrams.

H. Motors:

1. Except where otherwise specified or indicated for motors in mechanical and electrical work sections, the following shall govern:

a. Motors 1/2 - horsepower and smaller shall be single phase, 115 - volt; 3/4 - horsepower and larger shall be three phase; exceptions will be made, as approved, in case of fractional horsepower motor-driven equipment units furnished by manufacturer with integral motor to suit this standard design.

b. Single-phase motors shall be capacitor-start, split-phase or shaded- pole type, as approved for individual application.

I. Polyphase motors shall be squirrel-cage induction, or wound-rotor induction type, of NEMA Design B, according to starting torque and current characteristics, as approved for individual application. Motors with variable frequency drives shall have insulation rated for that service.

J. Where motor type, horsepower, speed, or other essential data are not specified in detailed specification of individual equipment unit or indicated on schedules, obtain this information from manufacturer of equipment unit and have it approved before ordering motors.

K. Manufacture:

1. Motors furnished under mechanical and electrical work shall not be the product of more than two manufacturers. Exceptions will be made as approved, in cases of fractional horsepower motor, or when motor is furnished integral with driven equipment unit as manufacturer's standard.

L. Design, Performance:

1. NEMA standards shall be taken as minimum requirements for motor design and performance, except where otherwise specified.

M. Motors shall be suitable for load, duty, voltage, frequency and hazard, for service and location intended.

N. NEMA classification of motor enclosures shall apply when motor types are specified as open, drip proof, splash proof, totally enclosed and the like.

O. Motors shall have ball or roller type bearings with pressure grease lubrication; exceptions will be made, as approved, in special cases for sleeve type bearings with approved method of oil lubrication.

P. Motors shall be quiet operating.

Q. Motors shall be rated for continuous duty and under full load; maximum rise in temperature shall not exceed current standards.

R. Motors shall be capable of withstanding momentary overloads of 50 percent, without injurious overheating.

S. Motors shall have nameplates giving manufacturer's name, shop number, horsepower, rpm, and current characteristics.

T. Motor Tests:

1. Check tests against complete tests of similar motor will be accepted.

2. Test for following:

a. Determine motor load performance in accordance with ANSI Standard C-50, for insulation resistance, dielectric strength, efficiency, and power factor and temperature rise.

b. Determine efficiency and power factor for 50 percent, 75 percent and 100 percent of rated horsepower; for motors 100 horsepower and larger, include also 125 percent rating.

c. Perform temperature-rise test at rated horsepower for rated time interval or until temperature becomes constant.

U. Motor Controls:

1. Controls Defined: Term "Motor Controls" as used herein relation to motor-driven equipment, shall include starting, disconnecting, actuating, protective and signal devices such as: starters, circuit breakers, disconnect switches, and load transfer switches; float, pressure, temperature and limit control switches; push button stations, indicating lights, alarms, relays and the like; also their enclosures.

2. Where motor controls are specified in general terms but individual devices are not named, furnish as many of above-mentioned devices as may be required for satisfactory operation of driven equipment, also to conform to NEC and local code requirements.

3. Protective devices shall include overload protection, and low voltage release or low voltage protection, as approved for individual application.

4. Where starter is located out of sight of motor-driven equipment, provide enclosed non-fusible disconnect switch close to motor, whether so specified or not; in such case, stencil both starter and equipment unit for identification with panel circuit.

5. When automatic control is specified, provide also required devices for manual operation, for transferring from automatic to manual control, and for "STOP" position, whether so specified or not.

6. Motor controls shall be products of Cutler-Hammer, Inc., Allen-Bradley Co., Square D Co., or General Electric Co.

V. Magnetic Motor Starter:

1. Furnish magnetic, full-voltage, non-reversing motor starters unless otherwise indicated on the drawings.

2. Furnish each starter with ambient-compensated thermal overload relays, one per phase leg.

3. Furnish contactors sized according to NEMA standards, size 0 or larger as shown on the drawings. Furnish three main poles, the number and type of auxiliary contacts to perform the required functions, rated 10 amperes (NEMA contact rating designation A600). Use double break contacts of silver alloy or similar material to minimize sticking or welding. Furnished contactor coils suitable for continuous operation at 120 volts, 60 hertz.

W. Control Power Transformer:

1. In each enclosure furnish a single-phase control power transformer with a line-to-line primary and a 120-volt secondary.

2. Fuse both the primary and secondary of the transformer.

3. Furnish NEMA1 enclosures for indoor dry locations, and NEMA 3R enclosures for all outdoor or interior wet or damp locations, unless otherwise indicated on the drawings.

4. Furnish each starter with a three-position selector switch (H-O-A) or push button (ON-OFF) and pilot lights as specified below:

   a. Selector Switches: Heavy-duty, oil-tight, maintained contact, with marked nameplate. On two-speed starters, furnish a three-position (H-O-A) switch and a two-position (HIGH-LOW) switch connected in series with the HAND position of the H-O-A switch.

   b. Pushbutton Units: Heavy-duty, oil-tight, momentary contact, spring return, with marked nameplate, or maintained contact with marked nameplate. Furnish momentary contact, spring return pushbutton unless otherwise indicated on the drawings.

   c. Indicating Lights: Provide red (running) and green (stopped) lenses. On two-speed starters, provide amber (low speed), red (high speed) and green (stopped) lenses.

5. Acceptable Manufacturers:

   a. ABB

   b. Siemens

X. Reduced Voltage Type Starter:

1. Where this type is specified, furnish magnetic starter, reduced voltage, primary resistance type, in enclosure for wall or floor mounting; factory wired and tested; Cutler-Hammer, Inc., Bul 9605, Clark Controller Co., Bul 6080, or approved equal.

Y. Alarm Audible Signal Device:

1. Where alarm bell or gong is specified, furnish 4 - inch, 6 - inch or 10 -inch heavy duty vibrating bell, for 24-volt or 115 - volt alternating current; Edwards Co., "Adaptable" No. 340, or approved equal.

2. Where size is not specified, furnish 10-inch sized for boiler room, 6-inch or 4-inch in other locations as approved.

Z. For outdoor installation, mount bell in weatherproof box Edwards Co., No. 348 or 349.

AA. Motor Control Enclosure for individual Motor:

1. Enclosure shall be furnished by manufacturer of control devices, of size and design to suit each application; with operating and resetting device operable from outside; hinged door with padlock; NEMA Type 1 for general purpose indoor application, other types for special applications, as approved.

BB. Cleaning Piping and Equipment:

1. Piping and equipment shall be thoroughly cleaned of dirt, cuttings and other foreign substances. Should any pipe or other part of the systems be stopped by any foreign matter, disconnect, clean and reconnect wherever necessary for

purpose of locating and removing obstructions. Repair work damaged in the course of removing obstructions.

3.4 EXCAVATION, BACKFILLING, AND CUTTING

A. Boring, excavating, backfilling and cutting shall not be undertaken without receiving approval of the Architect/Engineer before starting same. Cutting through masonry on concrete shall be made with masonry saws or core drills. This approval is required where the work may interfere with the work of other trades or where it may weaken the structure in any way.

B. Excavation:

1. All excavation of every description and of whatever substances encountered, to the depth indicated on the drawings and/or required for the installation of piping, utility system, etc., shall be performed. All exterior lines shall be installed with a minimum cover of 12 inches unless otherwise indicated. Concrete encase all sewer lines under streets with less than 30 inches of cover. Generally, more cover shall be provided if grade will permit. All excavated materials not required for backfill or fill shall be removed and wasted as acceptable to the Architect/Engineer. All grading in the vicinity of excavations shall be controlled to prevent surface ground water from flowing into the excavation. During excavation, material suitable for backfilling shall be stacked in an orderly manner sufficient distance back from edges of trenches to avoid overloading and prevent slide or cave-ins. Any water accumulated in the excavations shall be removed by pumping or other approved method. All shoring and sheeting required to perform and protect the excavations and to safeguard employees shall be performed. Excavate as required under the building in order that all piping, etc. shall clear the ground a minimum of 12 inches for a distance of 24 inches on either side. Edges of such excavation shall slope at an angle of not over 45 degrees with the horizontal unless otherwise approved by the Architect/Engineer. The bottom of such excavation shall be graded to drain in a manner acceptable to the Architect/Engineer.

C. Backfilling:

1. The trenches shall not be backfilled until all required tests are performed and until the piping, conduits, utilities systems, etc., as installed, conform to the specified requirements. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale, or other approved materials free from larger clods of earth or stone, deposited in thoroughly and carefully rammed 6 inch layers, until the pipe has a cover of not less than 1 foot. The remainder of the material shall be backfilled after moistening and then tamped in place using 1-foot layers. Blasted rock, broken concrete or pavement, and large boulders shall not be used as backfill material. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, be refilled and mounded over and smoothed off. Unless otherwise indicated open trenches across roadways or other areas to be paved shall be backfilled as specified above, except that entire depth of trench shall be backfilled in 6 inch layers, each layer moistened and compacted to a density at least equal to that of the adjacent level in such manner as to permit the rolling and compaction of the filled trench together with the adjoining earth to provide the required bearing value, so that paving of the area can proceed immediately after backfilling is completed. Where an area has been prepared for pavement prior to excavation, backfill shall be of such materials and installed as to comply with the paving requirements for preparation of subgrade and stabilized base courses as specified in other sections of the specifications. Along all other

portions of the trenches, the ground shall be graded to a reasonable uniformity and the mounding over the trenches left in a uniform and neat condition. Backfill under concrete slab on fill shall be as specified above, shall be select fill, or shall be such other materials more suitable for the application. Installation and compaction shall be as required for compatibility with adjacent materials.

D. Opening and Closing Pavement and Lawns:

1. Where excavation requires the opening of existing walks, streets, drives, other existing pavement or lawns, such surfaces shall be cut as required to install new lines and to make new connections to existing lines. The sizes of the cut shall be held to minimum, consistent with the work to be accomplished. After the installation of the new work is completed and the excavation has been backfilled, paved areas shall be reinstalled to match existing paving and lawn areas shall be resodded.

3.5 CONCRETE WORK

A. Where concrete work is indicated or specified under mechanical work, as for foundations, piers, pedestals, tank encasement, cradles or saddles for tanks or pipes, manholes, pits, and catch basins, perform as follows:

1. Concrete Strength:

a. Concrete shall have compressive strength after 28 days of 2,200 pounds per square inch minimum.

b. Concrete mix shall consist of one part Portland cement to 4-1/2 parts by volume of fine and coarse aggregate in dry state, with 7-1/2 gallons water maximum per sack of cement.

c. Portland cement shall be as per ASTM C 150, Type 1.

d. Concrete aggregate shall be as per ASTM C 33.

e. Water shall be clear, of quality suitable for domestic consumption.

3.6 TESTS

A. Following requirements are supplementary to tests specified for individual equipment or systems in mechanical and electrical work sections.

B. Notice of Tests:

1. Give written notice in ample time to all concerned of date when tests will be conducted.

C. Prior Tests:

1. Concealed or insulated work shall remain uncovered until required tests have been completed, but if construction schedule requires it, arrange for prior tests on parts of system as approved.

D. Preliminary Tests:

1. As soon as conditions permit, conduct preliminary or "turn-over" test of certain equipment as directed, to ascertain compliance with specified requirements. Make needed changes, adjustments or replacements as preliminary tests may indicate, prior to acceptance test.

E. Testing of Plumbing Piping System:

1. During the process of the work and upon completion, tests shall be made as specified herein and as required by Authorities Having Jurisdiction, including

Inspectors, Owner or Engineer. The Architect/Engineer shall be notified in writing at least 2 working days prior to each test or other Specification requirement which requires action on the part of the Engineer.

2. Tests shall be conducted as part of this work and shall include all necessary instruments, equipment, apparatus and service as required to perform the test with qualified personnel.

3. Test shall be preformed before piping of various systems have been covered.

4. All piping systems shall be tested and proved absolutely tight for a period of not less than 24 hours. Tests shall be witnessed by the Engineer or an authorized representative and pronounced satisfactory before pressure is removed or any water drawn off.

5. Leaks, damage or defects discovered or resulting from test shall be repaired or replaced to a like new condition. Leaking pipe joints or defective pipe, shall be removed and replaced with acceptable materials. Test shall be repeated after repairs are completed and shall continue until such time as the entire test period expires without the discovery of any leaks.

6. Wherever conditions permit, each piping system shall thereafter be subjected to its normal operating pressure and temperature for a period of no less than five 5 days. During that period, it shall be kept under the most careful observation. The piping systems must demonstrate the propriety of their installation by remaining absolutely tight during this period.

7. Recycled Water:

   a. Pressure test at one and one half times the normal working pressure or 125 psig, which ever is the greater, for 24 hours.

8. Sanitary Sewer:

   a. After the rough-in soil and other parts of the sanitary sewer including branch laterals have been set from the lowest level, at point of connection to existing utility lines, to above the floor line, all outlets shall be temporarily plugged or capped, except as are required for testing as described herein. Ground work shall not permit the backfill of trenches to cover any joints until the completion of testing. Back fill shall be limited to mid sections of full joints of piping only. For pipe in ground the piping shall be readied as described herein and filled with water to a verifiable and visible level to 10’ above the lowest portions of the system being tested and be allowed to remain so for 24 hours. If after 24 hours the level of the water has been lowered by leakage, the leaks must be found and stopped and the water level shall again be raised to the level described and the rest repeated until, after a 24 hour retention period, there shall be no perceptible lowering of the water level in the system being tested. Should the completion of these tests leave any reasonable question or doubt of the integrity of the installation, additional test including peppermint smoke, or other measures shall be performed to demonstrate the reliability of these systems to the complete satisfaction of the Owner’s duly authorized representative. Such tests shall be conducted and completed before any joints in plumbing are concealed or made inaccessible.

F. Costs:

1. Furnish labor, material, and instruments and bear other costs in connection with all tests

3.7 GUARANTEES

A. All work, including mechanical, equipment, and materials, shall be guaranteed by the Contractor for a period of one (1) year after final acceptance of the work. All defects in labor and materials occurring during the one year after final acceptance of the work shall be immediately repaired or replaced by the Contractor at no additional cost to the owner.

3.8 CERTIFICATION

A. Certification shall be furnished by the authorized manufacturer's representative stating equipment is installed in accordance with the manufacturer's recommendation and is eligible for specified warranties.

3.9 OPERATING INSTRUCTIONS

A. The Contractor shall turn over the following to the Owner at completion of contract.

B. Operating instructions together with wiring diagrams.

C. Approved drawings, equipment submittals, as-built control diagrams, etc.

D. All equipment guarantees and warranties together with instructions shipped with equipment.

E. Parts list of all major items of equipment.

F. All above items shall be "punched" and bound in a loose-leaf notebook.

END OF SECTION

SECTION 22 05 03
PIPES AND TUBES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Pipe and pipe fittings for the following systems:
   1. Recycled water piping.
   2. Fountain piping.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
   1. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B16.22 – Wrought Copper and Copper Alloy solder Joint Pressure Fittings.

B. ASTM International:
   1. ASTM B86 – Standard Specification for Seamless Copper Water Tube.
   2. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   3. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   4. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
   5. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:
   1. Submit data on pipe materials and fittings. Submit manufacturers catalog information.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with manufacturer's requirements.

1.5 QUALIFICATIONS

A. Manufacturer:
   1. Company specializing in manufacturing Products specified in this section with minimum ten years experience.

B. Installer:
   1. Company specializing in performing work of this section with minimum five years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 UNDERGROUND PIPING

A. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride (PVC) material.
1. Fittings: ASTM D2466, Schedule 40, PVC.
2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.2 ABOVE GROUND PIPING

A. PVC Pipe: ASTM D1785, Schedule 40, polyvinyl chloride material.
1. Fittings: ASTM D2466, Schedule 40, PVC.
2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

B. Copper Tubing: ASTM B88, Type K, drawn.
1. Fittings: ASME 16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 PREPARATION

B. Ream pipe. Remove burrs.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment with unions or flanges.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 INSTALLATION – BURIED PIPING SYSTEMS

A. Establish elevations of buried piping with not less than 18” of cover.

B. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density.

C. Install pipe on prepared bedding.

D. Install pipe to allow for expansion and contraction without stressing pipe of joint.

E. Install plastic ribbon tape with trace wire continuous buried 6 inches below finish grade over top of piping

F. Backfill trench and maintain optimum moisture content of fill material to attain required compaction density. After hydrostatic test, evenly backfill entire trench width by hand placing backfill material and hand tarping in 4 inch compacted layers to 12 inches minimum cover over top at piping.

3.4 INSTALLATION - ABOVE GROUND PIPING

A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 00.

D. Slope piping and arrange systems to drain at low points.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

3.5 FIELD QUALITY CONTROL

A. Test piping systems at 50 psi for a 24 hour period.

END OF SECTION

SECTION 22 05 23
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Ball valves.
2. Butterfly valves.
3. Check valves.
4. Gate valves.

1.2 REFERENCES

A. ASTM International:
1. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit manufacturers catalog information with valve data and ratings for each service.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:
1. Record actual locations of valves.

C. Operation and Maintenance Data:
1. Submit installation instructions, spare parts lists, exploded assembly views.

1.5 QUALIFICATIONS

A. Manufacturer:
1. Company specializing in manufacturing Products specified in this section with minimum ten years experience.

B. Installer:
1. Company specializing in performing work of this section with minimum five years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements:
1. Requirements for transporting, handling, storing, and protecting products.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

PART 2 - PRODUCTS

2.1 GATE VALVES

A. Manufacturers:
1. Crane Valve.
2. Hammond Valve Model.
3. Milwaukee Valve Company Model.
4. NIBCO, Inc. Model.
5. Stockham Valves & Fittings Model.
6. Substitutions: Section 01 60 00 - Product Requirements.

B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, non-rising stem, hand-wheel, inside screw, solid wedge disc, alloy seat rings, or] threaded ends.

C. 2-1/2 inches and Larger: MSS SP 70, [lass 125, cast iron body, bronze trim, bolted bonnet, non-rising stem, hand-wheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.2 BALL VALVES

A. Manufacturers:
1. Crane Valve, North America Model.
2. Hammond Valve Model.
3. Milwaukee Valve Company Model.
4. NIBCO, Inc. Model.
5. Stockham Valves & Fittings Model.
6. Substitutions: Section 01 60 00 - Product Requirements.

B. 2 inches and Smaller: MSS SP 110, Class 150, bronze, two piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, threaded ends extended lever handle with balancing stops.

C. 2 inches and Smaller: 150 psi at 73 degrees F water temperature, maximum service temperature: 140 degrees F ASTM D1785 PVC body and ball, double lever handle, EPDM seals, teflon seats, full port, single union type with threaded ends.

2.3 BUTTERFLY VALVES

A. Manufacturers:
1. Crane Valve, North America Model.
2. Hammond Valve Model.
3. Milwaukee Valve Company Model.
4. NIBCO, Inc. Model.
5. Stockham Valves & Fittings Model.
6. Substitutions: Section 01 60 00 - Product Requirements.

B. 2-1/2 inches and Larger: MSS SP 67, Class 150.
1. Body: Cast or ductile iron, lug ends, stainless steel stem, extended neck.
2. Disc: Nickel-plated ductile iron.
3. Seat: Resilient replaceable EPDM.
4. Handle and Operator: Infinite position lever handle with memory stop.

C. 2 inches through 10 inches: 150 psi at 73 degrees F water temperature, maximum service temperature: 140 degrees F, one piece body, ASTM D1785 PVC, lug type flange facing, disc encapsulated with EPDM, stainless steel shaft, locking lever handle.

2.4 CHECK VALVES

A. Horizontal Swing Check Valves:
1. Manufacturers:
a. Crane Valve.
b. Hammond Valve Model.
c. Milwaukee Valve Company Model.
d. NIBCO, Inc. Model.
e. Stockham Valves & Fittings Model.
f. Substitutions: Section 01 60 00 - Product Requirements.
2. 2 inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, threaded ends.

3. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:
1. Manufacturers:
   a. Crane Valve, North America Model.
   b. Hammond Valve Model.
   c. Milwaukee Valve Company Model.
   d. NIBCO, Inc. Model.
   e. Stockham Valves & Fittings Model.
   f. Substitutions: Section 01 60 00 - Product Requirements.
2. 2 inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, threaded ends.
3. 2-1/2 inches and Larger: MSS SP 71, Class 125, globe style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system is ready for valve installation.

3.2 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install valves with clearance for installation of insulation and allowing access.

3.3 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.

B. Install ball, butterfly or gatae valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball or butterfly valves for throttling, bypass, or manual flow control services.

D. Install spring loaded check valves on discharge of water pumps or elsewhere as indicated.

E. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

END OF SECTION

SECTION 22 05 29
HANGERS AND SUPPORTS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Hanger rods.

1.2 REFERENCES

A. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:
1. Hangers and Supports:
a. Submit manufacturers catalog data including load capacity.

C. Manufacturer's Certificate:
1. Certify products meet or exceed specified requirements.

1.4 QUALIFICATIONS

A. Manufacturer:
1. Company specializing in manufacturing Products specified in this section with minimum ten years experience.

B. Installer:
1. Company specializing in performing Work of this section with minimum five years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
1. Anvil
2. Carpenter & Paterson Inc
3. B-Line
4. Grinnel
5. Substitutions: Section 01 60 00 - Product Requirements.

B. Plumbing Piping:
   1. Conform to MSS SP58, MSS SP69, MSS SP89.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hook.
   6. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
   7. Vertical Support: Steel riser clamp.

2.2 ACCESSORIES

A. Hanger Rods:
   1. Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 CONCRETE EXPANSION ANCHORS

A. Manufacturers:
   1. Hilti.
   2. Substitutions: Section 01 60 00 - Product Requirements.

B. Anchors:
   1. Stainless steel expansion shell, size anchor to suit threaded hanger rods.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 PREPARATION

A. Obtain permission from Owner before drilling structural members.

3.3 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Install in accordance with MSS SP 58, MSS SP 69 and MSS SP 89.

B. Support horizontal piping as scheduled.

C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

D. Place hangers within 12 inches of each horizontal elbow.

E. Use hangers with 1-1/2 inch minimum vertical adjustment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation.

3.4 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

3.5 SCHEDULES

A. Copper Tubing Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches
1	6	3/8
1-1/4	7	3/8
1-1/2	8	3/8
2	8	3/8
2-1/2	9	1/2
3	10	1/2
4	12	1/2
5	13	1/2
6	14	5/8
8	16	3/4
10	18	3/4
12	19	3/4
14	22	7/8

B. Plastic Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
PVC (All Sizes)	4	3/8

END OF SECTION

SECTION 22 05 53
IDENTIFICATION FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe markers.

1.2 REFERENCES

A. American Society of Mechanical Engineers:
1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Submit manufacturers catalog literature for each product required.

C. Shop Drawings:
1. Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Manufacturer's Certificate:
1. Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

1.5 QUALIFICATIONS

A. Manufacturer:
1. Company specializing in manufacturing products specified in this section with minimum three years experience.

PART 2 - PRODUCTS

2.1 PIPE MARKERS

A. Color and Lettering:
1. Conform to ASME A13.1.

B. Plastic Pipe Markers:
1. Manufacturers:
a. Seton
b. Substitutions: Section 01 60 00 - Product Requirements.
2. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.
3. Text shall read “RECYCLED NON-POTABLE WATER ”

C. Plastic Tape Pipe Markers:
1. Manufacturers:
a. Seton.
b. Substitutions: Section 01 60 00 - Product Requirements.

2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
3. Text shall read “RECYCLED NON-POTABLE WATER ”

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install identifying devices after completion of coverings.

B. Install labels with sufficient adhesive for permanent adhesion.

C. Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Plumbing piping insulation, jackets and accessories.

1.2 REFERENCES

A. ASTM International:
1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
2. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
3. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
4. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:
1. Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

1.4 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.5 QUALIFICATIONS

A. Manufacturer:
1. Company specializing in manufacturing products specified in this section with minimum 10 years experience.

B. Applicator:
1. Company specializing in performing Work of this section with minimum five years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements:
1. Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Manufacturers for Closed Cell Elastomeric Insulation Products:
1. Aeroflex. Aerocell.
2. Armacell, LLC. Armaflex.
3. Nomaco. K-flex.
4. Substitutions: Section 01 60 00 - Product Requirements.

2.2 PIPE INSULATION

A. TYPE P-1: ASTM C534, Type I, flexible, nonhalogen, closed cell elastomeric insulation, tubular.
1. Thermal Conductivity: 0.27 at 75 degrees F (0.039 at 24 degrees C).
2. Maximum Service Temperature: 250 degrees F (120 degrees C).
3. Operating Temperature Range: Range: Minus 58 to 250 degrees F (minus 50 to 120 degrees C).

2.3 PIPE INSULATION JACKETS

A. Aluminum Pipe Jacket:
1. ASTM B209.
2. Thickness: 0.025 inch thick sheet.
3. Finish: Smooth.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.4 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive:
1. Compatible with insulation.

B. Closed Cell Elastomeric Insulation Pipe Hanger:
1. Polyurethane insert with aluminum single piece construction with self adhesive closure. Thickness to match pipe insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify piping has been tested before applying insulation materials.

C. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces:
1. Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

C. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and pump bodies.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.

D. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.

E. Insulation Terminating Points:
1. Condensate Piping: Insulate entire piping system and components to prevent condensation.

F. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
2. Miter joints at elbows.
3. Seal seams and butt joints with manufacturer's recommended adhesive.
4. When application requires multiple layers, apply with joints staggered.
5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

G. Exposed Piping Outdoors and in Equipment Room:
1. Finish with aluminum jacket.

3.3 SCHEDULES

A. Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS Inches
Recycled water	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	0.5 1.0

END OF SECTION

SECTION 22 13 00
FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sanitary sewer piping buried within 5 feet of building.

2. Cleanouts.

1.2 REFERENCES

A. ASTM International:

1. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.

2. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

3. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.

2. Sanitary Drainage Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.

C. Manufacturer's Installation Instructions:

1. Submit installation instructions for material and equipment.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents:

1. Record actual locations of equipment and clean-outs.

1.5 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing products specified in this section with minimum five years experience.

B. Installer:

1. Company specializing in performing Work of this section with minimum five years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

1.9 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED

A. PVC Pipe:

1. ASTM D2665, polyvinyl chloride (PVC) material, bell and spigot solvent sealed ends.

2. Fittings: PVC, ASTM D2665.

3. Joints: ASTM D2855, solvent weld with ASTM F656 purple primer and D2564 solvent cement.

2.2 CLEANOUTS

A. Manufacturers:

1. Mifab.

2. Wade.

3. Zurn.

4. Substitutions: Section 01 60 00 - Product Requirements.

B. Exterior Surfaced Areas (YCO-1):

1. Round cast nickel bronze access frame and non-skid cover.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test sanitary sewer piping system in accordance with Section 22 05 00.

END OF SECTION

SECTION 22 21 23
HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Close coupled pumps.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. Underwriters Laboratories Inc.:
1. UL 778 - Motor Operated Water Pumps.

1.3 PERFORMANCE REQUIREMENTS

A. Provide pumps to operate at system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.4 SUBMITTALS

A. Section 01 33 00 – Submittal Requirements: Submittal procedures.

B. Product Data:
1. Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.

C. Manufacturer's Certificate:
1. Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data:
1. Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

C. Provide name, address and phone number of local manufacturer’s representative.

1.6 QUALIFICATIONS

A. Manufacturer:
1. Company specializing in manufacturing products specified in this section with minimum ten years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 WARRANTY

A. Comply with requirements of Division 1 for products warranties and product bonds. Coordinate with General Contractor.

1.9 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Comply with requirements of Division 1 for provision of spare parts and maintenance products. Arrange to turn over to Owner's representative.

PART 2 - PRODUCTS

2.1 CLOSE COUPLED PUMPS

A. Manufacturers:
1. Franklin Electric.
2. Substitutions: Section 01 60 00 - Product Requirements.

B. Type:
1. Horizontal shaft, single stage, close coupled, radial split casing, for 125 psig maximum working pressure.

C. Casing:
1. Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

D. Impeller:
1. Bronze, fully enclosed, keyed to motor shaft extension.

E. Shaft:
1. Stainless steel.

F. Seal:
1. Carbon rotating against stationary ceramic seat, 212 degrees F maximum continuous operating temperature.

G. Performance:
1. See schedule on drawings.

H. Electrical Characteristics and Components:
1. Electrical Characteristics: See schedule on drawings.
2. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Install flexible connectors at or near pumps where piping configuration does not absorb vibration.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and larger. Provide Armaflex or equal insulation on supports to prevent condensation.

D. Provide air cock and drain connection on pump casings.

E. Provide drains for seals.

END OF SECTION

SECTIONS 26 05 00
ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Applicable provisions of General Conditions, Special Conditions, and Special Instructions to Bidders govern work under this section and all of electrical divisions.

B. This section is in particular reference to and shall be considered a part of all Electrical specifications sections following. It is intended that comments in this section be applicable to all included electrical sections of Division 26. Work described hereinafter shall be included as though written within each specific section of the specification.

C. The Contractor shall provide all items, articles, materials, operations, or methods listed, mentioned, or scheduled on the Drawings and/or herein, including all labor, materials, equipment, and incidentals necessary and required for their completion.

D. All work shall conform to requirements of all local construction codes, applicable sections of the National Fire Protection Association, and the Public Health Agency.

1.2 SCOPE

A. Requirements specified in this section shall govern applicable portions of all Electrical sections including related fire protection, plumbing and mechanical work, whether so stated therein or not.

B. Where items specified in the specific Electrical sections conflict with requirements in this section, the former specific sections shall govern.

C. The Contractor shall furnish all labor, plant, equipment, and materials, complete in connection with the installation of the Electrical systems in strict accordance with this specification and accompanying plans. The Contractor shall submit his bid based on performing all work hereinafter specified or indicated on applicable plans. The Contractor shall furnish and install all connections and appurtenances necessary and usually furnished in connection with such work and systems even though not specifically mentioned or shown on the plans.

D. These requirements cover information, work, equipment and accessories listed under the following headings:
1. References, Definitions, Procedures
2. Permits and Fees
3. Utility Connections and Inspections
4. Workmanship
5. Mechanical Provisions
6. Electrical Provisions

E. Work of Other Sections:
1. Requirements given within this Section apply to the Work of all Sections of the electrical divisions.

F. Finish painting is specified in other Divisions. Prime and protective painting shall be provided under this Division.

G. Electrical interlock apparatus and other electrical apparatus, which are not an integral part of equipment, are specified under this Division.

1.3 REFERENCES

A. References to standards, codes, specifications and recommendations shall mean the latest edition of such publications adopted and published at a date of invitation to submit Proposals.

B. References to technical societies, trade organizations and governmental agencies is made in Electrical specification sections in accordance with the following abbreviations:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. CSD Commodity Standards Division U.S. Dept of Commerce
4. IEEE Institute of Electrical and Electronic Engineers
5. NFPA National Fire Protection Association
6. NBS National Bureau of Standards
7. NEC National Electrical Code (NFPA 70)
8. NEMA National Electrical Manufactures Association
9. UL Underwriters' Laboratories, Inc.

1.4 DEFINITIONS

A. Definitions of terms and expressions used in electrical work are:

1. Approval: It is understood that approval must be obtained from the Architect in writing before proceeding with the proposed work. Approval by the Architect of any changes, submitted by the Contractor, will be considered as general only to aid the Contractor in expediting his work.
2. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.
3. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
4. General: Basic Contract definitions are included in the Conditions of the Contract.
5. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.
6. Install: The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
7. This Contractor: This Contractor, engaged to execute the work included in this particular section only, even though he may be technically described as a Subcontractor to the General Contractor or Managing Construction Contractor, referred to as "the Contractor". If this Contractor, engaged to execute said work, employs Sub-Contractors to perform various portions of the work included under this Section, he shall be held responsible for the execution of this work, in full conformity with Contract Document requirements. This Contractor shall cooperate at all times and shall be responsible for the satisfactory cooperation of his Subcontractors with the other Contractors on the job so that all of the various phases of the work may be properly coordinated without unnecessary delays or damage to any parts of the work of any Contractor.
8. Provide: Defined as requiring both the furnishing and installation of the item or facility indicated, complete in all respects and ready for operation unless

otherwise specifically noted.

B. NEMA Classifications: (For complete definitions and listing see NEMA Standards)
1. Type 1 General Purpose, Indoor.
2. Type 2 Drip-proof, Non-corrosive, Indoor.
3. Type 3R Rain-proof, Outdoor.
4. Type 4 Watertight and dust-tight, non-corrosive, indoor and outdoor.
5. Type 4X Watertight and dust-tight, corrosion resistant, indoor and outdoor.
6. Type 12 Dust-tight, watertight, non-corrosive, indoor.

1.5 DRAWINGS

A. Drawings and Instructions:
1. Contract drawings for Electrical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, fixtures, interlocks, conduit and approximate sizes and locations of equipment and outlets. Electrical trades shall follow these drawings in laying out their work, consult other trades and general construction drawings to familiarize themselves with all conditions affecting their work, and shall verify and coordinate spaces in which their work will be installed. The contract drawings shall be considered as a part of these specifications. It is intended that any Contractor making proposal to execute any work should study the drawings for his own particular trade, as well as all drawings of all other trades in order to fully understand the work he is expected to perform. As a qualification for bidding, the contractor shall visit the site and be responsible for determining all existing conditions in as far as it affects his work prior to submitting a proposal.

B. General:
1. The Drawings are schematic in nature and indicate approximate locations of the Electrical equipment, fixtures, conduit, etc., except where specific locations are noted and dimensioned on the Drawings. All items are shown approximately to scale. The intent is to show how these items shall be integrated into the building. Locate all items by on-the-job measurements and in accordance with the Contract Documents. Cooperate with other trades to ensure project completion as indicated.

C. Unless otherwise expressly agreed to in writing, all rights to the Electrical specifications and drawings prepared by Alderson & Associates, Inc. shall belong to Alderson & Associates, Inc. The sole exception is that the specifications and drawings may be used for construction of the project for which the specifications and drawings were prepared if all other contractual obligations have been complied with, including the payment of fees. Each page of the drawings, if prepared in whole or in part by Alderson & Associates, Inc., and all pages of these specifications of Section are covered by copyright and may not be reproduced, published or used in any way without the permission of Alderson & Associates, Inc.

D. Location:
1. Prior to locating Electrical equipment, outlets, devices, etc., obtain the Architect/Engineer's approval as to exact location. Locations shall not be determined by scaling drawings. Mounting heights shall be as directed by the Architect/Engineer or in accordance with the Texas Accessibility Standards and the A.D.A. Contractor shall be responsible for costs of redoing work of trades necessitated by failure to comply with this requirement.

1.6 DISCREPANCIES

A. Clarification:
1. Clarification shall be obtained before submitting a proposal for the Work under the electrical divisions as to discrepancies or omissions from the Contract Documents or questions as to the intent thereof.

B. Contractor Agreement:
1. Consideration will not be granted for misunderstanding of the amount of work to be performed. Tender of a proposal conveys full Contractor agreement of the items and conditions specified, shown, scheduled, or required by the nature of the project.

C. The drawings intend that all equipment and conduit be arranged as shown with necessary minor rearrangements to suit the equipment approved and to comply with the requirements of the various equipment manufacturers' recommendations. Some minor rearrangements are expected to best fit the structural conditions. It shall be the responsibility of the Contractor to make known his desires in such change, by shop drawings as required, to obtain agreement of the Architect/Engineer before proceeding with any change or variation. Changes required by job conditions, equipment employed, or structural conditions of the building shall be at no cost to the Owner.

D. Perform all work in strict accordance with the requirements and recommendations stated in the codes and standards except when requirements are modified by the contract documents. Nothing in the Contract Documents shall be construed to permit work not conforming to these codes. When two or more codes or standards are applicable to the same work, then the stricter code or standard shall govern. The date of the code or standard is that in effect on the date of issue of the contract documents except when a particular publication date is specified. The Contractor shall be held responsible for verifying all State, Federal, NFPA, local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting the deficiencies. Where particular publication date is specified. The Contractor shall be held responsible for verifying all State, Federal, NFPA, local codes and ordinances that may alter any part of the plans or specifications. The Contractor shall bear all costs for correcting the deficiencies. Where local codes and ordinances are not in writing or on record but a local precedence has been set, the Owner shall pay for any additional cost incurred.

1.7 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for Substitutions. Architect/Engineer shall receive such requests a minimum of 10 days prior to scheduled bid date.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that Bidder:
1. Has investigated proposed product and has determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:
1. Submit two copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

1.8 SUBMITTALS

A. Submittal Procedures: Division 1 - Requirements in addition to the following:
1. Submittal Preparation:
a. Minimum of two copies and an electronic are required, complete (all items submitted at one time), index to each Section of Specifications and include the following information and action taken.
1) Project Name
2) Date
3) Name and Address of Architect
4) Name and Address of Engineer (See Division 1 of Specifications)
5) Name, Address and Telephone Number of Contractor or Sub-contractors.
6) Manufacturer's Name
7) Published ratings or capacity data
8) Detailed equipment drawing for fabricated items
9) Wiring diagrams
10) Installation instructions
11) Other pertinent data
12) All required submittals and data, bound together, submitted at one time.
b. Where literature is submitted covering a group or series of similar items, the applicable items must be clearly indicated on each copy with a highlighter pen, or other means of identification clearly legible.
c. Data and shop drawings shall be coordinated and included in a single submission. Multiple submissions are not acceptable except where prior approval has been obtained from the Architect/Engineer. In such cases, a list of data to be submitted later shall be included with the first submission. Failure to submit shop drawings that meet the requirements of the Drawings and Specifications in ample time for review shall not entitle the Contractor to an extension of contract time, and no claim for extension by reason of such Contractor default shall be allowed.

B. Submittal Organization:
1. Organize all required data in a 3-ring binder of sufficient size with index tabs with number and appropriate title of specification section.

C. Provide a cover sheet and an index sheet listing all items submitted.

D. The second and third sheet shall be blank for stamping of submittals. All submittals are to be processed at same date; partial submittals will not and are not acceptable.

E. Show any revisions to equipment layout required by use of selected equipment. The Engineer shall receive submittals no later than thirty (30) working days from contract date with General Contractor and Owner.

F. The Engineer's review of submittals is only for confirmation of adherence to design of project and does not relieve the Contractor of final responsibility for furnishing all materials required for a complete working system and in complying with the Contract Documents in all respects.

1.9 SHOP DRAWINGS, DESCRIPTIVE DATA

A. As soon as practical and within thirty days after the official award of contract and before any materials and equipment are purchased, the Contractor shall submit to the Architect/Engineer, for review, of the complete list of all materials and equipment identified and referenced to specification paragraphs together with applicable shop drawings. In addition, the names and addresses of the manufacturers, their catalog data, numbers, and trade names shall be furnished. Published performance data shall be furnished to indicate compliance with scheduled performance. This data will be marked "Reviewed" by the Engineer, dated and distributed to the several parties involved, with two (2) copies returned to the Contractor. The data shall include the following:
   1. Equipment-room layouts drawn to ¼" scale, including equipment and accessories, to show clearances for operating and servicing.
   2. Equipment and materials as indicated in each Section.
   3. Composite drawings of crowded locations where there is a possibility of conflict among trades.

B. Verification of Dimensions:
   1. The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall verify all dimensions in the field and advise the Architect/Engineer of any discrepancy before performing the work. Adjustments to the work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner.

C. Equipment other than that shown should be used in bids only when approved by the Engineer prior to bidding. Those models and manufacturers identified in drawings and specifications were selected to provide minimum acceptable performance. These models are used in sake of brevity to establish a basis of quality, weights, performance, capacities, etc., required. Any such alternate proposals must include all necessary changes and additions to the work occasioned by such substitution including but not limited to foundations, supports, connections, piping, etc. which shall be paid for by the Contractor. In the event that the Contractor submits for approval any material, equipment, etc., that are not in conformity with the specifications, the Architect/Engineer reserves the right to reject this equipment, and the Contractor shall submit data on other equipment which meets the requirements of the specifications for approval.

D. Installation Directions:
   1. Obtain manufacturer's printed installation directions to aid in properly executing work on equipment requiring such directions.

E. Submit such directions to Architect/Engineer prior to time of installation for use in review of the work.

F. Operating Instructions, Charts:
1. Furnish manufacturer's printed operating and maintenance instruction for equipment and systems, which, in opinion of Architect/Engineer, require such instructions; obtain receipt for it.

G. When so specified or instructed, mount operating instructions in approved frame with glass over; locate where directed.

1.10 GENERAL INSTALLATION

A. Lines and Grades:
1. Construct work in conformity with lines and grades as indicated, using axis lines and bench marks provided under General Construction; verify such axis lines and bench marks.
2. Axis lines within building will be so spaced on each floor level that mechanical work may be laid out with tape measure having length of 50 feet maximum.
3. Bench marks outside building will be at accessible points on building walls, from which lines and grades required for installation of mechanical and electrical work may be set.

B. Cutting and Patching
1. Notify the General Contractor sufficiently ahead of construction of any floors, walls, ceiling, roof, etc., of any openings that will be required for his work. The Contractor shall see that all sleeves required for his work are set at proper times so as to avoid delay of the job. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper installation of the work under this Contract shall be done at the Subcontractor's expense in a neat and workmanlike manner, and as approved by the Architect/Engineer. No joists, beams, girders or columns shall be cut by any Contractor without first obtaining written permission of the Architect/Engineer. The General Contractor shall provide patching of openings and/or alterations. All openings in fire walls and floors shall be completely sealed after installation for a completely air-tight installation. Sealing material shall be non-combustible and UL approved. The installed sealing assembly shall not cause the fire rating of the penetrated structure to be decreased. All openings in exterior walls shall be sealed watertight. Seal voids around conduits penetrating fire-rated assemblies and partitions using fire stopping materials and methods in accordance with NFPA and local codes.

C. Existing Services:
1. Active Services: When encountered in work, protect, brace and support existing active sewers, gas, piping and other services where required for proper execution of the work. If existing active services are encountered that require relocation, make request in writing for determination. Do not proceed with work until written directions are received. Do not prevent or disturb operation of active services that are to remain. Outages shall be kept to a minimum and allowed only as arranged with the Architect/Engineer.
2. Inactive Services: When encountered in work, remove, cap, or plug inactive services.
3. Interruption of Services: Where work makes temporary shutdowns of services unavoidable, shut down at night or at such times as approved by Owner, which will cause the least interference with established operating routine. Arrange to work continuously, including overtime, if required, to assure that services will be shut down only during time actually required to make necessary connection to existing work.

D. Manufacturer’s Instructions:
   1. All equipment and devices shall be installed in accordance with the drawings and specifications, manufacturer's instructions and applicable codes. Where specifications call for installation of a product to be in accordance with manufacturer's instructions and/or where manufacturer's instructions are required for installation of a product, it shall be the contractor's responsibility to obtain the necessary applicable manufacturer's instructions and install the product in accordance with the manufacturer's instructions. It shall be the Contractor's responsibility to install all equipment, materials, and devices shown on the plans and as called out in these specifications even if manufacturer's instructions are absolutely unattainable.

E. Related Work:
   1. The various specification sections for this division may or may not include related work listings.
   2. All related work shall be coordinated and provided by the Electrical Contractor regardless whether specifically identified or not.

F. Electrical Wiring and Equipment for Mechanical Systems
   1. The Electrical plans are based on the equipment and devices scheduled shown on the drawings or as called for in the specifications. Should any mechanical equipment or device associated devices be changed or accepted from those which are shown or noted, all electrical and/or mechanical changes shall be made at the expense of the trade or contractor initiating the change with no expense to the Owner, Architect, Engineer or their representatives.

G. Objectionable Noise and Vibration:
   1. Electrical equipment shall operate without objectionable noise or vibration.
   2. If such objectionable noise or vibration should be produced and transmitted to occupied portions of building or other parts of Electrical work, make necessary changes and additions, as approved, without extra cost to Owner.

H. Equipment Design and Installation:
   1. Uniformity: Unless otherwise specified, equipment or material of same type or classification, used for same purpose shall be the product of same manufacturer.
   2. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with ASME, AIEE or other applicable technical standards, and shall have neat and finished appearance.
   3. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviation from indicated arrangements may be made, as approved.

I. Protection of Equipment and Materials:
   1. Responsibility for care and protection of work rests with the Contractor until it has been tested and accepted.
   2. After delivery, before and after installation, protect equipment and materials against theft, injury or damage from all causes.

J. Installation:
   1. Cooperation with trades of adjacent, related or affected materials or operations, and or trades performing continuations of this work under subsequent contracts is considered a part of this work in order to effect timely and accurate placing of work and to bring together, in proper and correct sequence, the work of such trades, including trade in general contractor allowance and Division 26.

2. The Electrical Contractor shall coordinate installation of the electrical system with the General Contractor, Mechanical, Plumbing, and Communications Contractors to insure a complete working system for the Owner.
3. Where required, all conduit and boxes for all systems, except mechanical controls specified otherwise, shall be provided by the Electrical Contractor, including systems in the Electrical divisions, any and all allowances shall be included. Normally low voltage wiring shall run open in accessible attic space. Coordinate with, and verify with these specifications to provide required conduit and boxes at locations and heights required.
4. All wiring shall be enclosed in conduit or raceway in all exposed areas.
5. Workmen skilled in their trade must perform Work. The installation must be complete whether the work is concealed or exposed.
6. Conceal electrical work in walls, floors, chases, under floors, underground and above ceilings. Branch circuits may be installed in the slab. Install in slab as directed by Structural Engineer. Coordinate the actual electrical outlets and equipment with building features and mechanical equipment as indicated on architectural, structural and mechanical drawings. Review with the Architect any proposed changes in outlet or equipment location. Relocation of outlets before installation, of up to 3 feet from the position indicated, may be directed without additional cost. Remove and relocate outlets placed in an unsuitable location when so requested by the Architect.
7. If structural sheets do not address conduits in the slab, the Contractor must get written approval from Structural Engineer prior to installation.

K. Temporary Service and Lighting
1. Electrical service to all portions of buildings at the construction site shall remain in operation throughout construction. Provide all required temporary electrical service in the base bid to all required areas so as to satisfy OSHA requirements.
2. Temporary lighting shall be provided by a minimum of at one 100-watt lamp per 400 sq. ft. of building area and not less than one lamp per room of 150 sq. ft or more. Wiring and lamp holders shall meet all codes. Temporary systems are the responsibility of the Contractor and shall be removed before final acceptance of this project.
3. The Contractor/Managing Construction Contractor shall pay all metering and temporary electrical service charges and/or costs of utilities.

L. Project Record Documents
1. The Contractor shall keep a set of plans on the job, noting daily all changes made in connection with the final installation including exact dimensioned locations of all new and existing switchgear, devices, fixtures, equipment and new or existing site utilities and lights.
2. Upon submitting his request for final payment, he shall turn over to the Architect/Engineer, record document submittals as outlined in Division 1 - General Requirements of the Specifications.
3. In addition to the above, the Contractor shall accumulate during the job's progress the following data, in duplication. Two (2) each prepared in 3-ring black in color binder neat in appearance of sufficient size and turned over to the Architect/Engineer for checking and subsequent delivery to the Owner:
   a. All warranties, guarantees and manufacturer's directions on equipment and material covered by the Contract.
   b. All shop drawings.
   c. Set of operating instructions. Operating instructions shall also include recommended maintenance and seasonal changeover procedures.
   d. Any and all other data and/or plans required during construction.
   e. Repair parts lists of all major items and equipment including name,

address and telephone number of local supplier or agent.

f. The first page, or pages, shall have the names, addresses, and telephone numbers of the following:
   1) General Contractor and all sub-contractors.
   2) Major Equipment Suppliers

g. Submit Megger Reading Log copies in accordance with the specifications.

h. Submit ground tests methods and results in accordance with the specifications.

i. Submit testing of Electrical System results in accordance with the specifications.

j. Submit conductor insulation test results in accordance with the specifications.

k. Submit surge suppression - switchgear mounted warranty in accordance with the specifications.

M. Final Acceptance Review:

1. It shall be the duty of this Contractor to make a careful inspection trip of the entire project, to ensure that the work on the project is ready for final acceptance before calling upon the Architect/Engineer to make a final observation visit.
2. To avoid delay of final acceptance of the work, the Contractor shall have all necessary bonds, warranties, receipts, affidavits, etc., called for in the various articles of these specifications, prepared and signed in advance, together with a letter of transmittal, listing each paper included, and shall deliver the same to the Architect/Engineer at or before the time of said final visit. The Contractor is cautioned to check over each bond, receipt, etc., before preparing for submission to verify that the terms check with the requirements of the specifications.
3. The following will be required at time of final completion:
   a. Final clean-up completed.
   b. All systems are fully operational, all material and devices installed and tested.
   c. Ground tests (megger readings) performed, two copies of method used, and results attached.
   d. Project Record Documents

N. Warranty:

1. This Contractor shall warranty his work against defective materials and workmanship for a period of one year from date of acceptance of the job.
2. Neither the final payment nor any provisions in Contract Documents shall relieve this Contractor, or the Contractor, of the responsibility for faulty materials or workmanship.
3. He shall remedy any defects due thereto, and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from date of substantial completion.
4. The Owner shall give notice of observed defects with reasonable promptness.
5. This Warranty shall not be construed to include the normal maintenance of the various components of the system covered by these specifications.

O. Training:

1. Upon completion of the work and at a time designated by the Architect, provide a formal training session for the Owner's operating personnel to include location, operation, and maintenance of all electrical equipment and systems.
2. See other sections in Division 26 for time requirements.

P. Adjustments:

1. It shall be the responsibility of the Contractor to adjust properly any and all equipment and devices and to run reasonable operating tests together with more

specific tests indicated in the separate sections of the specifications. If for some reason any piece of equipment does not function satisfactorily after the first adjustments are made, the Contractor shall continue on the job until satisfactory corrections and adjustments have been made. The Contractor is responsible for the proper performance, functioning, integration, and balance of all equipment. Where tests are required by the Architect/Engineer to ascertain equipment capacities in the installed condition, it shall be the responsibility of the Contractor to run approved tests, to provide all required instruments and apparatus and to submit certified statements of test results. All such instruments shall be in proper calibration and shall meet approval of the Architect/Engineer.

Q. Completeness:
1. The Contractor shall be responsible for the absolute completeness of his work, including all adjustments and all final balancing to obtain proper operation in all respects.
2. Each system is intended to be complete and functional in performance. All such items as trim, electrical work, and appurtenances required shall be installed at no extra cost.
3. The Contractor shall take such precautions as may be necessary to properly protect his apparatus from damage. This shall include the creation of all required temporary shelters to adequately protect any apparatus above the floor of the construction and the covering of apparatus in the completed building with tarpaulins or other protective covering. Failure to comply with the above to the satisfaction of the Owner's inspector will be sufficient cause for the rejection of the equipment in question and its complete replacement by this Contractor.

1.11 ELECTRICAL TESTS

A. During the progress of the work and upon completion, tests shall be made as specified herein and as required by authorities having jurisdiction; including inspectors, Owner, Architect or Engineer. Tests shall be conducted by the Contractor as part of the work of the electrical divisions and shall include the services of qualified personnel as well as all equipment, apparatus and services required. Each wiring system with devices connected must test free from short circuit and ground faults and must have an insulation resistance between conductors and ground in accordance with ANSI and IEEE standards.

B. Prior to the execution of testing, the Contractor shall submit proposed test procedures recording forms, list of personnel and test equipment for the Engineer’s review.

C. The tests shall include, but not be limited to, the following:
1. Wire and Cable Test
2. Branch Circuit Test
3. Feeder and Motor Circuit Test

D. Wire and Cable Test (600 Volt Insulation)
1. Each main feeder conductor shall have its insulation resistance tested after the installation is complete, except for connection at its source and points of termination. Tests shall be made using a Biddle Megger or equivalent test instrument at a voltage of not less than 1,000 VDC. Resistance shall be measured from conductor-to-conductor and from conductor-to-ground.
2. Insulation resistance shall not be less than the following:
3. Conductors that do not meet or exceed the insulation resistance values listed above shall be removed, replaced and retested.
4. Prior to energization, check cable and wire for continuity of circuitry and for short circuits. Correct malfunction when detected.

E. Branch Circuit Test
   1. Operate all lighting and receptacle circuits with associated switching and controls.

F. Feeder and Motor Circuit Test
   1. Provide voltage and current readings for each feeder and motor circuit under maximum operating conditions.
   2. Verify phasing and direction of rotation for rotating equipment and correct as required.

G. Warranty Requirements
   1. The foregoing tests shall in no way relieve the Contractor of the warranty requirements.

1.12 PERMITS AND FEES

A. All building permits and their required fees, extension of utilities together with applicable meters, and all inspection fees for all Electrical work shall be arranged and paid for by the Electrical trade involved in the particular work for which the permit is taken, and for the pertinent inspection fee for the work involved by the Contractor.

1.13 UTILITY CONNECTIONS AND INSPECTIONS

A. Extensions:
   1. The Contractor shall provide or obtain and pay for all utility connections, utility extensions, and/or relocations and shall pay all costs and inspection fees for all work included therein.

B. Compliance:
   1. The Contractor is required to comply in every respect with all requirements of local inspection departments, local ordinances and codes, and utility company requirements.

C. Utilities:
   1. The Contractor shall check with the various utility companies whose services are required for this project and shall provide, complete in all respects, the required utility relocations, extensions, modifications, and/or changes.

D. Certifications:
   1. Prior to final acceptance, the Contractor shall furnish without additional charge a certificate of acceptance from the inspection departments having jurisdiction over the work for any and all work installed under this Contract.

E. Utility Locations and Elevations:
   1. Locations and elevations of the various utilities included within the scope of this work have been obtained from substantially reliable sources and are offered as a general guide only, without guarantee as to accuracy. The Contractor shall examine the site, shall verify to his own satisfaction the locations, elevations, and availability of all utilities and services required, and shall adequately inform himself as to their relation to the work. The submission of bids shall be deemed evidence thereof.

F. Ordinances, rules and regulations:
   1. All installations shall comply with applicable code, ordinances and regulations except where the drawings require a higher degree of work as indicated on the plans or specified hereinafter. All installations shall comply with applicable codes, ordinances and regulations except where drawings required a higher degree of work as indicated on the plans or specified hereinafter.

G. Installations and equipment shall comply with applicable requirements of the National Fire Protection Association, Underwriters Laboratories, National Electrical Code, utility company, or other local, State or Federal agencies having jurisdiction. Compliance with these requirements shall be done at no additional cost to the Owner.

H. Any changes to the contract required by the aforementioned requirements shall be submitted to the Architect/Engineer in writing for approval prior to execution.

1.14 QUALITY ASSURANCE

A. Provide complete installations of and verify that all systems, comply with NFPA 70, latest edition.

B. The more stringent of the N.E.C. or specifications shall apply to this project. All materials furnished under this Contract shall be new, free from defects of any kind, of the quality and design hereinafter specified, and shall conform to the standards of Underwriter's Laboratories Inc., except for equipment which U.L. does not list or provide label service.

C. Submit a bid on the basis of a complete installation including all labor, material, delivery, insurance, permits, inspection fees and tests required even though each and every item necessary is not specifically mentioned or shown. In case of any conflict between the specifications, plans and ordinances, the ordinances shall govern. In case of any conflict between the specifications and plans, the Architect shall make the final decision.

D. Refer to Division 1 - General Requirements:
   1. All materials and equipment shall be installed in accordance with the approved recommendation of the manufacturer and workmen skilled in the trade involved shall accomplish the installation.

1.15 CONTRACTOR'S RESPONSIBILITY

A. Erect barricades, protective fencing, and signs as required to prevent injury to personnel on site.

B. Make permanent connection to new utilities or existing lines. Determine depth and location, and bid accordingly.

C. Relocate and repair any existing lines cut by general construction work.

D. Pay all costs in connection with metering. Plans do not show exact location and elevations of lines. Deviate from plans as required to conform to the general construction, and provide proper grading and installation.

E. Maintain all utility services during construction to existing portions of job that remain.

F. Procure and pay for all necessary permits or licenses to carry out the work.

G. Obtain and pay for all the necessary certificates of approval, which must be delivered to the Architect before final acceptance of the work.

H. Periodically remove rubbish, clean or repair all surfaces marred by the work required under this contract.

I. Protect work from damage by other trades.

J. Where job conditions require changes in indicated locations and arrangement, make such changes without extra cost to Owner.

K. Exposed piping and/or other materials will not be permitted in the finished job.

L. Provide required hook-up to line voltage at all electromagnetic door holder/release, fire/smoke dampers, and smoke dampers. See Mechanical drawings for all locations of required devices. Provide required relays and wiring to fire alarm panels and coordinate with other specified work.

M. Accomplish all demolition and remodeling work involving his trade in a manner and completeness to provide the appearance of new construction work.

N. Replace any usable equipment and/or structure damaged during demolition and remodel work.

1.16 FLAME SPREAD PROPERTIES OF MATERIALS

A. Materials and adhesives incorporated in this project shall conform to ASTM Standard E84, "Test Method of Surface Burning Characteristics of Building Materials" and NFPA 90. The classification shall not exceed a flame spread rating of 25 for all materials, adhesives, finishes, etc., specified for each system, and shall not exceed a smoke developed rating of 50.

1.17 ASBESTOS ABATEMENT

A. In the event the Contractor encounters at the site material reasonably believed to be asbestos which has not been abated, the Contractor shall immediately stop work in the area affected and report the condition to the Owner. If in fact the material is asbestos and the asbestos has not been abated, the Contractor shall not resume the non-asbestos-related work in the affected area until the asbestos has been abated. The abatement action may be done in two ways, as the Owner may decide. The Owner may perform the abatement by its own forces, or the Owner may contract with a third party to perform the abatement.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Equipment, Spaces and Clearances:
1. All equipment and accessories shall be new and standard models of a type that has been in satisfactory use for two (2) years. All major components of any given system shall be of the same manufacturer and shall have a manufacturer's nameplate stating address, catalog model number and capacity.

B. Materials and equipment shall be installed in accordance with manufacturers' recommendations and best standard practice for the type of work involved.

C. All equipment shall be continuously protected, using temporary shelters, etc., from dirt, dust, moisture, damage, etc., and will not be accepted otherwise. All necessary supports, frames and foundations shall be provided for all equipment.

D. The responsibility for the furnishing of the proper Electrical equipment rests entirely upon the Contractor who shall request advice and supervisory assistance from the representatives of specific manufacturers during the installation.

E. It shall be the responsibility of the Contractor that the combination of proposed Electrical equipment will fit into the allotted space shown on the plan with adequate clearances for maintenance and servicing.

F. Any apparatus, which is too large to permit access through stairways, doorways, shaft, etc., shall be delivered to the job and set in place prior to constructing the mechanical room enclosures.

G. Design and construct supporting structures of strength to safely withstand stresses to which they may be subjected and to distribute properly the load and impact over the building areas.

H. Conform to applicable technical societies' standards, also to codes and regulations of agencies having jurisdiction.

I. Submit detailed shop drawings of all supports; obtain approval before fabricating or constructing.

3.2 SPACE REQUIREMENTS

A. General:
1. Determine in advance of purchase that the equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearances for adjustment, repair or replacement.

B. Clearance:
1. Allow adequate space for clearance in accordance with the Code requirements and the requirements of the local inspection department.

C. Responsibility:
1. Since space requirements and equipment arrangement vary for each manufacturer, the responsibility for initial access and proper fit rests with the Contractor.

D. Review:
1. Final arrangements of equipment to be installed shall be subject to the Architect/Engineer’s review.

3.3 RELATED ELECTRICAL PROVISIONS

A. Such items as electric control, motors, relays, thermostats, terminal or limiting switches on equipment, etc., shall be furnished as part of the equipment involved. All of these electrical controls, interlocks, and devices shall be installed and wired into the system to conform to Division 26. They shall be complete with all required conduit, condulets, boxes, wire, grounds, power disconnect switches, etc. The electrical trades doing Division 26 work shall provide all power wiring of 115 volt or higher including interlocks. All temperature control wiring shall be the responsibility of the mechanical trades, who shall furnish all wiring and diagrams.

B. Cleaning Electrical Equipment:
   1. Equipment shall be thoroughly cleaned of dirt, cuttings and other foreign substances.

3.4 GUARANTEES

A. All work, equipment, and materials, shall be guaranteed by the Electrical Contractor for a period of one (1) year after final acceptance of the work. All defects in labor and materials occurring during the one year after final acceptance of the work shall be immediately repaired or replaced by the Contractor at no additional cost to the owner.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes building wire and cable; nonmetallic-sheathed cable; direct burial cable; service entrance cable; armored cable; metal clad cable; and wiring connectors and connections.

B. Related Sections:
1. Section 26 05 53 - Identification for Electrical Systems: Product requirements for wire identification.

1.2 REFERENCES

A. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

C. Underwriters Laboratories, Inc.:
1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:
1. Solid conductor for feeders and branch circuits #10 AWG and smaller.
2. Stranded conductors for control circuits.
3. Conductor not smaller than #12 AWG for power and lighting circuits.
4. Conductor not smaller than 14 AWG for control circuits.
5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.

B. Wiring Methods: Provide the following wiring methods:
1. Concealed Dry Interior Locations: Use only building wire, Type XHHW insulation, in raceway.
2. Exposed Dry Interior Locations: Use only building wire, Type XHHW insulation, in raceway.
3. Wet or Damp Interior Locations: Use only building wire, Type XHHW insulation, in raceway.
4. Exterior Locations: Use only building wire, Type XHHW insulation, in raceway.

1.4 DESIGN REQUIREMENTS

A. Conductor sizes are based on copper.

1.5 SUBMITTALS

A. Product Data:
1. Submit for building wire and each cable assembly type.

B. Design Data:
1. Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.

C. Test Reports:
1. Indicate procedures and values obtained.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:
1. Record actual locations of components and circuits.

1.7 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

1.8 QUALIFICATIONS

A. Manufacturer:
1. Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.9 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on Drawings.

1.10 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Manufacturers:
1. AETNA
2. American Insulated Wire Corp.
3. Colonial Wire
4. Encore Wire
5. General Cable Co.
6. Republic Wire
7. Rome Cable
8. Service Wire Co.
9. Southwire
10. Superior Essex
11. Substitutions: Section 01 60 00 - Product Requirements

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper.

D. Insulation Voltage Rating: 600 volts.

E. Insulation Temperature Rating: 90 degrees C.

F. Insulation Material: Thermoplastic.

2.2 TERMINATIONS

A. Terminal Lugs for Wires #6 AWG and Smaller:
1. Solderless, compression type copper.

B. Lugs for Wires #4 AWG and Larger:
   1. Color keyed compression type copper, with insulating sealing collars.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify interior of building has been protected from weather.

C. Verify mechanical work likely to damage wire and cable has been completed.

D. Verify raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 EXISTING WORK

A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.

B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.

C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.

D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.4 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

D. Minimum Conductor Size – Building Wire in Raceway:
   1. Minimum #14 AWG for control circuits.
   2. Minimum #10 AWG for power homeruns.
   3. Minimum #10 AWG for special outlets, dedicated outlets and junction boxed hard wire connections for equipment.
   4. Minimum #10 AWG for 20 ampere 120-277 volt branch circuits. The backbone of all 20 ampere lighting and power branch circuits shall be #10 AWG. Drops to individual receptacles and light fixtures may be #12 AWG.

E. Special Techniques - Building Wire in Raceway:
   1. Pull conductors into raceway at same time.
   2. Install building wire #4 AWG and larger with pulling equipment and lubricant.

F. Special Techniques - Cable:
   1. Protect exposed cable from damage.
   2. Support cables above accessible ceiling, using spring metal clips to support cables from structure. Do not rest cable on ceiling panels.
   3. Use suitable cable fittings and connectors.

G. Special Techniques - Wiring Connections:
   1. Clean conductor surfaces before installing lugs and connectors.
   2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
   3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
   4. Install split bolt connectors for copper conductor splices and taps, #6 AWG and larger.
   5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, #8 AWG and smaller.
   6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, #10 AWG and smaller.

H. Install stranded conductors for branch circuits #10 AWG and smaller. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

I. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.

J. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires #4 AWG and larger to copper bus bars.

K. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

3.5 WIRE COLOR

A. Phase Conductors, including Switch Legs – Color code conductors as indicated in the Wire Color Code Table below, per City of San Antonio standards:
   1. For wire sizes #10 AWG and smaller, install wire with insulation color per the table.
   2. For wire sizes #8 AWG and larger, identify wire with colored tape at terminals, splices and boxes, with color per the table.

B. Neutral Conductors - Color code conductors as indicated in the Wire Color Code Table below. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.
   1. For wire sizes #10 AWG and smaller, install wire with insulation color per the table.
   2. For wire sizes #8 AWG and larger, identify wire with colored tape at terminals, splices and boxes, with color per the table.

C. Ground Conductors – Color code conductors as indicated in the Wire Color Code Table below.
   1. For wire sizes #10 AWG and smaller, install wire with insulation table per table.
   2. For wire sizes #8 AWG and larger, identify with colored tape at terminals, splices and boxes, with color code per the table.

WIRE COLOR CODE TABLE				
Phase Conductor	480Y/277 3 Phase	208Y/120 3 Phase	120/240V 1 Phase	240/120V, Delta, 3 Phase
A or L1	Purple	Black	Black	Black
B or L2	Brown	Red	Red	Orange (High Leg)
C or L3	Yellow	Blue	*NA*	Blue
Neutral	Gray	White	White	White
Ground	Green	Green	Green	Green
Isolated Ground	---	Green with Yellow Tracer	Green with Yellow Tracer	Green with Yellow Tracer
Switch Leg	Same Color as Branch Circuit Conductor	Same Color as Branch Circuit Conductor	Same Color as Branch Circuit Conductor	Same Color as Branch Circuit Conductor

3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rod electrodes.
   2. Active electrodes.
   3. Wire.
   4. Grounding well components.
   5. Mechanical connectors.
   6. Exothermic connections.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
   1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
   2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

B. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:
   1. NFPA 70 - National Electrical Code.

1.3 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 5 ohms maximum.

1.4 SUBMITTALS

A. Product Data:
   1. Submit data on grounding electrodes and connections.

B. Test Reports:
   1. Indicate overall resistance to ground and resistance of each electrode.

C. Manufacturer's Certificate:
   1. Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.6 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

1.7 QUALIFICATIONS

A. Manufacturer:
   1. Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer:
1. Company specializing in performing work of this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

D. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

1.9 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

PART 2 - PRODUCTS

2.1 ROD ELECTRODES

A. Manufacturers:
1. Erico, Inc.
2. O-Z Gedney Co.
3. Thomas & Betts, Electrical.
4. Substitutions: Section 01 60 00 – Product Requirements Not Permitted.

B. Product Description:
1. Material: Copper-clad steel Copper.
2. Diameter: ¾ inch (19 mm).
3. Length: 10 feet (3.0m).

2.2 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 4 AWG.

C. Grounding Electrode Conductor: Copper conductor bare insulated.

D. Bonding Conductor: Copper conductor bare insulated.

2.3 MECHANICAL CONNECTORS

A. Manufacturers:
1. Erico, Inc.
2. ILSCO Corporation.
3. O-Z Gedney Co.
4. Thomas & Betts, Electrical.
5. Substitutions: Section 01 60 00 - Product Requirements.

B. Description:
1. Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.

2.4 EXOTHERMIC CONNECTIONS

A. Manufacturers:
1. Copperweld, Inc.
2. ILSCO Corporation.

3. O-Z Gedney Co.
4. Thomas & Betts, Electrical.
5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:
1. Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

3.2 PREPARATION

A. Remove surface contaminants at connection points.

3.3 INSTALLATION

A. Install in accordance with IEEE 142 or 1100.

B. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

C. Install grounding and bonding conductors concealed from view.

D. Install grounding electrode conductor and connect to reinforcing steel in foundation footings as indicated on Drawings. Electrically bond steel together.

E. Equipment Grounding Conductor - Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

F. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

G. Install branch circuits feeding isolated ground receptacles with separate insulated grounding conductor, connected only at isolated ground receptacle, ground terminals, and at ground bus of serving panel.

H. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

I. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

J. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.4 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform continuity testing in accordance with IEEE 142.

D. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

END OF SECTION

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Conduit supports.
2. Formed steel channel.
3. Spring steel clips.
4. Sleeves.
5. Mechanical sleeve seals.
6. Firestopping relating to electrical work.
7. Firestopping accessories.
8. Equipment bases and supports.

B. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.

1.2 REFERENCES

A. ASTM International:

1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. FM Global:

1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

C. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

D. Underwriters Laboratories Inc.:

1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
3. UL 1479 - Fire Tests of Through-Penetration Firestops.
4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
5. UL - Fire Resistance Directory.

E. Intertek Testing Services (Warnock Hersey Listed):

1. WH - Certification Listings.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System):

1. Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Firestopping Materials:

1. UL 1479, to achieve fire ratings of adjacent construction in accordance with FM.

B. Surface Burning:

1. UL 723 with maximum flame spread / smoke developed rating of 25/450.

C. Firestop interruptions to fire rated assemblies, materials, and components.

1.5 PERFORMANCE REQUIREMENTS

A. Firestopping:

1. Conform to applicable code FM for fire resistance ratings and surface burning characteristics.

2. Provide certificate of compliance from authority having jurisdiction indicating approval of materials used.

1.6 SUBMITTALS

A. Shop Drawings:

1. Indicate system layout with location and detail of trapeze hangers.

B. Product Data:

1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

C. Firestopping Schedule:

1. Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

D. Design Data:

1. Indicate load carrying capacity of trapeze hangers and hangers and supports.

E. Manufacturer's Installation Instructions:

1. Hangers and Supports: Submit special procedures and assembly of components.

2. Firestopping: Submit preparation and installation instructions.

F. Manufacturer's Certificate:

1. Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 with 0.10 inch water gage (24.9 Pa) minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.

2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.

3. Floor Penetrations within Wall Cavities: T-Rating is not required.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies:

1. Materials to resist free passage of flame and products of combustion.

2. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.

3. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies:

1. UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

D. Fire Resistant Joints between Floor Slabs and Exterior Walls:

1. ASTM E119 with 0.10 inch water gage (24.9 Pa) minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

E. Surface Burning Characteristics:

1. 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.8 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer:

1. Company specializing in performing work of this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F (15 degrees C).

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

A. Manufacturers:

1. Allied Tube & Conduit Corp.
2. Electroline Manufacturing Company.
3. O-Z Gedney Co.
4. Substitutions: Section 01 60 00 - Product Requirements.

B. Hanger Rods:

1. Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps:

1. Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers:

1. Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.

F. Cable Ties:

1. High strength nylon temperature rated to 185 degrees F (85 degrees C). Self locking.

2.2 FORMED STEEL CHANNEL

A. Manufacturers:

1. Allied Tube & Conduit Corp.
2. B-Line Systems.
3. Midland Ross Corporation, Electrical Products Division.
4. Unistrut Corp.
5. Kindorf.
6. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. Galvanized 12 gage (2.8 mm) thick steel. With holes 1-1/2 inches (38 mm) on center.

2.3 SLEEVES

A. Sleeves through Non-fire Rated Floors:

1. 18 gage (1.2 mm) thick galvanized steel.

B. Sleeves through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors:

1. Steel pipe or 18 gage (1.2 mm) thick galvanized steel.

C. Sleeves through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing:

1. Prefabricated fire rated sleeves including seals, UL listed.

D. Fire-stopping Insulation:

1. Glass fiber type, non-combustible.

2.4 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Thunderline Link-Seal, Inc.
2. NMP Corporation.
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.5 FIRESTOPPING

A. Manufacturers:

1. Dow Corning Corp.
2. Fire Trak Corp.
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Specified Technology, Inc.
7. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
2. Silicone Firestopping Elastomeric Firestopping: Silicone elastomeric compound and compatible silicone sealant.
3. Foam Firestopping Compounds: Single.
4. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.

5. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.

6. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.

7. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.

8. Firestop Pillows: Formed mineral fiber pillows.

2.6 FIRESTOPPING ACCESSORIES

A. Primer:

1. Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Installation Accessories:

1. Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

C. General:

1. Furnish UL listed products.

2. Select products with rating not less than rating of wall or floor being penetrated.

D. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.

2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing materials to arrest liquid material leakage.

D. Do not drill or cut structural members.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors and preset inserts.

2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

C. Install conduit and raceway support and spacing in accordance with NEC.

D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:

1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch (25 mm) off wall.
4. Support vertical conduit at every other floor.

3.4 INSTALLATION - FIRESTOPPING

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

D. Compress fibered material to maximum 40 percent of its uncompressed size.

E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

F. Place intumescent coating in sufficient coats to achieve rating required.

G. Remove dam material after firestopping material has cured.

H. Fire Rated Surface:

1. Seal opening as follows:

a. Install sleeve through opening and extending beyond minimum of 1 inch (25 mm) on both sides of building element.

b. Size sleeve allowing minimum of 1 inch (25 mm) void between sleeve and building element.

c. Pack void with backing material.

d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.

2. Where cable tray, bus, cable bus, conduit, wireway, and trough, penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.

I. Non-Rated Surfaces:

1. Seal opening through non-fire rated surface as follows:

a. Install sleeve through opening and extending beyond minimum of 1 inch (25 mm) on both sides of building element.

b. Size sleeve allowing minimum of 1 inch (25 mm) void between sleeve and building element.

c. Install type of firestopping material recommended by manufacturer.

2. Install escutcheons or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.

3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

4. Interior partitions: Seal pipe penetrations at clean rooms, laboratories, hospital spaces, computer rooms, telecommunication rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches (87 mm) thick and extending 6 inches (150 mm) beyond supported equipment. Refer to Section 03 30 00.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

3.6 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 1 inch (25 mm) above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

G. Install chrome plated steel escutcheons at finished surfaces.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements Field inspecting, testing, adjusting, and balancing.

B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

B. Related Sections:

1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
2. Section 26 05 29 - Hangers and Supports for Electrical Systems.
3. Section 26 05 34 - Floor Boxes for Electrical Systems.
4. Section 26 05 53 - Identification for Electrical Systems.
5. Section 26 27 26 - Wiring Devices.

1.2 REFERENCES

A. American National Standards Institute:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).

B. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Outdoor Locations, Above Grade:

1. Provide rigid steel conduit. Provide cast metal or nonmetallic outlet, pull, and junction boxes.

C. Wet and Damp Locations:

1. Provide rigid steel conduit. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

D. Concealed Dry Locations:

1. Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

E. Exposed Dry Locations:

1. Provide rigid steel conduit. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

1.4 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch (13 mm) unless otherwise specified.

1.5 SUBMITTALS

A. Product Data: Submit for the following:

1. Flexible metal conduit.
2. Liquidtight flexible metal conduit.
3. Nonmetallic conduit.
4. Flexible nonmetallic conduit.
5. Nonmetallic tubing.
6. Raceway fittings.
7. Conduit bodies.
8. Surface raceway.
9. Wireway.
10. Pull and junction boxes.

B. Manufacturer's Installation Instructions:

1. Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents:

1. Record actual routing of conduits larger than 2 inch (DN50).
2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

1.8 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.

C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT

A. Manufacturers:

1. AFC Cable
2. Alflex
3. Allied Tube & Conduit
4. Anamet Electrical
5. Electri-Flex
6. Manhattan/CDT
7. Maverick Tube
8. O-Z Gedney
9. Wheatland Tube
10. Substitutions: Section 01 60 00 - Product Requirements.

B. Rigid Steel Conduit: ANSI C80.1.

C. Rigid Aluminum Conduit: ANSI C80.5.

D. Intermediate Metal Conduit (IMC): Rigid steel.

E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable
2. Alflex
3. Allied Tube & Conduit
4. Anamet Electrical
5. Electri-Flex
6. Manhattan/CDT
7. Maverick Tube
8. O-Z Gedney
9. Wheatland Tube
10. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. Interlocked steel construction.

C. Fittings: NEMA FB 1.

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable
2. Alflex
3. Allied Tube & Conduit
4. Anamet Electrical
5. Electri-Flex
6. Manhattan/CDT
7. Maverick Tube
8. O-Z Gedney
9. Wheatland Tube
10. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1.

2.4 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. AFC Cable
2. Alflex
3. Allied Tube & Conduit
4. Anamet Electrical
5. Electri-Flex
6. Manhattan/CDT
7. Maverick Tube
8. O-Z Gedney
9. Wheatland Tube
10. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies:

1. NEMA FB 1; steel, compression set screw type.

2.5 PVC CONDUIT

A. Manufacturers:

1. Carlon Electric Products
2. Ethyl Corp.
3. Can-Tex Industries
4. Condux

B. Product Description:

1. NEMA TC 2, PVC Tubing and Conduit.

C. Fittings:

1. NEMA TC 3, PVC fittings for use with rigid PVC Conduit and Tubing.

2.6 CONDUIT REQUIREMENTS

A. Minimum size shall be ¾ inch unless otherwise noted in the electrical specifications or the electrical drawings.

B. Underground installations:

1. More than five feet from foundation wall use rigid metal conduit or schedule 80 PVC conduit.
2. Within five feet of foundation wall use rigid metal conduit.
3. Under slab on grade use PVC conduit. All conduits turned up or stubbed up through slab shall be rigid metal conduit.
4. Minimum size, for underground conduits shall be 1 inch, unless otherwise noted in electrical documents.

C. Conduits in slab shall be rigid metal conduit of maximum size ¾ inch.

D. Outdoor locations above grade shall be rigid metal conduit.

E. Interior wet and damp locations shall be rigid metal conduit.

F. Interior dry locations:

1. Concealed shall be electrical metallic tubing.
2. Exposed above 10’ AFF in mechanical rooms or in areas not subject to physical damage shall be electrical metallic tubing.
3. Exposed below 10’ AFF in mechanical rooms or in area subject to physical damage shall be rigid metal conduit.

G. Equipment connections shall be liquid tight flexible metal conduit for exterior equipment (5’-0” maximum length).

2.7 SURFACE NONMETALLIC RACEWAY

A. Manufacturers:

1. The Wiremold Co.
2. Panduit
3. Hubbell

4. Lamson & Sessions
5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. Plastic channel with fitted cover, suitable for use as surface raceway.

C. Finish: Gray.

D. Fittings, Boxes, and Extension Rings:

1. Furnish manufacturers standard accessories, finish to match raceway.

2.8 OUTLET BOXES

A. Manufacturers:

1. Cooper
2. Appleton
3. Erickson
4. Haffman
5. Hubbell
6. O-Z/Gedney
7. Thomas & Belts
8. Walker
9. The Wiremold Co.
10. Substitutions: Section 01 60 00 - Product Requirements.

B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch (13 mm) male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

C. Nonmetallic Outlet Boxes: NEMA OS 2.

D. Cast Boxes:

1. NEMA FB 1, Type FD, cast feralloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

E. Wall Plates for Finished Areas:

1. As specified in Section 26 27 26.

F. Wall Plates for Unfinished Areas:

1. Furnish gasketed cover.

2.9 PULL AND JUNCTION BOXES

A. Manufacturers:

1. Carlon Electrical Products.
2. Hubbell Wiring Devices
3. Thomas & Betts Corp.

4. Walker Systems Inc.
5. The Wiremold Co.
6. Substitutions: Section 01 60 00 - Product Requirements.

B. Sheet Metal Boxes:

1. NEMA OS 1, galvanized steel.

C. Hinged Enclosures:

1. As specified in Section 26 27 16.

D. Surface Mounted Cast Metal Box:

1. NEMA 250, Type 4 ; flat-flanged, surface mounted junction box:
   a. Material: Galvanized cast iron.
   b. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

E. In-Ground Cast Metal Box:

1. NEMA 250,
   a. Type 6, inside flanged, recessed cover box for flush mounting:
      1) Material: Galvanized cast iron.
      2) Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
      3) Cover Legend: "ELECTRIC".

F. Concrete composite Handholes:

1. Die-molded, glass-fiber concrete composite hand holes:
   a. Cable Entrance: Pre-cut 6 inch x 6 inch (150 mm x 150 mm) cable entrance at center bottom of each side.
   b. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.

D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

E. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.

F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 05 26.

B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.

C. Identify raceway and boxes in accordance with Section 26 05 53.

D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29.

E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach raceway to ceiling support wires or other piping systems.

G. Construct wireway supports from steel channel specified in Section 26 05 29.

H. Route exposed raceway parallel and perpendicular to walls.

I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

J. Maintain clearance between raceway and piping for maintenance purposes.

K. Maintain 12 inch (300 mm) clearance between raceway and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

L. Cut conduit square using saw or pipe cutter; de-burr cut ends.

M. Bring conduit to shoulder of fittings; fasten securely.

N. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.

O. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.

P. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.

Q. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

R. Install fittings to accommodate expansion and deflection where raceway crosses seismic control and expansion joints.

S. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

T. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

U. Surface Raceway:

1. Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

V. Close ends and unused openings in wireway.

3.5 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device.

B. Adjust box location up to 10 feet (3 m) prior to rough-in to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. In Accessible Ceiling Areas:

1. Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches (150 mm) separation. Install with minimum 24 inches (600 mm) separation in acoustic rated walls.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Install stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

K. Install adjustable steel channel fasteners for hung ceiling outlet box.

L. Do not fasten boxes to ceiling support wires or other piping systems.

M. Support boxes independently of conduit.

N. Install gang box where more than one device is mounted together. Do not use sectional box.

O. Install gang box with plaster ring for single device outlets.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified.

C. Locate outlet boxes to allow luminaires positioned as indicated on lighting plan.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust flush-mounting outlets to make front flush with finished wall material.

C. Install knockout closures in unused openings in boxes.

3.8 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Stencils.
6. Underground Warning Tape.
7. Lockout Devices.

B. Related Sections:

1. Section 09 90 00 - Painting and Coating: Execution requirements for painting specified by this section.

1.2 SUBMITTALS

A. Product Data:

1. Submit manufacturer’s catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

B. Manufacturer's Installation Instructions:

1. Indicate installation instructions, special procedures, and installation.

1.3 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:

1. Record actual locations of tagged devices; include tag numbers.

1.4 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer:

1. Company specializing in performing Work of this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept identification products on site in original containers. Inspect for damage.

C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Install nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Product Description:

1. Laminated three-layer plastic with engraved white letters on black contrasting background color.

B. Letter Size:

1. 1/8 inch (3 mm) high letters for identifying individual equipment and loads.

2. 1/4 inch (6 mm) high letters for identifying grouped equipment and loads.

C. Minimum nameplate thickness: 1/8 inch (3 mm).

2.2 WIRE MARKERS

A. Description:

1. Split sleeve or tubing type wire markers.

B. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number.

2. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.

2.3 CONDUIT AND RACEWAY MARKERS

A. Description:

1. Nameplate fastened with adhesive Labels fastened with adhesive.

B. Color:

1. Medium Voltage System: Black lettering on white background.

2. 480 Volt System: Black lettering on white background.

3. 208 Volt System: Black lettering on white background.

C. Legend:

1. Medium Voltage System: HIGH VOLTAGE.

2. 480 Volt System: 480 VOLTS.

3. 208 Volt System: 208 VOLTS.

2.4 STENCILS

A. Stencils:

1. With clean cut symbols and letters of following size:

a. Up to 2 inches (50 mm) Outside Diameter of Raceway: 1/2 inch (13 mm) high letters.

b. 2-1/2 to 6 inches (64 to 150 mm) Outside Diameter of Raceway: 1 inch (25 mm) high letters.

B. Stencil Paint:

1. As specified in Section 09 90 00 semi-gloss enamel, colors conforming to the following:

a. Black lettering on white background.

b. White lettering on gray background.

c. Red lettering on white background.

d. Blue lettering on white background.

2.5 UNDERGROUND WARNING TAPE

A. Manufacturers:

1. Marking Services, Inc.; or Equal.

B. Description:

1. Detectable, 3 inch wide solid aluminum foil core tape, colored red with suitable warning legend describing buried electrical lines. Tape shall have black letters stating “CAUTION BURIED ELECTRIC LINE BELOW.”

2.6 LOCKOUT DEVICES

A. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches (184 x 75 mm).

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

3.2 EXISTING WORK

A. Install identification on existing equipment to remain in accordance with this section.

B. Install identification on unmarked existing equipment.

C. Replace lost nameplates.

D. Re-stencil existing equipment.

3.3 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:

1. Install nameplate parallel to equipment lines.

2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant screw, rivets or with bolt and nut.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant screws, rivets or with bolt and nut.
4. Secure nameplate to equipment front using corrosive-resistant screws, rivets or with bolt and nut.
5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
6. Install nameplates for the following:
   a. Panelboards.
   b. Transformers.
   c. Safety Switches.
7. Name plate requirements as indicated in table below:

EQUIPMENT	SIZE LETTERING	INFORMATION
PANELBOARDS	1/4" / 1/8"	
Name/Ratings	1/4" / 1/8"	Panelboard designation/ampere rating and voltage characteristics EX: 1LB3
TRANSFORMERS	1/8"	Load served and circuit number EX: PANEL 1LB3 CKT SWBD1-1
SAFETY SWITCHES	1/8"	Load served and circuit number EX: ELEVATOR NO. 1 CKT 1LB3 – 37,39,41
MOTOR STARTERS	1/8"	Load served and circuit number EX: AHU-1 CKT 1LB3 – 38, 40, 42

EQUIPMENT	SIZE LETTERING	INFORMATION
MOTOR CONTROL DEVICES	1/8”	Load served EX: AHU-2
TIME SWITCHES OR CONTACTORS	1/8”	Load served EX: Exterior Lights

C. Label Installation:

1. Install label parallel to equipment lines.
2. Install label for identification of individual control device stations,
3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:

1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and each load connection.
2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
3. Install labels at data outlets identifying patch panel and port designation as indicated on Drawings.

E. Conduit Marker Installation:

1. Install conduit marker for each conduit longer than 12 feet (4000 mm).
2. Conduit Marker Spacing: 20 feet (6000 mm) on center.
3. Raceway Painting: Identify conduit using field painting in accordance with Section 09 90 00.
    a. Paint colored band on each conduit longer than 6 feet 2000 mm).
    b. Paint bands 20 feet (6000 mm) on center.
    c. Color:
        1) 480 Volt System: Blue.
        2) 208 Volt System: Yellow.

F. Stencil Installation:

1. Apply stencil painting in accordance with Section 09 90 00.

G. Underground Warning Tape Installation:

1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes two-winding transformers; shielded transformers; autotransformers; and buck-and-boost transformers.

B. Related Sections:

1. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
2. Section 26 22 03 - Low-Voltage Transformers For Nonlinear Loads.
3. Section 26 22 06 - Low-Voltage Transformer Load Centers.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA ST 1 - Specialty Transformers (Except General Purpose Type).
2. NEMA ST 20 - Dry Type Transformers for General Applications.

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Submit outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, k-rating (when applicable) and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

C. Test Reports:

1. Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents:

1. Record actual locations of transformers.

1.5 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing products specified in this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 TWO-WINDING TRANSFORMERS

A. Manufacturers:

1. Cutler Hammer.
2. Square D.
3. G.E.
4. Siemens
5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. NEMA ST 20, factory-assembled, air-cooled, dry type transformers, ratings as indicated on Drawings.

C. Insulation system and average winding temperature rise for rated kVA as follows:

1. 1-15 kVA: Class 185 with 115 degrees C rise.
2. 16-500 kVA: Class 220 with 80 degrees C rise.

D. Case temperature:

1. Do not exceed 35 degrees C rise above ambient at warmest point at full load.

E. Winding Taps:

1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
2. Transformers 15 kVA and Larger: NEMA ST 20.

F. Sound Levels: NEMA ST 20.

G. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.

H. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.

I. Mounting:

1. 1-15 kVA: Suitable for wall mounting.
2. 16-75 kVA: Suitable for wall, floor, or trapeze mounting.
3. Larger than 75 kVA: Suitable for floor or trapeze mounting.

J. Coil Conductors:

1. Continuous copper windings with terminations brazed or welded.

K. Electrostatic Shield (when specified on the drawings):

1. Cooper, between primary and secondary windings.

L. Enclosure:

1. NEMA ST 20, Type 1 or Type 3R ventilated or non-ventilated as indicated on the electrical drawings. Furnish lifting eyes or brackets.

M. Isolate core and coil from enclosure using vibration-absorbing mounts.

N. Nameplate:

1. Include transformer connection data and overload capacity based on rated allowable temperature rise.

2.2 THREE PHASE DRY-TYPE TRANSFORMERS FOR NON-LINEAR LOADING

A. Manufacturers:

1. Cutler Hammer.
2. Square D.
3. G.E.
4. Siemens
5. Substitutions: Section 01 60 00 - Product Requirements.

B. Comply with ANSI/NEMA ST-20 Standards. Transformers shall be UL1561 and UL K factory listed.

C. Transformers shall be K-13 rating as indicated.

D. Coils shall be copper, continuous wound construction. A vacuum impregnation insulation system using non-moisture absorbing varnish is required.

E. A UL recognized 220º C insulation system shall be used. Windings shall not exceed 80º C temperature rise at rated full load.

F. Universal taps shall be provided. The primary shall contain two 2.5% above nominal and four 2.5% below nominal full capacity taps.

G. Neutral bars shall be sized for at least 200% ampacity of secondary phase conductors.

H. A full length copper electrostatic shield shall be included, producing an average effective coupling capacitance of 30 picofardas between primary and secondary. Electrical noise attenuation shall average 120 dB common mode and 30 dB normal mode. Noise attenuation measurements using the insertion loss method shall not be considered.

I. The core shall be constructed of high grade grain oriented silicon steel with flux density sufficiently below saturation point.

J. The enclosure shall be constructed of heavy duty steel. The finish shall consist of degreasing, phosphate cleaning, and an electrodeposit ANSI 61 gray enamel point.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify mounting supports are properly sized and located including concealed bracing in walls.

3.2 EXISTING WORK

A. Disconnect and remove abandoned transformers.

B. Maintain access and adequate ventilation to existing transformers and other installations remaining active and requiring access and ventilation. Modify installation or provide access panel or ventilation grilles.

C. Clean and repair existing transformers to remain or to be reinstalled.

3.3 INSTALLATION

A. Set transformer plumb and level.

B. Use flexible conduit, in accordance with Section 26 05 33, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Support transformers in accordance with Section 26 05 29.

1. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by manufacturer.

2. Mount floor-mounted transformers on vibration isolating pads suitable for isolating transformer noise from building structure.

3. Mount trapeze-mounted transformers as indicated on Drawings.

D. Provide seismic restraints.

E. Install grounding and bonding in accordance with Section 26 05 26.

3.4 FIELD QUALITY CONTROL

A. Field inspecting, testing, adjusting and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.2.1.

3.5 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution and branch circuit panelboards.

B. Related Sections:

1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

2. Section 26 05 53 - Identification for Electrical Systems.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:

1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:

1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.

4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

5. NEMA PB 1 - Panelboards.

6. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:

1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:

1. UL 67 - Safety for Panelboards.

2. UL 1283 - Electromagnetic Interference Filters.

3. UL 1449 - Transient Voltage Surge Suppressors.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:

1. Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

C. Product Data:

1. Submit catalog data showing specified features of standard products.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents:

1. Record actual locations of panelboards and record actual circuiting arrangements.

C. Operation and Maintenance Data:

1. Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing products specified in this section with minimum three years experience.

1.6 MAINTENANCE MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance products.

B. Furnish two of each panelboard key. Panelboards keyed alike to Owner's current keying system.

PART 2 - PRODUCTS

2.1 DISTRIBUTION PANELBOARDS

A. Manufacturers:

1. GE Electrical.

2. Siemens.

3. Square D.

4. Cutler Hammer.

5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. NEMA PB 1, circuit breaker type panelboard.

C. Panelboard Bus:

1. Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

D. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelborads; 14,000 amperes rms symmetrical for 480 volt panelboards. Panelboards shall be fully rated.

E. Molded Case Circuit Breakers:

1. NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

F. Circuit Breaker Accessories:

1. Trip units and auxiliary switches as indicated on Drawings.

G. Enclosure: NEMA PB 1, Type 1.

H. Cabinet Front:

1. Surface type, fastened with hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Manufacturers – Contractor shall provide panelboards compatible with existing building panelboards for interchangabl

1. Cutler Hammer.

2. GE Electrical.

3. Siemens.

4. Square D.

5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

C. Panelboard Bus:

1. Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard including insulated ground bus as indicated on Drawings.

D. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral, where indicated on the electrical drawings.

E. Minimum Integrated Short Circuit Rating; 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards or as indicated.

F. Molded Case Circuit Breakers:

1. NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

G. Enclosure: NEMA PB 1, Type 1.

H. Cabinet Box: 6 inches deep, 20 inches wide.

I. Cabinet Front:

1. Flush cabinet front, door-in-door, with concealed trim clamps, concealed hinge, metal directory frame and flush lock keyed alike. Finish in manufacturer’s standard gray enamel.

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Disconnect abandoned panelboard. Install blank cover for abandoned panelboards.

B. Maintain access to existing panelboard remaining active and requiring access. Modify installation or provide access panel.

C. Clean and repair existing panelboards to remain or to be reinstalled.

3.2 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb.

C. Install recessed panelboards flush with wall finishes.

D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.

E. Install filler plates for unused spaces in panelboards.

F. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to balance phase loads.

G. Install engraved plastic nameplates in accordance with Section 26 05 53.

H. Install spare conduits out of each recessed panelboard to accessible location above ceiling. Minimum spare conduits: 5 empty, 1 inch. Identify each as SPARE.

I. Ground and bond panelboard enclosure according to Section 26 05 26. Connect equipment ground bars of panels in accordance with NFPA 70.

3.3 FIELD QUALITY CONTROL

A. Section 01 70 00 – Execution and Closeout Requirements: Field inspecting, testing, adjusting and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

D. Perform switch inspections and tests listed in NETA ATS, Section 7.5.

E. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.4 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall Switches

B. Wall Dimmers

C. Receptacles

D. Device Plates and Decorative Box Covers

1.2 REFERENCES

A. NECA Standard of Installation.

B. NEMA WD 1 General Requirements for Wiring Devices.

C. NEMA WD 6 Wiring Device -- Dimensional Requirements.

D. NFPA 70 National Electrical Code.

1.3 SUBMITTALS FOR REVIEW

A. Section 26 05 00 - Submittals: Procedures for submittals.

B. Product Data:

1. Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.4 SUBMITTALS FOR INFORMATION

A. Section 26 05 00 - Submittals: Submittals for information.

B. Submit manufacturer's installation instructions.

1.5 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Provide products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

1.7 EXTRA MATERIALS

A. Section 26 05 00 - Contract Closeout.

B. Furnish two of each style, size, and finish wall plate.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Heavy duty quiet type, Ivory in color.

B. Manufacturers:

1. Pass & Seymour.

2. Leviton.
3. Hubbell.
4. Arrow Hart.
5. Bryant.

C. Single Pole (S): CS120

D. Double Pole (S2): CS220

E. Three Way (S3): CS320

F. Four Way (S4): CS420

G. Lock Single Pole (SK): 20AC1-L (The use of Pass & Seymour is not acceptable)

H. Lock Double Pole (SK2): 20AC2-L (The use of Pass & Seymour is not acceptable)

I. Lock Three Way (SK3): 20AC3-L (The use of Pass & Seymour is not acceptable)

J. Lock Four Way (SK4): 20AC4-L (The use of Pass & Seymour is not acceptable)

K. Security Switch (Single Pole): 20AC1-KL

L. Security Switch (Double Pole): 20AC2-KL

M. Security Switch (Three Way): 20AC3-KL

N. Security Switch (Four Way): 20AC4-KL

O. 15A, 3P Motor (S30): 7813

P. 20A, 2P Motor (S20): 20AC2-HP

Q. 30A, 2P Motor (S30): 30AC2-HP

R. Performance:

1. Amperes: 20 amperes
2. Rated Amperage Capacity:
    a. Lighting Loads: 100%
    b. Motor Loads: 80%

S. Construction:

1. Keyed Switches:
    a. Two prong keys. Provide 20 extra keys.
    b. Security key switches. Provide 20 extra keys.

2.2 WALL DIMMERS

A. Manufacturers:

1. Lutron Nova “N”.
2. Leviton
3. Hunt
4. Hubbell.
5. Douglass

B. Description:

1. NEMA WD 1; Semiconductor dimmer for incandescent lamps, Type as indicated on drawings.

C. Body and Handle: Ivory plastic with linear slide.

D. Voltage: 120 volts.

E. Accessory Wall Switch: Match dimmer appearance.

2.3 RECEPTACLES

A. Manufacturers:

1. Pass & Seymour.
2. Leviton.
3. Arrow Hart.
4. Bryant.
5. Hubbell.
   a. 20A, Duplex: 5322-I
   b. GFI: 2094-1
   c. Tamper-proof – CR5362I
   d. Four Plex: 5352-I/PJ82-1
   e. Weatherproof: Enclosure in clear Taymac.
   f. Isolated Ground: 5-20R, Orange, Engraved Plate "Isolated Ground" at all computer locations or as indicated “IG”.
   g. Clock Receptacle: S3713-I.

B. Device Body:

1. Ivory plastic or as indicated.

C. Configuration:

1. NEMA WD 6, type as specified and indicated.

D. Convenience Receptacle: Type 5-20.

E. GFCI Receptacle:

1. Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

F. Voice and Data Outlet:

1. Provide standard back boxes at each voice and data outlet shown with 1" conduit stub to above accessible ceiling.

2.4 WALL PLATES

A. All wall plates, switch plates, receptacle plates, cover plates, etc. shall be stainless steel.

B. Manufacturers:

1. Leviton.
2. Hubbell.

3. Cooper.

4. Pass & Seymour.

C. Weatherproof Cover Plate: WIUC10-DC Gasketed While-In-Use clear cover.

2.5 IDENTIFICATION

A. Provide identification label equal to Brother P-Touch.

B. Labels shall be over laminated with transparent plastic film labels equal to Seton Style 2089X.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that outlet boxes are installed at proper height.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that floor boxes are adjusted properly.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that openings in access floor are in proper locations.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

E. Do not share neutral conductor on load side of dimmers.

F. Install receptacles with grounding pole on top.

G. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

H. All switch and receptacle cover plates shall be marked to indicate panel and circuit #'s using approved label maker.

I. Label each floor box, receptacle, wall switches and dimmers.

J. Engrave wall plates for control of equipment. Lettering shall be 1/8-inch high and of contrasting color. Identify panel and circuit of each receptacle.

K. Connect wiring devices by wrapping conductor around screw terminal.

L. Use jumbo size plates for outlets installed in masonry walls.

M. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 05 00 to obtain mounting heights specified and indicated on drawings.

B. Install wall switch 44 inches form the finished floor to the center of the switch.

C. Install convenience receptacle 18 inches above finished floor.

D. Install convenience receptacle 3 inches above counter or backsplash of counter.

E. Install dimmer 44 inches from the finished floor to the center of the dimmer.

F. Install telephone jack 18 inches above finished floor.

G. Install telephone jack for side-reach wall telephone to position top of operable handle on telephone at 54 inches above finished floor.

H. Install telephone jack for forward-reach wall telephone to position top of telephone at 44 inches above finished floor.

I. Coordinate installation of access floor boxes with access floor system.

J. Coordinate the installation of wiring devices with underfloor duct service fittings provided under Section 26 05 33.

3.5 FIELD QUALITY CONTROL

A. Section 26 05 00 - Quality Control: Field inspection, testing, adjusting, and balancing.

B. Inspect each wiring device for defects.

C. Operate each wall switch with circuit energized and verify proper operation.

D. Verify that each receptacle device is energized.

E. Test each receptacle device for proper polarity.

F. Test each GFCI receptacle device for proper operation.

G. Verify that each telephone jack is properly connected and circuit is operational.

3.6 ADJUSTING

A. Section 26 05 00 - Contract Closeout: Adjusting installed work.

B. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

A. Section 26 05 00 - Contract Closeout: Cleaning installed work.

B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 26 28 19
ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fusible and nonfusible switches.

B. Related Sections:

1. Section 26 28 13 - Fuses.

1.2 REFERENCES

A. National Electrical Manufacturers Association:

1. NEMA FU 1 - Low Voltage Cartridge Fuses.

2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

B. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Product Data:

1. Submit switch ratings and enclosure dimensions.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents:

1. Record actual locations of enclosed switches and ratings of installed fuses.

1.5 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing products specified in this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:

1. GE Electrical.

2. Cutler Hammer.

3. Square D.

4. Siemens.

5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. NEMA KS 1, Type HD enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Fuse clips:

1. Designed to accommodate NEMA FU 1 fuses.

D. Enclosure:

1. NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.

2. Interior Dry Locations: Type 1.

3. Exterior Locations: Type 3R.

4. Industrial Locations: Type 4 or 4X as indicated on drawings.

E. Service Entrance:

1. Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

F. Furnish switches with entirely copper current carrying parts.

2.2 NONFUSIBLE SWITCH ASSEMBLIES

A. Manufacturers:

1. GE Electrical.

2. Cutler Hammer.

3. Square D.

4. Siemens.

5. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description:

1. NEMA KS 1, Type HD enclosed load interrupter knife switch. Handle lockable in OFF position.

C. Enclosure:

1. NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.

2. Interior Dry Locations: Type 1.

3. Exterior Locations: Type 3R.

4. Industrial Locations: Type 4 or 4X as indicated on drawings.

D. Service Entrance:

1. Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

E. Furnish switches with entirely copper current carrying parts.

2.3 SWITCH RATINGS

A. Switch Rating:

1. Horsepower rated for AC or DC as indicated on Drawings.

B. Short Circuit Current Rating:

1. UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere). 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes). 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

PART 3 - EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned enclosed switches.

B. Maintain access to existing enclosed switches and other installations remaining active and requiring access. Modify installation or provide access panel.

C. Clean and repair existing enclosed switches to remain or to be reinstalled.

3.2 INSTALLATION

A. Install enclosed switches plumb. Provide supports in accordance with Section 26 05 29.

B. Height: 5 feet (1500 mm) to operating handle.

C. Install fuses for fusible disconnect switches. Refer to Section 26 28 13 for product requirements.

D. Install engraved plastic nameplates in accordance with Section 26 05 53.

E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 26 51 00
LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes interior luminaires, lamps, ballasts, and accessories.

B. Related Sections:

1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

1.2 SUBMITTALS

A. Shop Drawings:

1. Indicate dimensions and components for each luminaire not standard product of manufacturer.

B. Product Data:

1. Submit dimensions, ratings, and performance data.

1.3 QUALIFICATIONS

A. Manufacturer:

1. Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.4 MAINTENANCE MATERIALS

A. Furnish two of each plastic lens type.

B. Furnish one of each LED driver type.

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. Product Description:

1. Complete luminaire assemblies, with features, options, and accessories as scheduled on the lighting fixture schedule, attached to this specification section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

B. Install wall-mounted luminaires at height as indicated on Drawings.

C. Install accessories furnished with each luminaire.

D. Connect luminaires to branch circuit outlets provided under Section 26 05 33 using flexible conduit.

E. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

F. Ground and bond luminaires in accordance with Section 26 05 26.

3.2 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 CLEANING

A. Remove dirt and debris from enclosures.

B. Clean photometric control surfaces as recommended by manufacturer.

C. Clean finishes and touch up damage.

END OF SECTION

SECTION 26 57 00

LIGHTING CONTROL

Part 1 - General

1.1 Administrative Data and Procedures

A. This specification details the equipment necessary for a dimming control system. Contractor shall provide all equipment material, wiring and labor for a complete functional lighting control system.

1.2 Summary

A. Section includes: eight-channel dimming control system, with stellar mini panel 8 (SMP8), stellar RMS8 and wifi interface. Basis of design is marlin Controls, Inc.

1.3 References

A. Underwriters Laboratories (UL) – www.ul.com

B. Canadian Standards Association (CSA) – www.csa.ca

C. ETL SEMKO – www.intertek-etlsemko.com

D. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) – www.ashrae.org

1.4 Submittals

A. Submittal drawings: provide a set of six shop drawings for approval. Include a dimming control system block diagram, controllers, and system dimensions.

B. Operation manuals: provide manuals describing installation procedures and controller operation prior to or upon product delivery.

1.5 Quality Assurance

A. System must meet UL 1472 standards.

B. System must meet CSA C22.2 No. 184.1-96 standards.

C. Manufacturer must have been producing lighting control equipment for at least ten years.

D. Manufacturer of specified dimming control system must also be manufacturer of dimmer cabinets and modules used in the system.

1.6 Delivery, Storage, and Handling

A. Provide a checklist of components included with the shipment of the dimming control system.

1.7 Project/Site Conditions

A. System must be installed indoors, in a designated electrical closet.

B. The ambient temperature of the installation space must not exceed 122°F or fall below 0°F.

C. The dimming control system installation space must not be exposed to water, steam, or heavy moisture.

1.8 Warranty

A. Provide a three-year limited warranty on parts.

B. Provide a one-year limited warranty on labor.

C. Provide a warranty that begins 90 days after the dimming control system's manufacture date, indicated by the system's manufacture datestamp.

1.9 Maintenance

A. Do not provide a system with any moving parts, including fans.

Part 2 - Products

2.1 Names

A. Stellar Mini Panel 8 (SMP8): dimming control system with up to eight dimmer modules.

B. Stellar RMS 8: 64-zone lighting controller with manual light level adjustment, 8 programmable scene presets, global on and off, and an IR receiver.

C. WiFi Interface: allows users to control Marlin Controls dimming control systems through WiFi (802.11b) networks.

2.2 Manufacturers

A. Marlin Controls, Inc.

11011 Regency Crest Drive, Suite 200

Dallas, TX 75238

800-788-5750

214-553-1011 (fax)

www.marlincontrols.com

B. Voluntary product substitutions cannot be made without prior approval by the lighting and control equipment specifier.

C. Failure to submit products and specifications by other manufacturers constitutes a guarantee that only the specified manufacturer's products will be used.

2.3 Component(s)

A. Enclosure

1. Provide a cover made of 0.090" 5052H-32 anodized aluminum.

2. Provide a baseplate made of 0.090" 5052H-32 black anodized aluminum.

3. Provide a baseplate with four keyhole mounts.

4. Do not use any fans. Provide a convection-cooled enclosure.

5. Do not provide a system larger than 16.125" x 12.375" x 5.125", including the cover of the dimming system.

6. Do not provide a system exceeding 12 pounds.

7. Include five 0.75"/1"-diameter top-feed knock-outs to allow connections for conduits.

B. Power distribution block

1. Provide a system that accepts inputs of 120, 240, or 277 VAC.

C. Control interface

1. Provide a control interface that contains an RS-485 interface.
2. Provide a control interface with a 12 VDC output.
3. If necessary, provide a control interface that accepts the DMX512 protocol, upon request.

D. Lighting controller

1. Provide a controller capable of controlling up to 64 channels and storing/recalling 8 scene preset switches with LED indicator.
2. Provide preprogrammed “on” and “off” switch with LED indicator.
3. Provide eight digital bar graph LEDs to display the light level of eight channels at a time.
4. Back up all preset information in the controller. Synchronize the data with dimmer modules when the controller or dimmers are replaced.
5. Allow an adjustable fade rate for each preset between 0 and 90 seconds.
6. Use one numeric display to show the active preset, and another to show the preset fade rate.
7. Include a switch that locks or unlocks preset programming to prevent tampering.
8. Include an infrared sensor that allows the user to recall resets and raise and lower light levels using a universal or TV remote, without any additional programming.
9. Provide ten dry contact closure inputs to drive the automatic recall of presets.
10. Provide four additional dry contact closure inputs for motions sensors, door switches, alarm systems, or other interfaces.
11. Provide a 3-gang masonry Raco #697 switch box (5-19/32” W x 3-3/4” H x 3-1/2” D).
12. Provide a faceplate with no visible mounting screws.
13. Provide a faceplate with customer colors, graphics, and type.

E. Dimming control interface

1. Provide an interface compatible with Wireless-B (802.11b) networks.
2. Provide an interface that automatically associates with existing wireless networks upon startup.
3. Provide software clients for the PC or Pocket PC that allows users to control the dimming control system.
4. Provide a higher-gain antenna upon request.
5. Allow static or dynamically-assigned IP addresses.
6. Provide LEDs to indicate signal and communication statuses.
7. Provide a 1-gang masonry Raco #695 switch box (1-31/32” W x 3-3/4” H x 3-1/2” D). If the dimming control system contains multiple interfaces and controllers, provide a switch box to mount all devices at the user’s request.
8. Provide a faceplate with no visible mounting screws.
9. Provide a faceplate with custom colors, graphics, and type.

2.4 Fabrication

A. Use UL 105-compliant tin-plated wire throughout the entire dimming control system.

B. Do not leave any stranded wire exposed. Cover and crimp each stripped wire end with a titanium ferrule.

2.5 Manufacturer or Supplier Quality Control

A. Test the fully assembled dimming control system with included controllers, with full loads, for a minimum of four hours.

B. Test each dimmer individually prior to assembling the dimming control panel.

C. Include a datestamp on each dimmer module indicating the assembly date.

D. Include a datestamp on each dimming control system indicating the manufacture date.

E. Include a datestamp on each dimming control system indicating the test date.

F. Maintain testing documentation for each dimming control system including the test date, test start and end times, name of person conducting the test, and notes of any troubleshooting performed on the dimming control system. Provide testing documentation upon request.

Part 3 - Execution

3.1 Installation

A. The electrical contractor must install the system according to the manufacturer's provided instructions. Failure to do so will void the limited warranty.

B. Install the dimming control system in a dedicated electrical closet or room free of water and heavy moisture.

C. Provide four keyhole mounts on the base of the system for surface mounting.

3.2 Interface with Other Products

A. Use shielded, four-conductor, 20-gauge Belden 9402 low-voltage control cable to interface the dimming control system with other controllers, per manufacturer's instructions.

B. Use shielded, four-conductor, 20-gauge Belden 9402 low-voltage control cable to interface the dimming control system with DMX512 control equipment.

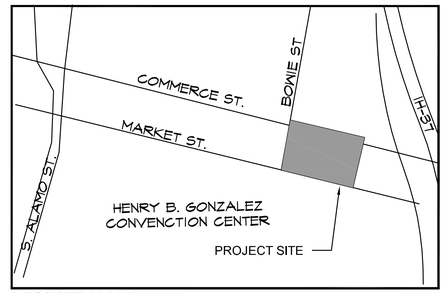
END OF SECTION

SAWS CHILLED WATER PLANT IMPROVEMENTS
900 E. COMMERCE ST., SAN ANTONIO, TX

CONSTRUCTION DOCUMENTS

DECEMBER 11, 2015

SHEET INDEX

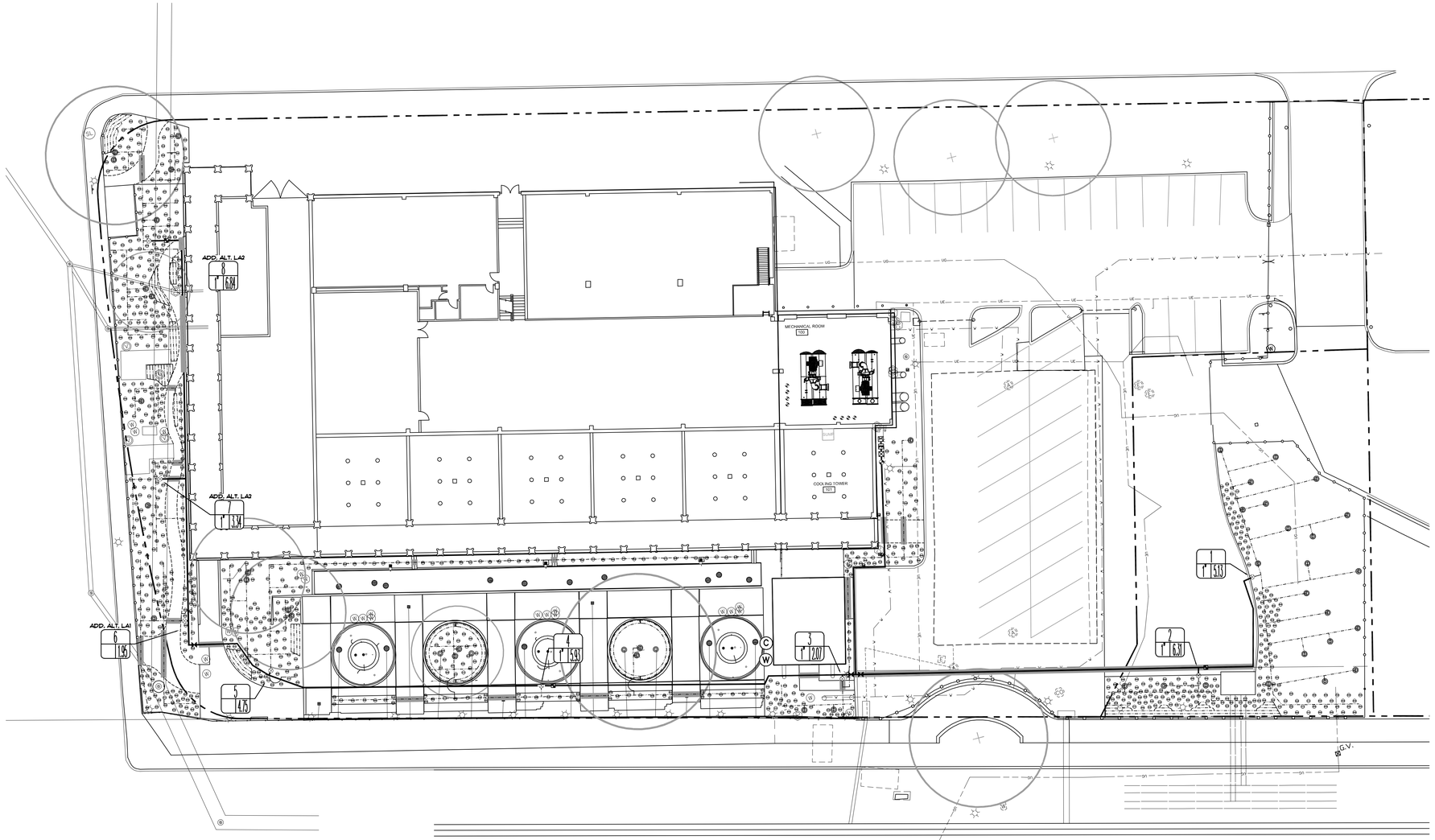


VICINITY MAP
(NOT TO SCALE)

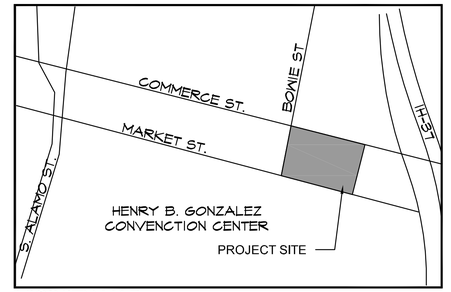
C•F•Z Group LLC
Coltrane • Fernandez • Zavala
Landscape Architecture
& Planning

7410 John Smith Dr., Suite 208
San Antonio, Texas 78229
210-366-1911/210-366-0044 fax

Alderson & Associates, Inc.



1 OVERALL IRRIGATION PLAN
1"=20'-0"



VICINITY MAP
(NOT TO SCALE)

IRRIGATION DESIGN REQUIREMENTS:

PRESSURE:
- Static PSI: 70 PSI
- Design PSI: 42.22 PSI

PRESSURE LOSS CALCULATIONS:

GPM/ZONE:	6.84	8
Service:	1"	.37
Meter:	1"	.55
Backflow Preventer:	1"	12.0
Master Control Valve:	1 1/2"	1.0
Elevation Loss:	+1	.433
Mainline:	1 1/2"	1.6
Remote Control Valve:	1"	1.7
Head PSI:		20
TOTAL LOSSES:		37.22

CONFORMITY LETTER:

I, Leticia Zavala, a licensed irrigator in the State of Texas do certify that the irrigation plan submitted conforms to the irrigation design and equipment standards set out in 35-510(j) and 35-511(c)(6) of the City of San Antonio Unified Development Code and also complies with the requirements of Chapter 344, 344.72 - 344.77 of the Texas Administrative Code.

By, Leticia Zavala

Licensed Irrigator's Number: #8650

VALVE SCHEDULE

DRIP DRIP ASSEMBLY ZONE

STATION NO.	SIZE	GPM	*PRECIP. RATE	**SCHEDULE MIN. per DAY/WK.
1	1"	5.13	.28	72 min./3 days
2	1"	6.31	.28	72 min./3 days
3	1"	2.07	.28	72 min./3 days
4	1"	5.93	.28	72 min./3 days
5	1"	4.75	.28	72 min./3 days
6	1"	1.98	.28	72 min./3 days
7	1"	3.34	.28	72 min./3 days
8	1"	6.84	.28	72 min./3 days

*REQUIRED PRECIPITATION RATE = .275"/HOUR
**WATER SCHEDULE REQUIRED TO PROVIDE 1"/WEEK

C•F•Z Group LLC
Coltrane • Fernandez • Zavala
Landscape Architecture
& Planning
7410 John Smith Dr., Suite 208
San Antonio, Texas 78229
210-366-1911/210-366-0044 fax

No.	Revision	Drawn	Approved	Date

REVISIONS

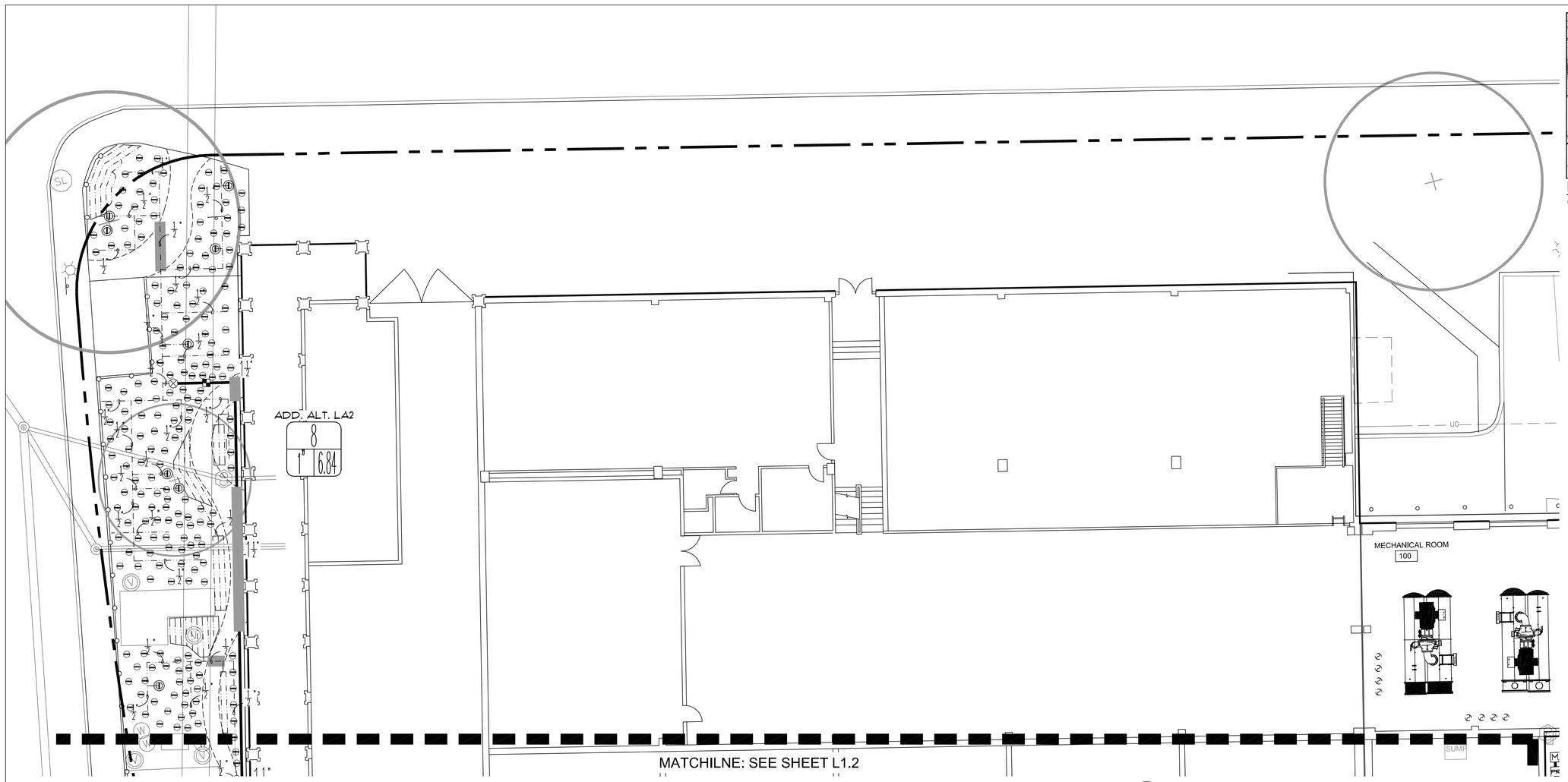
CHILLED WATER PLANT IMPROVEMENTS

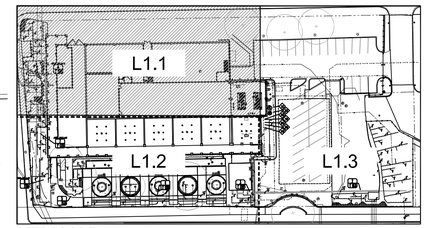
IRRIGATION PLAN

DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT CK. ABF JOB No. 15-958

SHEET L1.0 Of 20

STATE OF TEXAS LETICIA ZAVALA 8650 LICENSED IRRIGATOR 12/11/2015





KEY MAP
(NOT TO SCALE)

1 ENLARGED IRRIGATION PLAN
1"=10'-0"

LEGEND

- TREE DRIP BUBBLER ASSEMBLY, SEE DTL. 9/L2.2
- DRIP EMITTER, SEE DTL. 3/L2.2
- DRIP REMOTE CONTROL VALVE, SEE DTL. 2/L2.2
- MASTER CONTROL VALVE, SEE DTL. 7/L2.1
- MANUAL VALVE, SEE DTL. 2/L2.1
- QUICK COUPLER, SEE DTL. 8/L2.1
- REDUCED PRESSURE BACKFLOW PREVENTER, SEE DTL. 1/L2.1
- PRESSURE REDUCING VALVE, SEE DTL. 10/L2.1
- 1" IRRIGATION SUBMETER, SEE DTL. 3/L2.1
- LATERAL PIPING, SEE DTL. 9/L2.1
- DRIP LINE, SEE DTL. 9/L2.1
- SUPPLY LINE, SEE DTL. 9/L2.1
- IRRIGATION SLEEVE, SEE DTL. 10/L2.2
- CONTROLLER, SEE DTL. 4/L2.1
- WEATHER SENSORS, SEE DTL. 5/L2.1
- BED EDGER, SEE SHEET L5.1
- 17 / 1-1/2" / 29.6 — VALVE DESIGNATION; GALLONS PER MINUTE; VALVE SIZE

IRRIGATION NOTES (◇1 - Keyed Note)

1. Irrigation contractor shall be responsible for making himself familiar with the specifications and all submittal requirements. It is the responsibility of the irrigation contractor to notify the Landscape Architect for site inspections as specified in the specifications. Failure to notify the Landscape Architect does not relieve the contractor from inspection approval and will require the contractor to uncover work as required for approval at the cost of the contractor. Irrigation contractor is to inform Landscape Architect of the start date of work.
2. The irrigation contractor is required by law to notify Texas One Call (800-245-4545) and (800) DIG TESS (800-344-8377) 72 hours prior to any excavation. Irrigation contractor shall be responsible for making himself familiar with all underground utilities, pipes and structures. Irrigation contractor shall take sole responsibility for any cost incurred due to damage of said utilities whether or not Texas One Call is notified.
3. Do not willfully proceed with construction as designed without verifying actual on-site water pressure from the source. Do not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Landscape Architect or Owner's Representative. The irrigation contractor shall assume full responsibility for all necessary revisions due to failure to give such notification.
4. Irrigation contractor shall be responsible for any coordination with other contractors as required to accomplish irrigation installation.
5. Due to scale of drawings, it is not possible to indicate all offsets, fittings sleeves, etc., which may be required. Irrigation contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation system, planting and architectural features. This design is diagrammatic. All piping, valves, etc., shown within paved areas is for design clarification only and shall be installed in planting areas and within property lines.
6. It is the irrigation contractor's responsibility to coordinate piping with the landscape subcontractor to avoid conflict with planting beds. It will be the responsibility of the irrigation subcontractor to move piping to allow proper placement of plant material.
7. Irrigation contractor shall be responsible for sleeves and chases wherever piping or conduit passes, under all paving, through walls, etc. All sleeve locations may not be shown on plan, coordinate with architectural and civil drawings, general contractor and other subcontractors as required. All sleeve and chase locations are not noted on plan. All sleeves shall be Sch 40 PVC, sized twice the diameter of pipe or combination of pipes enclosed within the sleeve.
8. No cutting, filling, trenching, root disturbance, soil disturbance, or construction impacts shall occur closer to the trunk than 1/2 the root protection zone radius in accordance with City of San Antonio UDC 35-523(1X1) unless done by hand. Trenching is to be done by hand or by tunneling under root system by method approved by Landscape Architect. Piping layout is diagrammatic and piping shall be routed around existing plant material to avoid damage to existing plants. Do not cut any root over 3/4" diameter. Any cuts made shall be clean and without frayed ends.
9. All work will be in accordance with the requirements of the City of San Antonio Unified Development Code 35-510(J) and 35-511(CX6) and the Texas Administrative Code Chapter 344, 344.72-344.77.
10. If actual site static pressure exceeds design pressure by 10%, a pressure reducing valve shall be installed. See specifications.
11. Pressure at any point within a zone shall not vary by more than 10% from the design sprinkler operating pressure. See specifications for Testing.
12. All irrigation work shall be installed under the supervision of a licensed (in the State of Texas) irrigation contractor.
13. Obtain coverage test approval from Landscape Architect or Owner's Representative prior to planting, sodding or seeding.
14. All undesignated end lateral piping shall be 1/2".
15. Irrigation Contractor is to provide 15-emitters and associated fittings and piping for use on irrigation zone(s) as directed in the field by Landscape Architect.
16. Refer to civil dwgs. for grading plan.
17. Statement of Area Coverage: Drawing does not provide for 100% coverage of the site. See plans and specifications for areas to be irrigated.
18. Irrigation system is a reuse water system. Install purple pipe, heads, valve box covers and signage per specifications.

◇19 New 1" irrigation submeter to be supplied by existing reuse water line. See dtl. 3/L2.1

◇20 1-1/2" Master control valve. See dtl. 7/L2.1.

◇21 Locate controller in Mechanical Room. Contractor is responsible for coordinating with other trades as required to provide poner.

◇22 Locate weather sensors at outside of Mechanical Room.

◇23 Point of connection

◇23 Pressure reducing valve, see dtl. 10/L2.1

◇23 Reduced pressure backflow preventer, see dtl. 1/L2.1

C•F•Z Group LLC
Coltrane • Fernandez • Zavala
Landscape Architecture & Planning
7410 John Smith Dr., Suite 208
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210-366-1911/210-366-0044 fax

No.	Revision	Drawn	Approved	Date

REVISIONS

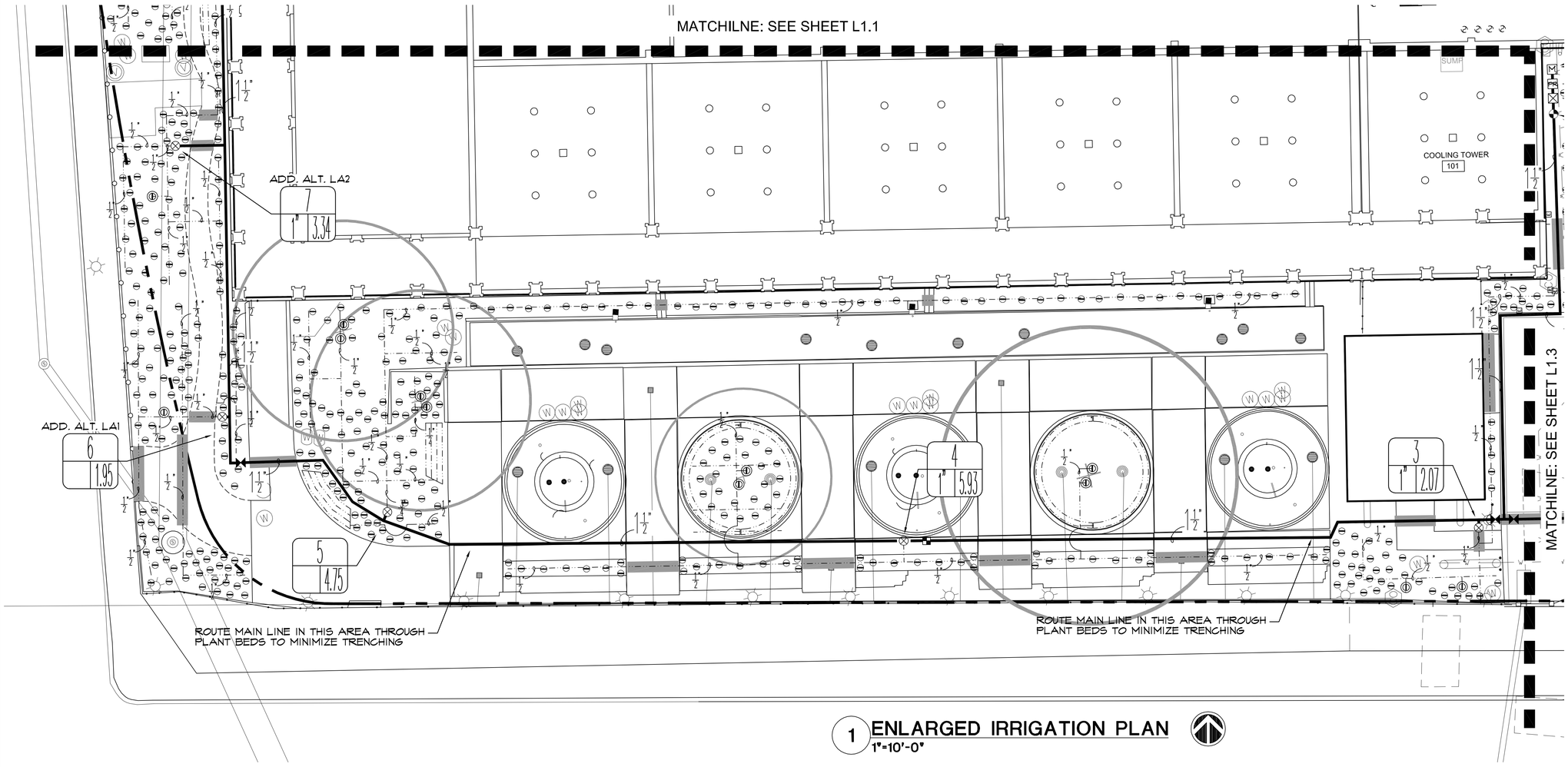
CHILLED WATER PLANT IMPROVEMENTS

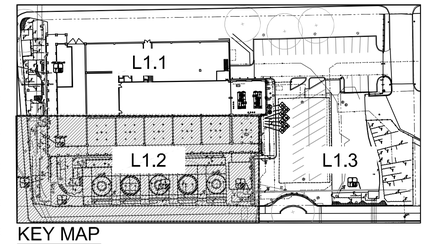
IRRIGATION PLAN

DEVELOPER:

CONT.	BUDGET PROJ.
SUBMITTED	
APPROVED	
MAP No.	SHEET L1.1
SECT. No.	
DR. SDT CK. ABF	JOB No. 15-958 OF 20

STATE OF TEXAS — ALFRED VELA — 8650 — LICENSED IRRIGATOR — 12/11/2015





KEY MAP
(NOT TO SCALE)

1 ENLARGED IRRIGATION PLAN
1"=10'-0"

LEGEND

- TREE DRIP BUBBLER ASSEMBLY, SEE DTL. 9/L2.2
- DRIP EMITTER, SEE DTL. 3/L2.2
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- IRRIGATION SLEEVE, SEE DTL. 10/L2.2
- CONTROLLER, SEE DTL. 4/L2.1
- WEATHER SENSORS, SEE DTL. 5/L2.1
- BED EDGER, SEE SHEET L5.1

17 — VALVE DESIGNATION
1-1/2" 29.6 — GALLONS PER MINUTE
VALVE SIZE

IRRIGATION NOTES (◇ - Keyed Note)

1. Irrigation contractor shall be responsible for making himself familiar with the specifications and all submittal requirements. It is the responsibility of the irrigation contractor to notify the Landscape Architect for site inspections as specified in the specifications. Failure to notify the Landscape Architect does not relieve the contractor from inspection approval and will require the contractor to uncover work as required for approval at the cost of the contractor. Irrigation contractor is to inform Landscape Architect of the start date of work.
2. The irrigation contractor is required by law to notify Texas One Call (800-245-4545) and (800) DIG TESS (800-344-8377) 72 hours prior to any excavation. Irrigation contractor shall be responsible for making himself familiar with all underground utilities, pipes and structures. Irrigation contractor shall take sole responsibility for any cost incurred due to damage of said utilities whether or not Texas One Call is notified.
3. Do not willfully proceed with construction as designed without verifying actual on-site water pressure from the source. Do not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Landscape Architect or Owner's Representative. The Irrigation contractor shall assume full responsibility for all necessary revisions due to failure to give such notification.
4. Irrigation contractor shall be responsible for any coordination with other contractors as required to accomplish irrigation installation.
5. Due to scale of drawings, it is not possible to indicate all offsets, fittings sleeves, etc., which may be required. Irrigation contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation system, planting and architectural features. This design is diagrammatic. All piping, valves, etc., shown within paved areas is for design clarification only and shall be installed in planting areas and within property lines.
6. It is the Irrigation contractor's responsibility to coordinate piping with the landscape subcontractor to avoid conflict with planting beds. It will be the responsibility of the irrigation subcontractor to move piping to allow proper placement of plant material.
7. Irrigation contractor shall be responsible for sleeves and chases wherever piping or conduit passes, under all paving, through walls, etc. All sleeve locations may not be shown on plan, coordinate with architectural and civil drawings, general contractor and other subcontractors as required. All sleeve and chase locations are not noted on plan. All sleeves shall be Sch 40 PVC, sized twice the diameter of pipe or combination of pipes enclosed within the sleeve.
8. No cutting, filling, trenching, root disturbance, soil disturbance, or construction impacts shall occur closer to the trunk than 1/2 the root protection zone radius in accordance with City of San Antonio UDC 35-523(IX1) unless done by hand. Trenching is to be done by hand or by tunneling under root system by method approved by Landscape Architect. Piping layout is diagrammatic and piping shall be routed around existing plant material to avoid damage to existing plants. Do not cut any root over 3/4" diameter. Any cuts made shall be clean and without frayed ends.
9. All work will be in accordance with the requirements of the City of San Antonio Unified Development Code 35-510(J) and 35-511(CX6) and the Texas Administrative Code Chapter 344, 344.72-344.77.
10. If actual site static pressure exceeds design pressure by 10%, a pressure reducing valve shall be installed. See specifications.
11. Pressure at any point within a zone shall not vary by more than 10% from the design sprinkler operating pressure. See specifications for Testing.
12. All irrigation work shall be installed under the supervision of a licensed (in the State of Texas) irrigation contractor.
13. Obtain coverage test approval from Landscape Architect or Owner's Representative prior to planting, sodding or seeding.
14. All undesignated end lateral piping shall be 1/2".
15. Irrigation Contractor is to provide 15-emitters and associated fittings and piping for use on irrigation zone(s) as directed in the field by Landscape Architect.
16. Refer to civil dwgs. for grading plan.
17. Statement of Area Coverage: Draning does not provide for 100% coverage of the site. See plans and specifications for areas to be irrigated.
18. Irrigation system is a reuse water system. Install purple pipe, heads, valve box covers and signage per specifications.

◇19 New 1" irrigation submeter to be supplied by existing reuse water line. See dtl. 3/L2.1

◇20 1-1/2" Master control valve. See dtl. 7/L2.1.

◇21 Locate controller in Mechanical Room. Contractor is responsible for coordinating with other trades as required to provide poner.

◇22 Locate weather sensors at outside of Mechanical Room.

◇23 Point of connection

◇23 Pressure reducing valve, see dtl. 10/L2.1

◇23 Reduced pressure backflow preventer, see dtl. 1/L2.1

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210-366-1911/210-366-0044 fax

No.	Revision	Drawn	Approved	Date

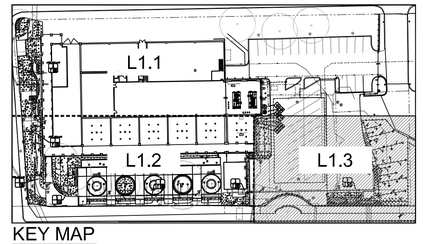
REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

IRRIGATION PLAN

DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT CK. ABF JOB No. 15-958
SHEET L1.2 OF 20

LETICIA AVALA 8650 LICENSED IRRIGATOR 12/11/2015



KEY MAP
(NOT TO SCALE)

1 ENLARGED IRRIGATION PLAN
1"=10'-0"

LEGEND

- TREE DRIP BUBBLER ASSEMBLY, SEE DTL. 9/L2.2
- DRIP EMITTER, SEE DTL. 3/L2.2
- DRIP REMOTE CONTROL VALVE, SEE DTL. 2/L2.2
- MASTER CONTROL VALVE, SEE DTL. 7/L2.1
- MANUAL VALVE, SEE DTL. 2/L2.1
- QUICK COUPLER, SEE DTL. 8/L2.1
- REDUCED PRESSURE BACKFLOW PREVENTER, SEE DTL. 1/L2.1
- PRESSURE REDUCING VALVE, SEE DTL. 10/L2.1
- 1" IRRIGATION SUBMETER, SEE DTL. 3/L2.1
- LATERAL PIPING, SEE DTL. 9/L2.1
- DRIP LINE, SEE DTL. 9/L2.1
- SUPPLY LINE, SEE DTL. 9/L2.1
- IRRIGATION SLEEVE, SEE DTL. 10/L2.2
- CONTROLLER, SEE DTL. 4/L2.1
- WEATHER SENSORS, SEE DTL. 5/L2.1
- BED EDGER, SEE SHEET L5.1
- 17 / 1½" / 29.6 — VALVE DESIGNATION / GALLONS PER MINUTE / VALVE SIZE

IRRIGATION NOTES (◇ - Keyed Note)

1. Irrigation contractor shall be responsible for making himself familiar with the specifications and all submittal requirements. It is the responsibility of the irrigation contractor to notify the Landscape Architect for site inspections as specified in the specifications. Failure to notify the Landscape Architect does not relieve the contractor from inspection approval and will require the contractor to uncover work as required for approval at the cost of the contractor. Irrigation contractor is to inform Landscape Architect of the start date of work.
2. The irrigation contractor is required by law to notify Texas One Call (800-245-4545) and (800) DIG TESS (800-344-8377) 72 hours prior to any excavation. Irrigation contractor shall be responsible for making himself familiar with all underground utilities, pipes and structures. Irrigation contractor shall take sole responsibility for any cost incurred due to damage of said utilities whether or not Texas One Call is notified.
3. Do not willfully proceed with construction as designed without verifying actual on-site water pressure from the source. Do not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Landscape Architect or Owner's Representative. The irrigation contractor shall assume full responsibility for all necessary revisions due to failure to give such notification.
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◇21 Locate controller in Mechanical Room. Contractor is responsible for coordinating with other trades as required to provide poner.

◇22 Locate weather sensors at outside of Mechanical Room.

◇23 Point of connection

◇23 Pressure reducing valve, see dtl. 10/L2.1

◇23 Reduced backflow preventer, see dtl. 1/L2.1

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No.	Revision	Drawn	Approved	Date

REVISIONS

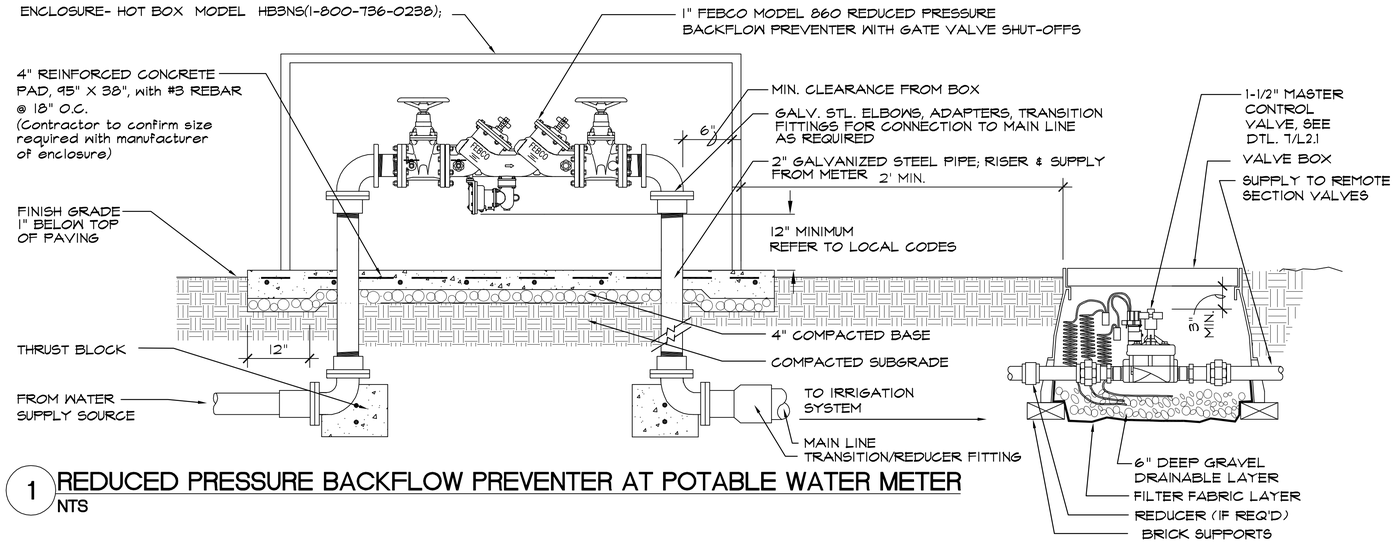
CHILLED WATER PLANT IMPROVEMENTS

IRRIGATION PLAN

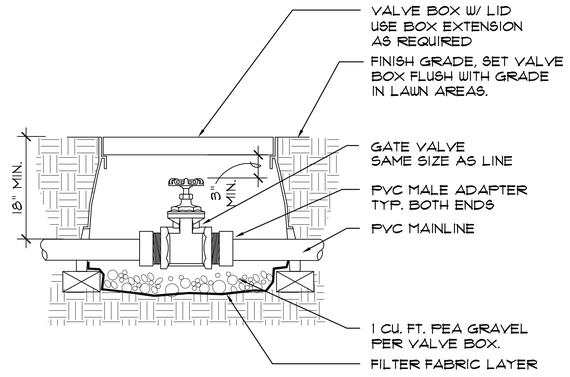
DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT CK. ABF JOB No. 15-958

STATE OF TEXAS — LETICIA OVALLE — 8650 — LICENSED IRRIGATOR — 12/11/2015

SHEET L1.3 OF 20



1 REDUCED PRESSURE BACKFLOW PREVENTER AT POTABLE WATER METER
NTS



2 GATE VALVE
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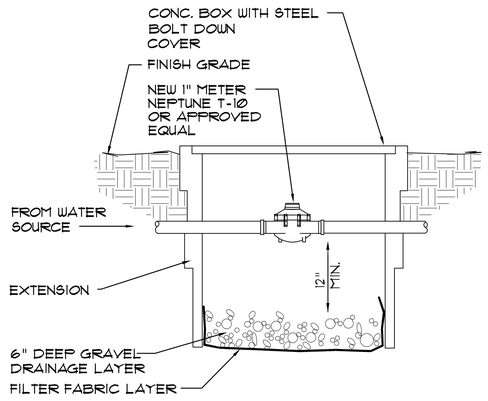

3 IRRIGATION SUB-METER
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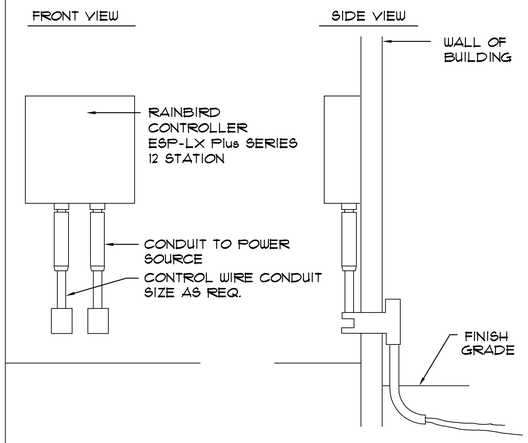
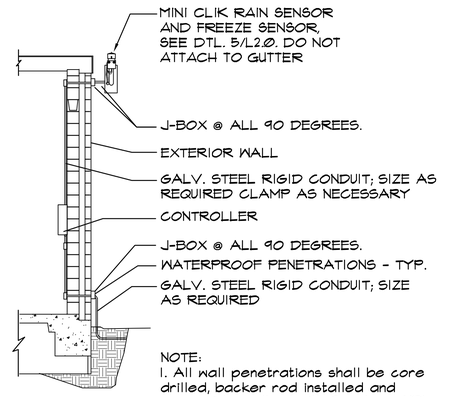


4 AUTOMATIC CONTROLLER
NTS



5 WEATHER SENSORS
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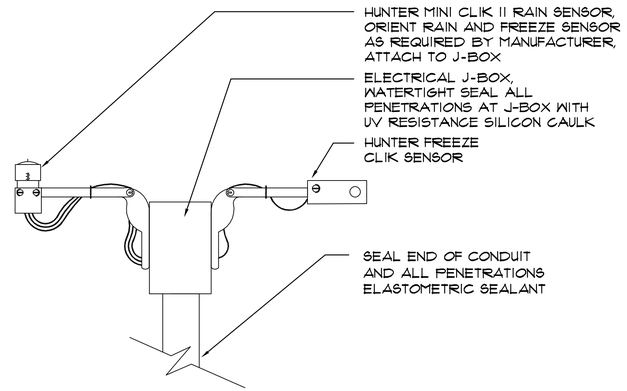
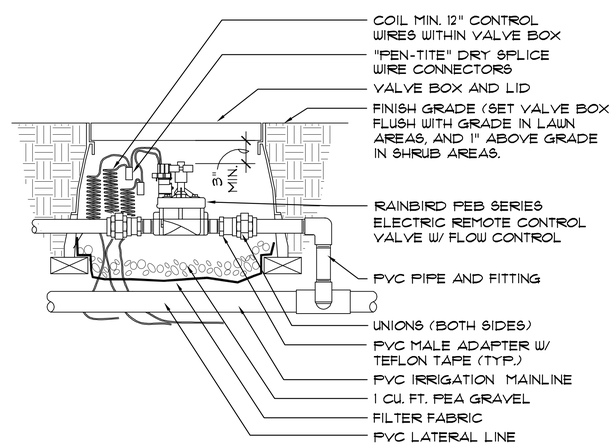


6 WEATHER SENSORS DETAIL
NTS



7 ELECTRIC REMOTE CONTROL VALVE
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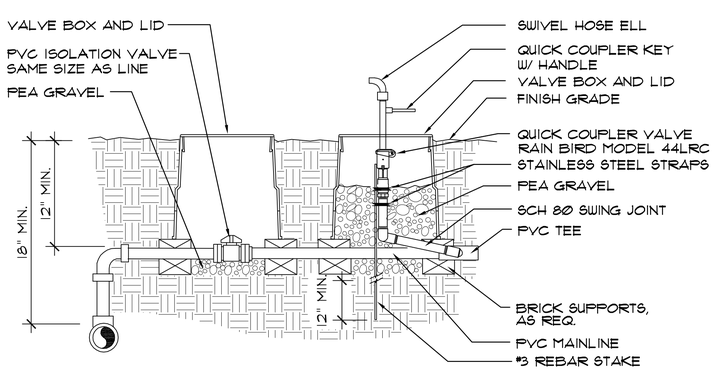
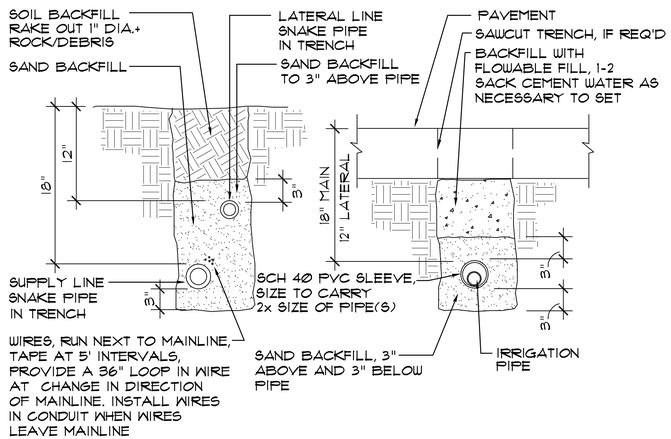


8 QUICK COUPLER
NTS



9 TYP. TRENCH DETAILS
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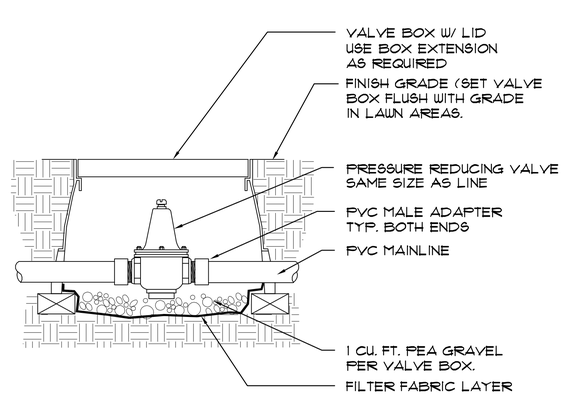

10 PRESSURE REGULATOR VALVE
NTS

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210-366-1911/210-366-0044 fax

No.	Revision	Drawn	Approved	Date

REVISIONS

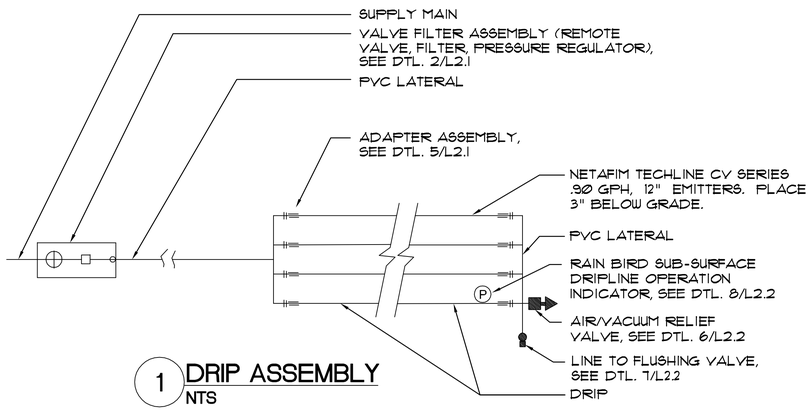
CHILLED WATER PLANT IMPROVEMENTS

IRRIGATION DETAILS

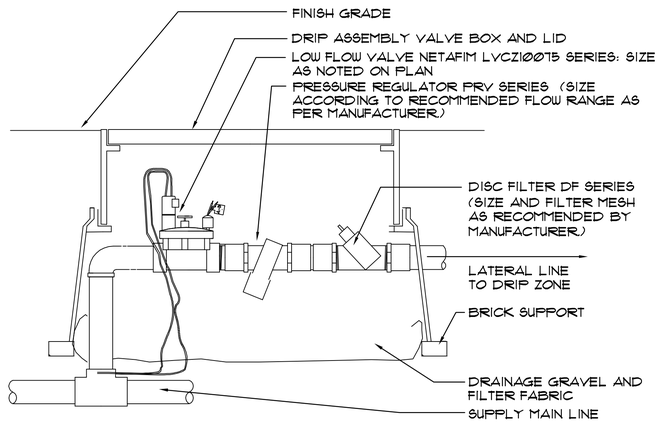
DEVELOPER:

CONT.	BUDGET PROJ.
SUBMITTED	
APPROVED	
MAP No.	SHEET
SECT. No.	L2.1
DR. SDT / CK. ABF / JOB No. 15-958	OF 20

STATE OF TEXAS — LETICIA C. AVALA — 8650 — LICENSED IRRIGATOR — 12/11/2015



1 DRIP ASSEMBLY
NTS



2 DRIP ZONE VALVE ASSEMBLY
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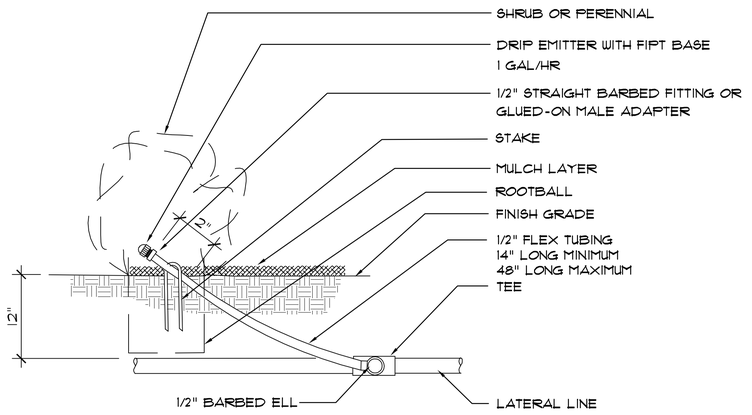
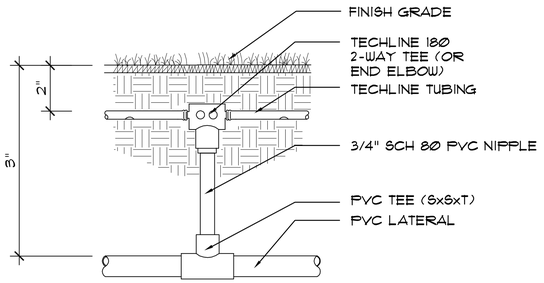
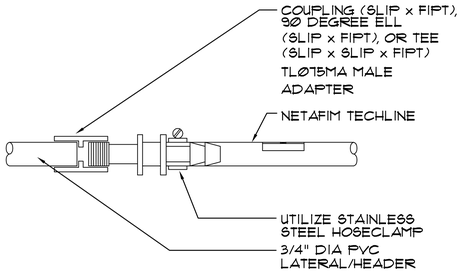


NOTE: ON SLOPES, PLACE EMITTER ON THE UPHILL SIDE OF SHRUB OR TREE

3 DRIP EMITTER
NTS



4 MANIFOLD CONNECTION (PVC to TEE)
NTS



5 ADAPTER ASSEMBLY
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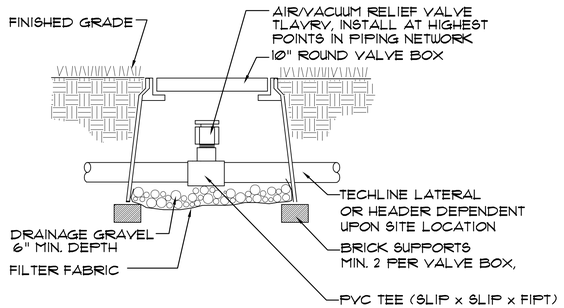

6 AIR RELIEF VALVE
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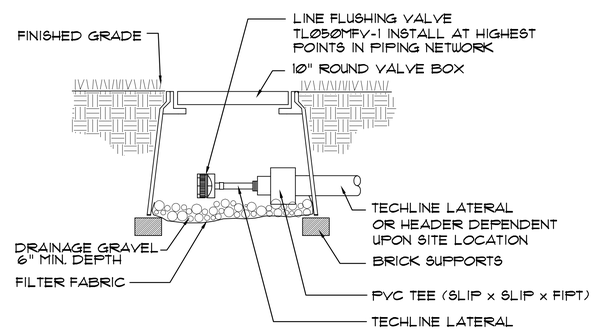

7 FLUSHING VALVE
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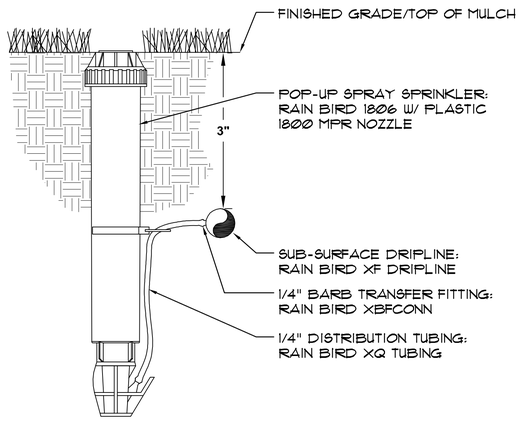
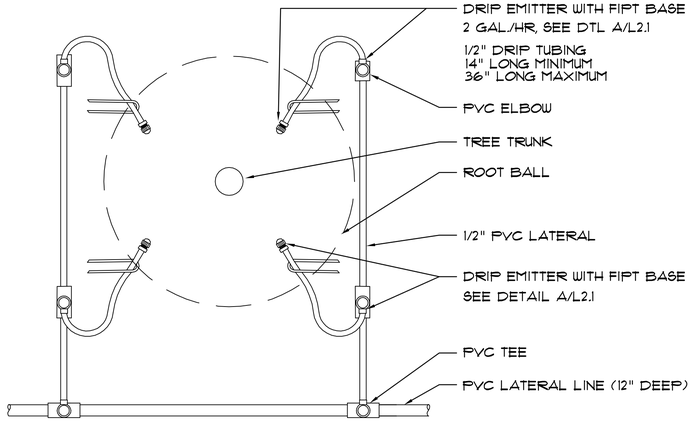


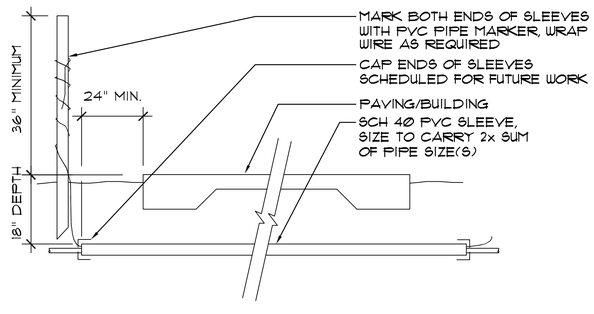
NOTE:
1. USE XERIMAN TOOL XM-TOOL TO INSERT BARB TRANSFER FITTING DIRECTLY INTO DRIPLINE TUBING.

8 DRIP SYSTEM OPERATION INDICATOR
NTS



NOTE:
INSTALL 4 EMITTERS PER SHADE TREE,
2 EMITTERS PER ACCENT TREE

9 TREE EMITTER DETAIL
NTS



10 IRRIGATION SLEEVE DETAIL
NTS

C•F•Z Group LLC
Coltrane • Fernandez • Zavala
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No.	Revision	Drawn	Approved	Date

REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

DRIP IRRIGATION DETAILS

DEVELOPER:		
CONT.	BUDGET PROJ.	
SUBMITTED		
APPROVED		
MAP No.		SHEET
SECT. No.		L5.1
DR. SDT	CK. ABF	JOB No. 15-958 OF 20

STATE OF TEXAS · JUSTIN CAVALA · 8650 · LICENSED IRRIGATOR · 12/11/2015

PLANTING NOTES

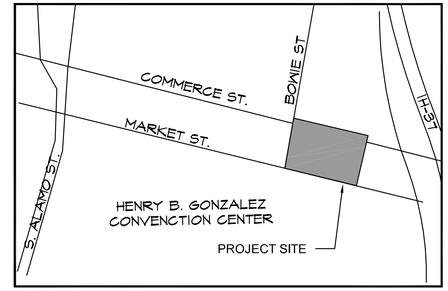
1. Landscape contractor shall be responsible for making himself familiar with the specifications and all submittal requirements. It is the responsibility of the Landscape contractor to notify the Landscape Architect for site inspections as specified in the specifications. Failure to notify the Landscape Architect does not relieve the contractor from inspection approval and will require the contractor to install/repair work as required for approval at the cost of the contractor. Landscape contractor is to inform Landscape Architect of the start date of work.
2. The landscape contractor is to notify Texas One Call (800-245-4545) and 800 DIG TESS (800-344-8377) 72 hours prior to any excavation. Landscape contractor shall be responsible for making himself familiar with all underground utilities, pipes and structures. Landscape contractor shall take sole responsibility for any cost incurred due to damage of said utilities whether or not Texas One Call is notified.
3. Do not willingly proceed with construction as designed when it is obvious that unknown obstruction and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Landscape Architect. The Contractor shall assume full responsibility for all necessary revisions due to failure to give such notification.
4. The Contractor shall be responsible for any coordination with subcontractors as required to accomplish planting operations.
5. If conflicts arise between size of areas and plans, Contractor is to contact Landscape Architect for resolution. Failure to make such conflicts known will result in Contractor's liability to relocate the materials.
6. See specifications for planting requirements, materials and execution.
7. All disturbed areas to receive sod or hydroseed.

LANDSCAPE ORDINANCE: COMPLIANCE NOT REQUIRED

TREE PRESERVATION NOTES

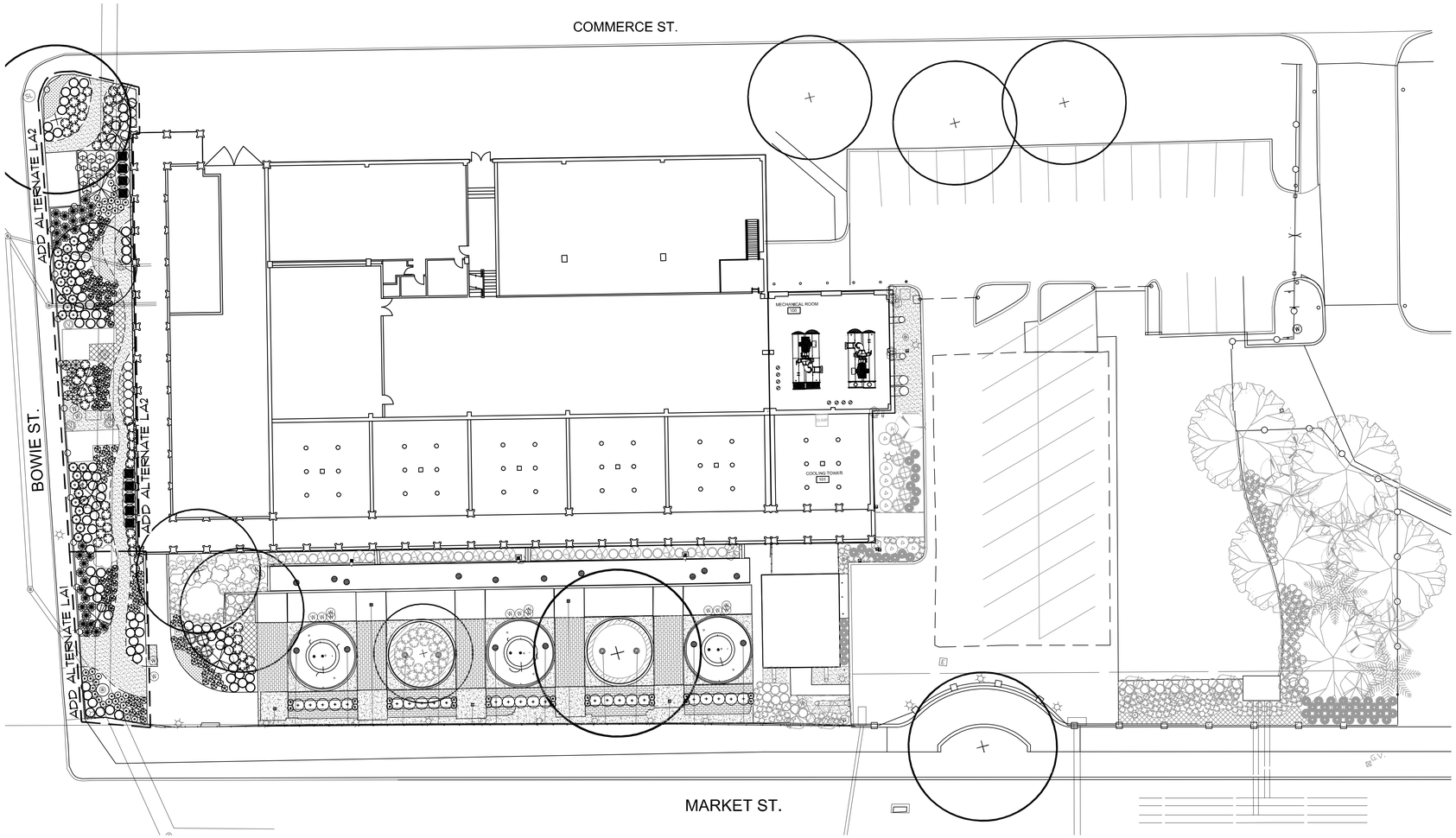
1. All existing trees are to be retained as directed by Landscape Architect.
2. All conditions necessitating the removal or pruning of a tree shall be reviewed by Landscape Architect. The locations of any improvements with the potential of impacting trees shall be staked/delineated prior to the field review.
3. Root Protection Zone (RPZ): RPZ requirements are defined as 12" diameter per 1" caliper of trunk at 42" DBH (Diameter Breast Height). Minimum RPZ requirements are 6" to each 1" caliper at DBH or 5' to trunk, whichever is greater.
4. Barricade fencing shall be placed to protect RPZ of all trees to remain that are adjacent to construction or disturbed areas unless otherwise approved by Landscape Architect to provide access to work. In these instances the minimum distance for barricade fencing from trunk shall be equal to 50% minimum of RPZ. Five feet (5'-0") from trunk of tree or clump of trees is allowed on one side of the tree with approved alternative construction methods only. Full RPZ is required on other side. Approval from City Aborist/Tree Inspector is required. Refer to detail for tree barricade fencing.
5. Maximum clearing limit within selective clearing areas around buildings to provide access for construction is 15'-0".
6. Protected & heritage trees shall be removed only under the following situations and with the approval of Landscape Architect:
   A. Approval from City Arborist (207-0278) is required for removal of any significant/heritage tree.
   B. Cut/fill greater than three (3") inches to take place beneath the dripline of a tree exceeds 50% of the Root Protection Zone (RPZ).
   C. Construction of a building or other improvements require the removal of more than 30% of the viable portion of a tree crown.
   D. Poor condition of tree.
7. No equipment, vehicles or materials shall be operated or stored within the root protection zone. No clean-out areas will be constructed so that the material will be in or migrate to the root protection zone.
8. Roots or branches in conflict with construction shall be cut cleanly according to proper pruning methods. All Oak wounds shall be painted within 30 minutes to prevent Oak Wilt infection.
9. Exposed roots shall be covered at the end of the work day using techniques such as covering with soil, mulch or wet burlap.
10. All woody material to be removed may be chipped into mulch & distributed on site within RPZ's at trees adjacent to construction & natural areas.
11. Trees must be maintained in good health throughout the construction process. Maintenance may include watering the root protection zone and or washing foliage. Contractor is responsible for providing a licensed tree maintenance professional throughout the project per City Ordinance, Article VIII 21-717.
12. Trees which are damaged or lost due to Contractor's negligence during construction shall be mitigated at Contractor's expense. Trees that die within twelve (12) months shall be replaced at a 1:1 ratio for significant trees and 3:1 for heritage trees per the Unified Development Code 35-523, Table 523-2.

TREE PRESERVATION ORDINANCE: COMPLIANCE NOT REQUIRED



VICINITY MAP
(NOT TO SCALE)

- EXISTING TREE TO REMAIN
- EXISTING SHRUB TO REMAIN
- TUSCARORA CRAPE MYRTLE
- AMERICAN BEAUTYBERRY (ABE)
- BICOLOR IRIS (BIC)
- CHERRY PINK SALVIA (SAL)
- DRIFT ROSE (DR)
- DWARF PALMETTO (DP)
- FOXTRAIL FERN (FT)
- GIANT LIRIOPE (GLI)
- PINK KATIE PETUNIA (KP)
- PINK SKULLCAP (SKU)
- PLUMBAGO (PLU)
- RED SPIDER LILY (RSL)
- SANDANKWA VIBURNUM (SV)
- SILVER DALEA (SD)
- SOCIETY GARLIC (SG)
- TURK'S CAP (TC)
- DECOMPOSED GRANITE
- STEEL EDGING
- EXISTING PLANTING



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No.	Revision	Drawn	Approved	Date

REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

PLANTING PLAN

DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT CK. ABF JOB No. 15-958

STATE OF TEXAS — JAMES R. TENNANT, JR. — 1218 — REGISTERED LANDSCAPE ARCHITECT
12/11/2015

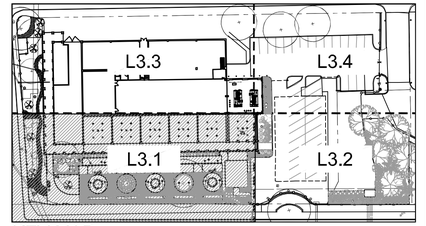
SHEET L3.0 OF 20

PLANT SCHEDULE:

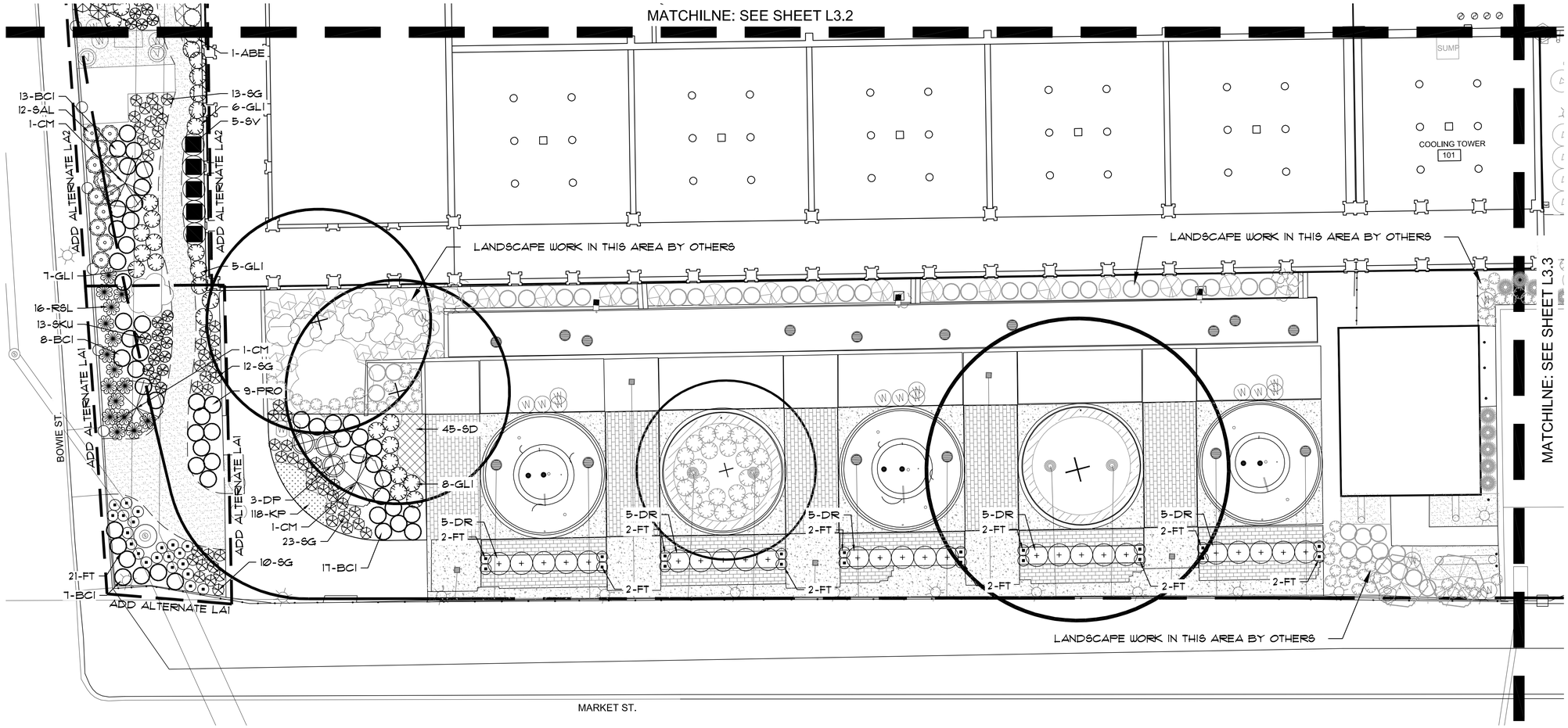
KEY	COMMON NAME	SCIENTIFIC NAME	CONDITION	REMARKS
	TREES			
CM	Tuscarora Crapemyrtle	*Lagerstroemia indica x fauriei* 'Tuscarora'	Container	8'-10" ht., 4'-5' sprd, multi-trunk, 5 cane min.
MTL	Texas Mt. Laurel	*Sophora secundiflora*	B & B	5'-6' ht; 4'-5' sprd, multi-trunk
	SHRUBS			
ABE	American Beautyberry	*Callicarpa americana*	5 gal.	18" ht., 18" sprd, full, 36" o.c.
BCI	Bicolor Iris	*Dietes bicolor*	5 gal.	18" ht., 18" sprd, full, 36" o.c.
DP	Dwarf Palmetto	*Sabal minor*	5 gal.	20" ht., 20 sprd, as shown
TC	Turk's Cap	*Malvaviscus arboreous*	5 gal.	15" ht., 15" sprd, full, 36" o.c.
PLU	Plumbago	*Plumbago auriculata*	5 gal.	12" ht., 10" sprd, full, 36" o.c.
DR	Drift Rose	*Rosa meijocos*	5 gal.	18" ht., 18" sprd, full, 48" o.c.
SAL	Cherry Pink Salvia	*Salvia greggi* 'Cherry Pink'	5 gal.	12" ht., 8" sprd, full, 36" o.c.
SV	Sandankwa Viburnum	*Viburnum suspendum*	5 gal.	18" ht., 18" sprd, full, 48" o.c.
	PERENNIALS			
FT	Foxtail Fern	*Asparagus densiflorus*	1 gal.	10" ht., 10" sprd, full, 24" o.c.
SD	Silver Dalea	*Dalea bicolor* var. *argyraea*	1 gal.	4" ht., 8" sprd, full, 12" o.c.
GLI	Giant Liriope	*Liriope gigantea*	1 gal.	15" ht., 12" sprd, full, 36" o.c.
SKU	Pink Skullcap	*Scutellaria suffrutescens*	1 gal.	8" ht., 8" sprd, full, 24" o.c.
SF	Society Garlic	*Tulbaghia violacea*	1 gal.	8" ht., 8" sprd, full, 24" o.c.
RSL	Red Spider Lily	*Lycoris radiata*	1 gal.	12" ht., 12" sprd, full, 36" o.c.
	GROUNDCOVER			
RUE	Katie Pink Petunia	*Ruellia brittoniana* 'Katie Pink'	4" pot	12" ht., 8" sprd, full, 8" o.c.

LEGEND

- EXISTING TREE TO REMAIN
- EXISTING SHRUB TO REMAIN
- TUSCARORA CRAPE MYRTLE
- AMERICAN BEAUTYBERRY (ABE)
- BICOLOR IRIS (BIC)
- CHERRY PINK SALVIA (SAL)
- DRIFT ROSE (DR)
- DWARF PALMETTO (DP)
- FOXTRAIL FERN (FT)
- GIANT LIRIOPE (GLI)
- PINK KATIE PETUNIA (KP)
- PINK SKULLCAP (SKU)
- PLUMBAGO (PLU)
- RED SPIDER LILY (RSL)
- SANDANKWA VIBURNUM (SV)
- SILVER DALEA (SD)
- SOCIETY GARLIC (SG)
- TURK'S CAP (TC)
- DECOMPOSED GRANITE
- STEEL EDGING
- EXISTING PLANTING



KEY MAP
(NOT TO SCALE)



C•F•Z Group LLC
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& Planning
7410 John Smith Dr., Suite 208
San Antonio, Texas 78229
210-366-1911/210-366-0044 fax

No.	Revision	Drawn	Approved	Date

REVISIONS

NORTH
0 10 20 30
1"=10'-0"

CHILLED WATER PLANT IMPROVEMENTS

PLANTING PLAN

STATE OF TEXAS
CHARLES B. FERNANDEZ JR.
1218
REGISTERED LANDSCAPE ARCHITECT
12/11/2015

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT | CK. ABF | JOB No. 15-958

SHEET L3.1 Of 20

- EXISTING TREE TO REMAIN
- EXISTING SHRUB TO REMAIN
- TUSCARORA CRAPE MYRTLE
- AMERICAN BEAUTYBERRY (ABE)
- BICOLOR IRIS (BIC)
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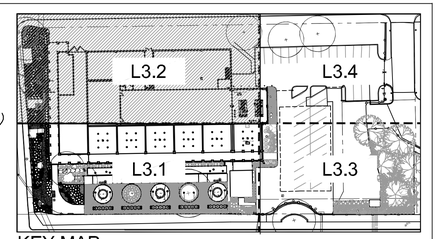

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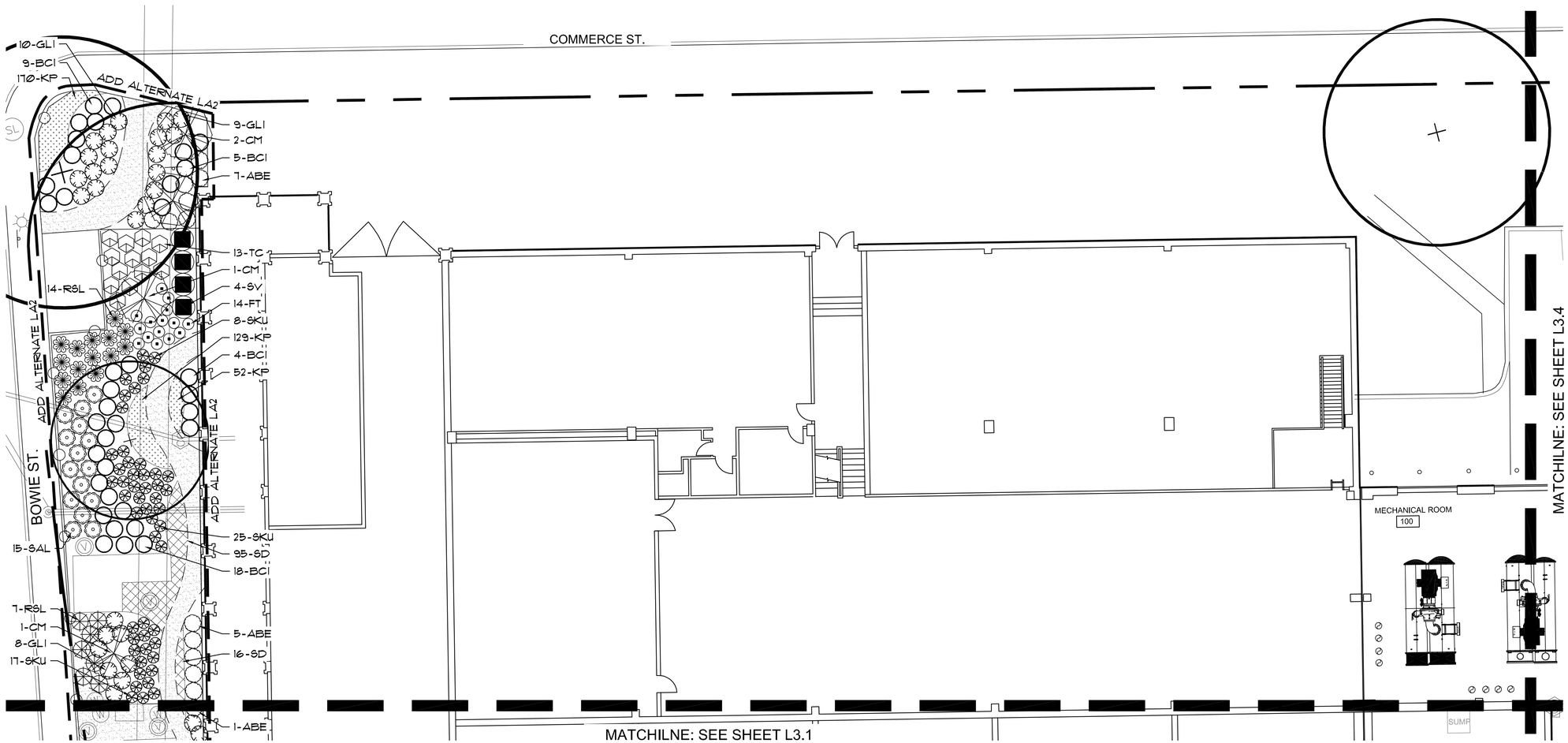

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No.	Revision	Drawn	Approved	Date

REVISIONS

NORTH
1"=10'-0"

CHILLED WATER
PLANT IMPROVEMENTS

PLANTING PLAN

DEVELOPER:

CONT. | BUDGET PROJ.

SUBMITTED

APPROVED

MAP No.

SECT. No.

DR. SDT | CK. ABF | JOB No. 15-958

SHEET L3.2 OF 20

STATE OF TEXAS
ANDREW B. FERNANDEZ
1218
REGISTERED
LANDSCAPE ARCHITECT
12/11/2015

- EXISTING TREE TO REMAIN
- EXISTING SHRUB TO REMAIN
- TUSCARORA CRAPE MYRTLE
- AMERICAN BEAUTYBERRY (ABE)
- BICOLOR IRIS (BIC)
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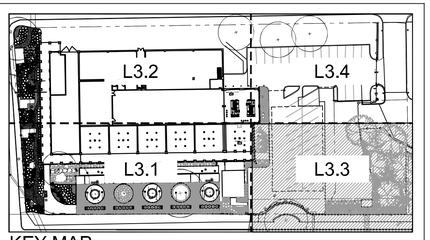
- TURK'S CAP (TC)
- DECOMPOSED GRANITE
- STEEL EDGING
- EXISTING PLANTING



KEY MAP
(NOT TO SCALE)

MATCHILNE: SEE SHEET L3.4

MATCHILNE: SEE SHEET L3.1

LANDSCAPE WORK IN THIS AREA BY OTHERS

E

G.V.

MARKET ST.

NORTH

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REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

LANDSCAPE PLAN

DEVELOPER:

CONT.		BUDGET PROJ.
SUBMITTED		
APPROVED		
MAP No.		SHEET L3.3
SECT. No.		
DR. SDT	CK. ABF	JOB No. 15-958 OF 20

STATE OF TEXAS
ROBERT A. FERNANDEZ JR.
1218
REGISTERED LANDSCAPE ARCHITECT
12/11/2015

- EXISTING TREE TO REMAIN
- EXISTING SHRUB TO REMAIN
- TUSCARORA CRAPE MYRTLE
- AMERICAN BEAUTYBERRY (ABE)
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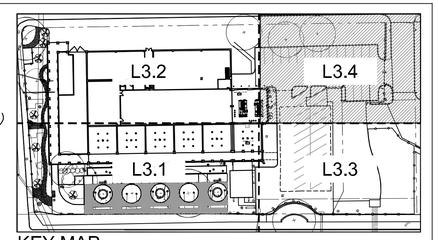

KEY MAP
(NOT TO SCALE)

COMMERCE ST.

NO LANDSCAPE WORK THIS SHEET

MATCHILNE: SEE SHEET L3.4

MATCHILNE: SEE SHEET L3.3

NORTH
0 10 20 30
1"=10'-0"

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REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

PLANTING PLAN

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT | CK. ABF | JOB No. 15-958

SHEET L3.4 Of 20

STATE OF TEXAS
ALBERT B. FERNANDEZ JR.
1218
REGISTERED
LANDSCAPE ARCHITECT
12/11/2015

DEMOLITION/CONSTRUCTION NOTES (◇# - KEYED NOTES)

1. Contractor shall be responsible for making himself familiar with the specifications and all submittal requirements. It is the responsibility of the contractor to notify the Landscape Architect for site inspections as specified in the specifications. Failure to notify the Landscape Architect does not relieve the contractor from inspection approval and will require the contractor to install work as required for approval by Landscape Architect and at the cost of the contractor.
2. The contractor is required by law to notify Texas One Call (800-245-4545) 72 hours prior to any excavation. Contractor shall be responsible for making himself familiar with all underground utilities, pipes and structures. Contractor shall take sole responsibility for any cost incurred due to damage of said utilities whether or not Texas One Call is notified.
3. Do not willfully proceed with construction as designed when it is obvious that unknown obstructions and/or grade differences exist that may not have been known during design. Such conditions shall be immediately brought to the attention of the Landscape Architect or Owner's Representative. The contractor shall assume full responsibility for all necessary revisions due to failure to give such notification.
4. Contractor shall be responsible for any coordination with other contractors as required to accomplish all construction operations. All piping, conduit, sleeves, etc. shall be set in place prior to installation of construction items.
5. Refer to State/City Standard Plans and specifications where applicable.
6. All existing improvements, materials, utilities and plant material to remain within the new construction area shall be properly and adequately protected from damage during demolition operations. It shall be the responsibility of the Contractor to restore to the original condition any of these existing items that are damaged or disturbed in any way. All existing trees within or near construction area are to be protected for duration of construction.
7. Streets and adjacent property shall be protected throughout the work as required by local codes and regulations and approved by the Owner.
8. During demolition operations, every effort shall be made to control dust per City requirements.
9. The entire demolition area shall be grubbed. Grubbing shall include all stumps and root systems of removed plant material and any other deleterious items. Grubbing shall be to the depths as required to remove these items.
10. All forms must be inspected and approved by the Landscape Architect prior to the installation of any construction.
11. Install felt expansion joints, sealant and backer rod where paving abuts existing hardscape.
12. All new paving shall match existing grade.

◇13 EXISTING CONCRETE PAVING;
ALT. FW2: STAINED CONCRETE PAVING

◇14 NEW CONCRETE PAVING TO MATCH EXISTING, SEE DTL. 1/L5.3
ALT. FW2: STAINED CONCRETE PAVING

◇15 EXISTING CLAY PAVERS
ALT. FW1: STAINED CONCRETE PAVERS

◇16 NEW CLAY PAVERS TO MATCH EXISTING, SEE DTL. 2/L5.3
ALT. FW1: STAINED CONCRETE PAVERS TO MATCH EXISTING

◇17 COLORED ASPHALT (BY OTHERS)

◇18 REFURBISHED EXISTING FOUNTAIN, SEE DTL. 7/L5.3

◇19 REFURBISHED EXISTING REFLECTING POOL, SEE DTL. 8/L5.3

◇20 NEW PLANTER, SEE DTL. 6/L5.3

◇21 DECOMPOSED GRANITE, SEE DTL. 4/L5.1

◇22 STEEL EDGING, SEE DTL. 2/L5.1

◇23 EXISTING PLANTER, PROTECT IN PLACE

◇24 FENCE, BY OTHERS

◇25 EXISTING FENCE TO REMAIN

◇26 EXISTING BUS STOP TO REMAIN

◇27 EXISTING UTILITY TO REMAIN

◇28 MAINTENANCE VEHICLE ACCESS

◇29 REMOVE EXISTING CONCRETE

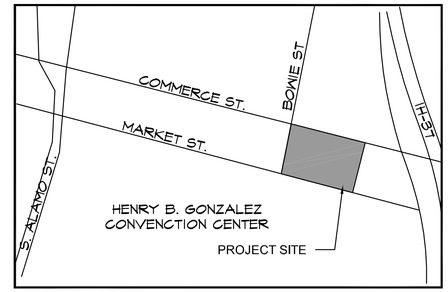
◇30 REMOVE EXISTING PAVERS, CONCRETE SUBSLAB AND BASE

◇31 REMOVE EXISTING STEEL EDGING

◇32 REMOVE EXISTING CONCRETE AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.

◇33 REMOVE EXISTING CONCRETE PAVERS AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.

◇34 REMOVE EXISTING TILE BENCH. REPAIR FOUNTAIN/PLANTER WALL AT BENCH LOCATIONS.



VICINITY MAP
(NOT TO SCALE)

LEGEND

- EXISTING TREE
- EXISTING SHRUB TO REMAIN
- EXISTING SHRUB TO BE REMOVED
- EXISTING CONCRETE
- EXISTING PAVERS
- PAVING TO BE REMOVED
- NEW CONCRETE
- NEW PAVERS
- COLORED ASPHALT
- DECOMPOSED GRANITE
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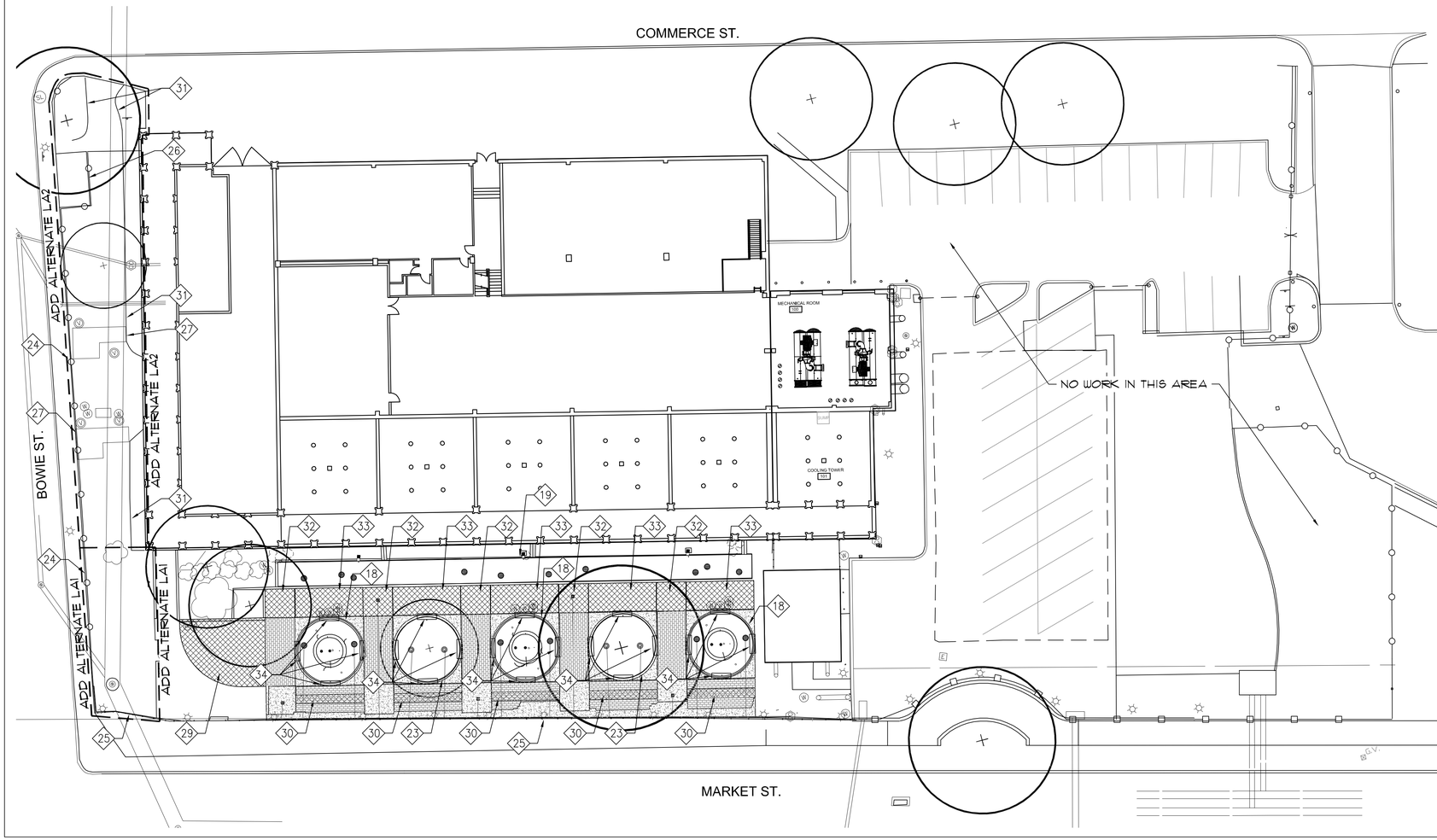

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REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

DEMOLITION PLAN

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT | CK. ABF | JOB No. 15-958

SHEET L4.0 Of 20

STATE OF TEXAS — ALBERT R. FERNANDEZ JR. — 1218 — REGISTERED LANDSCAPE ARCHITECT

12/11/2015

DEMOLITION/CONSTRUCTION NOTES (◇# - KEYED NOTES)

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ALT. FW2: STAINED CONCRETE PAVING

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ALT. FW2: STAINED CONCRETE PAVING

◇15 EXISTING CLAY PAVERS
ALT. FW1: STAINED CONCRETE PAVERS

◇16 NEW CLAY PAVERS TO MATCH EXISTING, SEE DTL. 2/L5.3
ALT. FW1: STAINED CONCRETE PAVERS TO MATCH EXISTING

◇17 COLORED ASPHALT (BY OTHERS)

◇18 REFURBISHED EXISTING FOUNTAIN, SEE DTL. 7/L5.3

◇19 REFURBISHED EXISTING REFLECTING POOL, SEE DTL. 8/L5.3

◇20 NEW PLANTER, SEE DTL. 6/L5.3

◇21 DECOMPOSED GRANITE, SEE DTL. 4/L5.1

◇22 STEEL EDGING, SEE DTL. 2/L5.1

◇23 EXISTING PLANTER, PROTECT IN PLACE

◇24 FENCE, BY OTHERS

◇25 EXISTING FENCE TO REMAIN

◇26 EXISTING BUS STOP TO REMAIN

◇27 EXISTING UTILITY TO REMAIN

◇28 MAINTENANCE VEHICLE ACCESS

◇29 REMOVE EXISTING CONCRETE

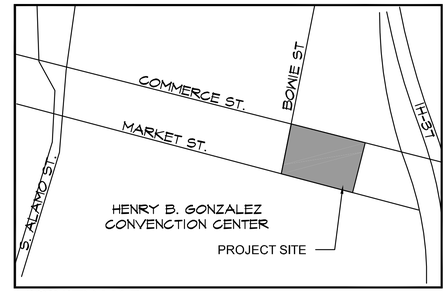
◇30 REMOVE EXISTING PAVERS, CONCRETE SUBSLAB AND BASE

◇31 REMOVE EXISTING STEEL EDGING

◇32 REMOVE EXISTING CONCRETE AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.

◇33 REMOVE EXISTING CONCRETE PAVERS AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.

◇34 REMOVE EXISTING TILE BENCH. REPAIR FOUNTAIN/PLANTER WALL AT BENCH LOCATIONS.



VICINITY MAP
(NOT TO SCALE)

LEGEND

- EXISTING TREE
- EXISTING SHRUB TO REMAIN
- EXISTING SHRUB TO BE REMOVED
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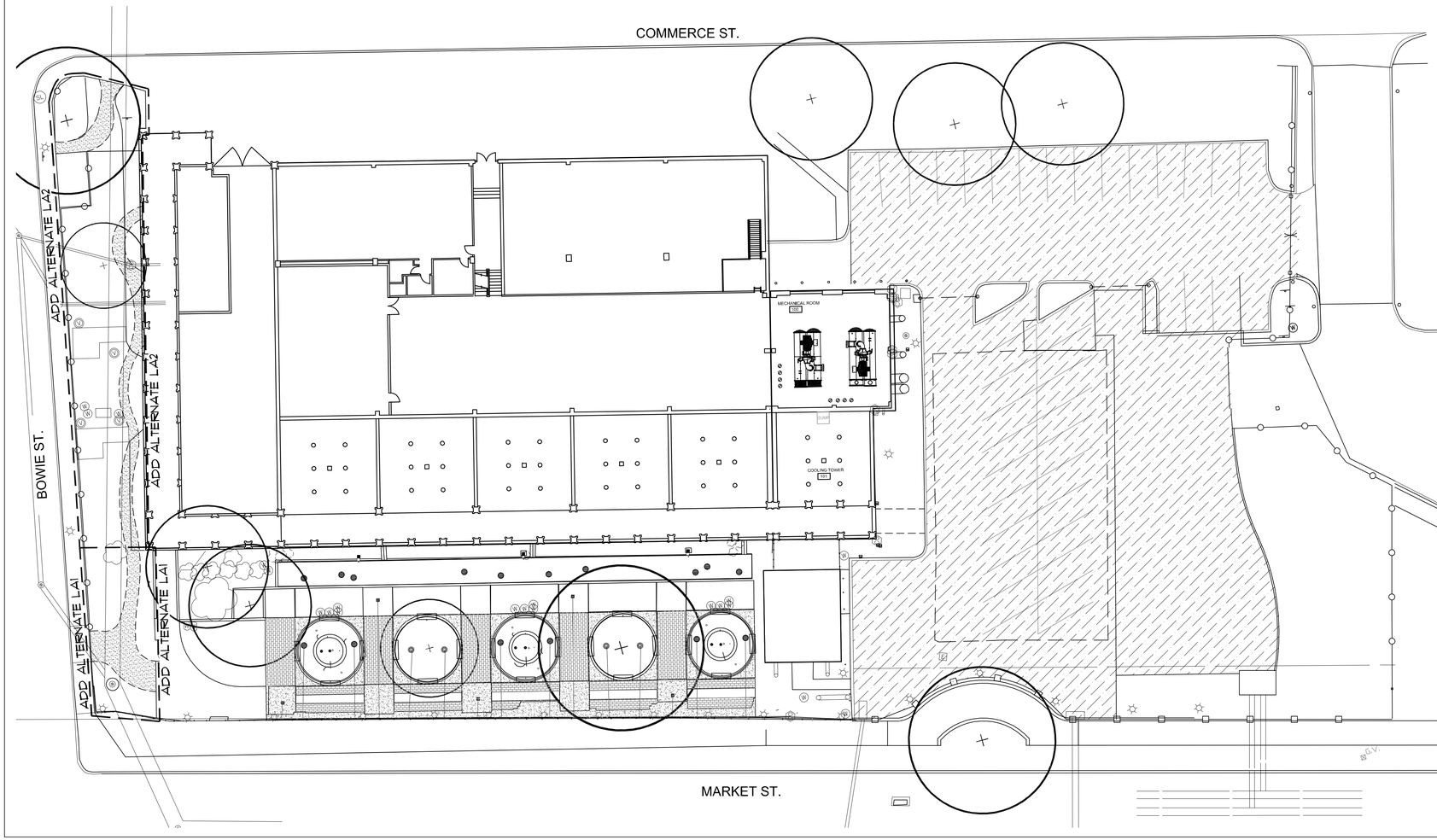

NORTH
0 20 40 60
1"=20'-0"

C•F•Z Group LLC
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REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

SITE PLAN

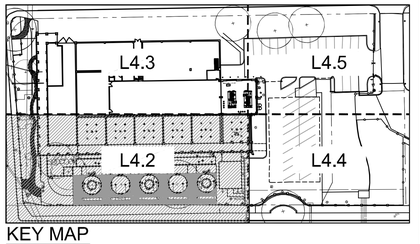
DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT CK. ABF JOB No. 15-958

STATE OF TEXAS · ANDREW B. FERNANDEZ · 1218 · REGISTERED LANDSCAPE ARCHITECT
12/11/2015

SHEET L4.1 OF 20

DEMOLITION/CONSTRUCTION NOTES KEY NOTES

13. EXISTING CONCRETE PAVING;
ALT. FW2: STAINED CONCRETE PAVING
14. NEW CONCRETE PAVING TO MATCH EXISTING, SEE DTL. 1/L5.3
ALT. FW2: STAINED CONCRETE PAVING
15. EXISTING CLAY PAVERS
ALT. FW1: STAINED CONCRETE PAVERS
16. NEW CLAY PAVERS TO MATCH EXISTING, SEE DTL. 2/L5.3
ALT. FW1: STAINED CONCRETE PAVERS TO MATCH EXISTING
17. COLORED ASPHALT (BY OTHERS)
18. REFURBISHED EXISTING FOUNTAIN, SEE DTL. 7/L5.3
19. REFURBISHED EXISTING REFLECTING POOL, SEE DTL. 8/L5.3
20. NEW PLANTER, SEE DTL. 6/L5.3
21. DECOMPOSED GRANITE, SEE DTL. 4/L5.1
22. STEEL EDGING, SEE DTL. 2/L5.1
23. EXISTING PLANTER, PROTECT IN PLACE
24. FENCE, BY OTHERS
25. EXISTING FENCE TO REMAIN
26. EXISTING BUS STOP TO REMAIN
27. EXISTING UTILITY TO REMAIN
28. MAINTENANCE VEHICLE ACCESS
29. REMOVE EXISTING CONCRETE
30. REMOVE EXISTING PAVERS, CONCRETE SUBSLAB AND BASE
31. REMOVE EXISTING STEEL EDGING
32. REMOVE EXISTING CONCRETE AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.
33. REMOVE EXISTING CONCRETE PAVERS AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.
34. REMOVE EXISTING TILE BENCH. REPAIR FOUNTAIN/PLANTER WALL AT BENCH LOCATIONS.



KEY MAP
(NOT TO SCALE)

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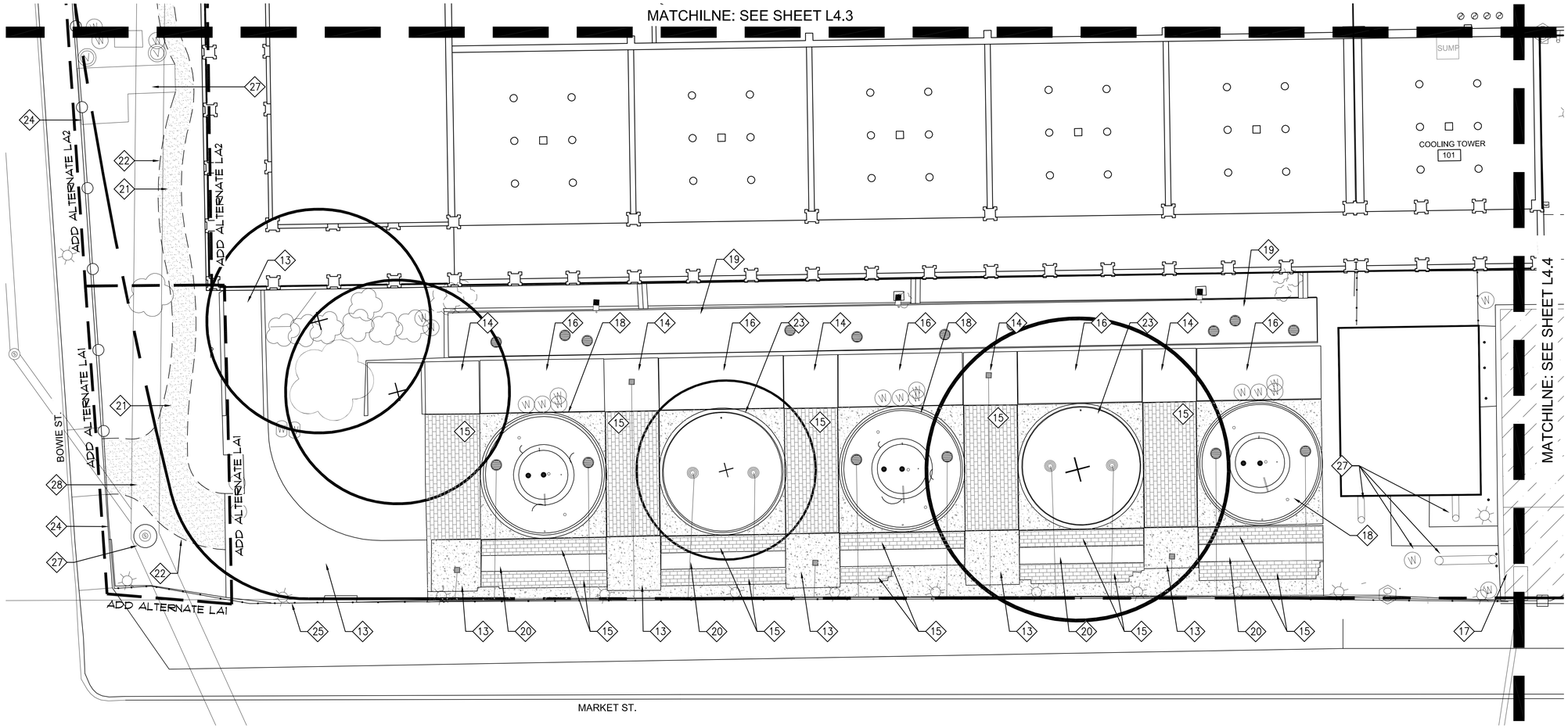

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NORTH
1"=10'-0"

STATE OF TEXAS
ROBERT S. FERNANDEZ JR.
1218
REGISTERED LANDSCAPE ARCHITECT
12/11/2015

No.	Revision	Drawn	Approved	Date
	REVISIONS			

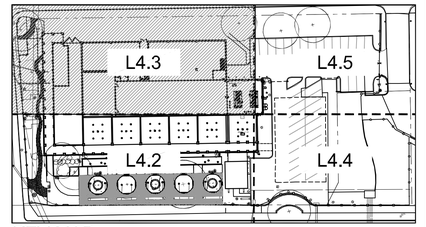
CHILLED WATER PLANT IMPROVEMENTS

SITE PLAN

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT | CK. ABF | JOB No. 15-958
SHEET L4.2 OF 20

DEMOLITION/CONSTRUCTION NOTES KEY NOTES

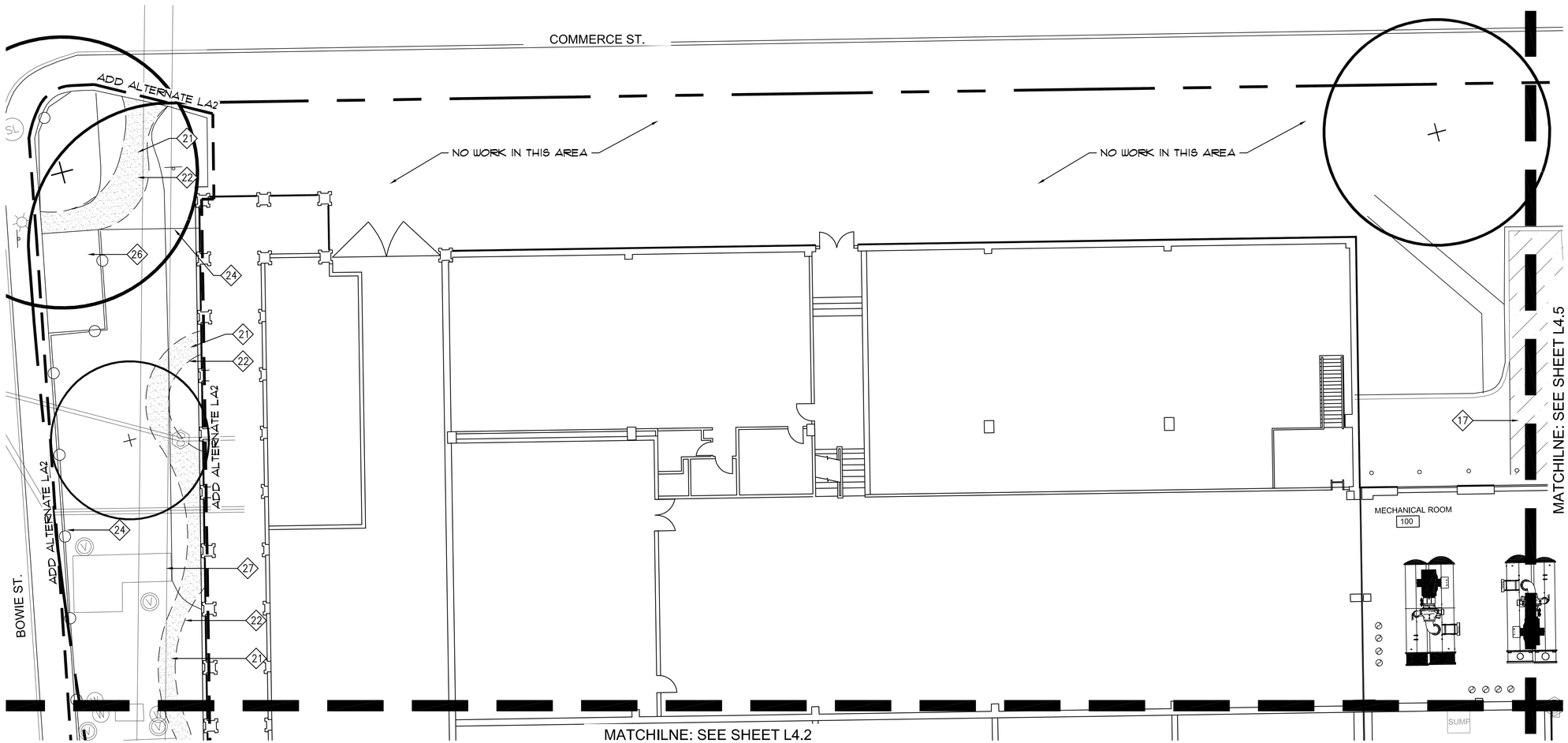
13. EXISTING CONCRETE PAVING;
ALT. FW2: STAINED CONCRETE PAVING
14. NEW CONCRETE PAVING TO MATCH EXISTING, SEE DTL. 1/L5.3
ALT. FW2: STAINED CONCRETE PAVING
15. EXISTING CLAY PAVERS
ALT. FW1: STAINED CONCRETE PAVERS
16. NEW CLAY PAVERS TO MATCH EXISTING, SEE DTL. 2/L5.3
ALT. FW1: STAINED CONCRETE PAVERS TO MATCH EXISTING
17. COLORED ASPHALT (BY OTHERS)
18. REFURBISHED EXISTING FOUNTAIN, SEE DTL. 7/L5.3
19. REFURBISHED EXISTING REFLECTING POOL, SEE DTL. 8/L5.3
20. NEW PLANTER, SEE DTL. 6/L5.3
21. DECOMPOSED GRANITE, SEE DTL. 4/L5.1
22. STEEL EDGING, SEE DTL. 2/L5.1
23. EXISTING PLANTER, PROTECT IN PLACE
24. FENCE, BY OTHERS
25. EXISTING FENCE TO REMAIN
26. EXISTING BUS STOP TO REMAIN
27. EXISTING UTILITY TO REMAIN
28. MAINTENANCE VEHICLE ACCESS
29. REMOVE EXISTING CONCRETE
30. REMOVE EXISTING PAVERS, CONCRETE SUBSLAB AND BASE
31. REMOVE EXISTING STEEL EDGING
32. REMOVE EXISTING CONCRETE AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.
33. REMOVE EXISTING CONCRETE PAVERS AS NEEDED FOR FOUNTAIN REPAIR. SEE MEP DWGS.
34. REMOVE EXISTING TILE BENCH. REPAIR FOUNTAIN/PLANTER WALL AT BENCH LOCATIONS.



KEY MAP
(NOT TO SCALE)

LEGEND

- EXISTING TREE
- EXISTING SHRUB TO REMAIN
- EXISTING SHRUB TO BE REMOVED
- EXISTING CONCRETE
- EXISTING PAVERS
- PAVING TO BE REMOVED
- NEW CONCRETE
- NEW PAVERS
- COLORED ASPHALT
- DECOMPOSED GRANITE
- STEEL EDGING



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Colcrane • Fernandez • Zavala
Landscape Architecture
& Planning
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San Antonio, Texas 78229
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No.	Revision	Drawn	Approved	Date

REVISIONS

NORTH

CHILLED WATER PLANT IMPROVEMENTS

SITE PLAN

STATE OF TEXAS
STEVEN D. TENNYSON JR.
1218
REGISTERED LANDSCAPE ARCHITECT
12/11/2015

DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT CK. ABF JOB No. 15-958

SHEET L4.3 OF 20

DEMOLITION/CONSTRUCTION NOTES KEY NOTES

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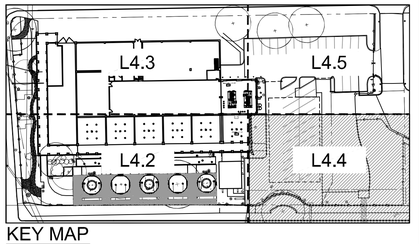
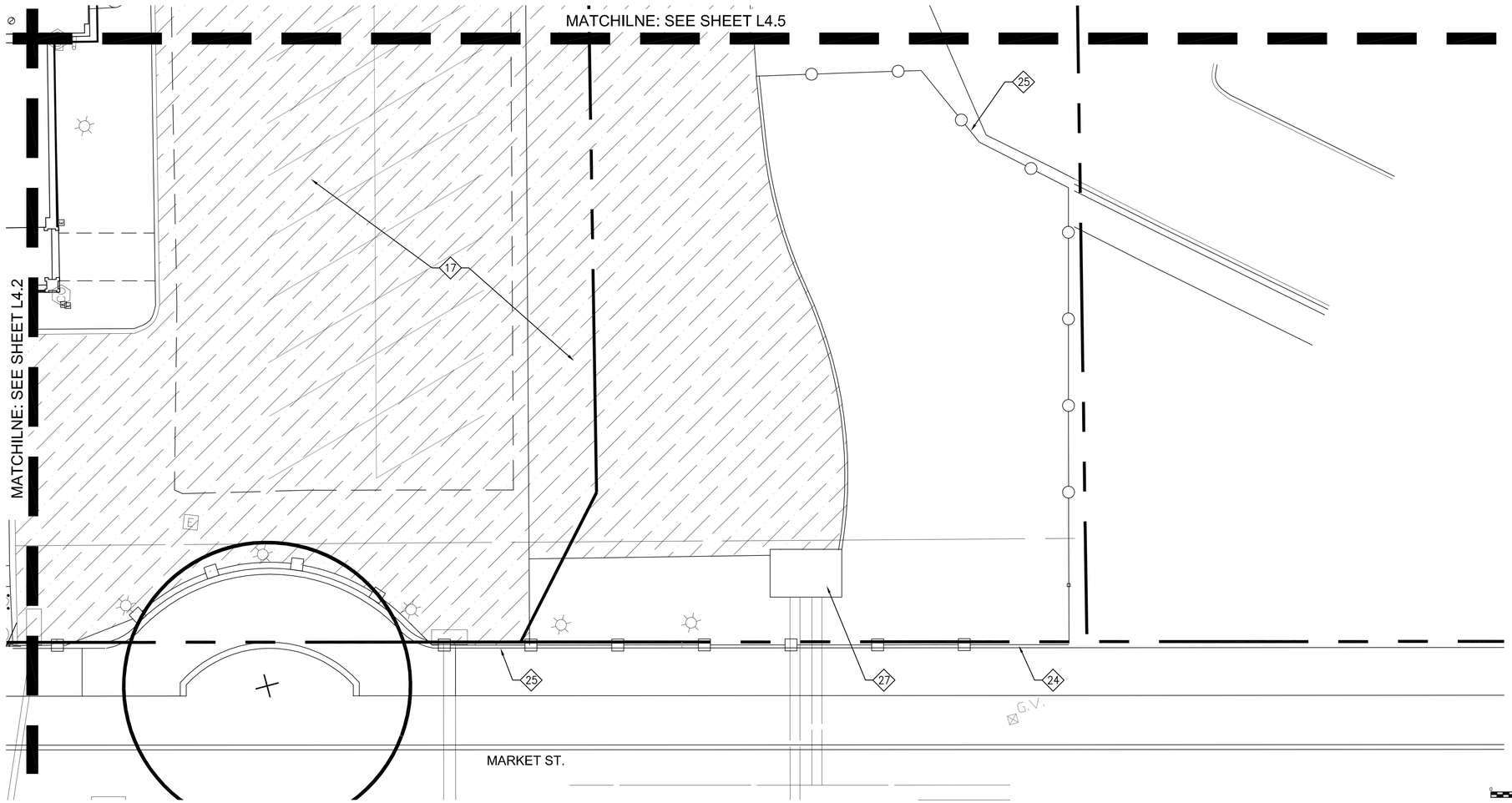


KEY MAP
(NOT TO SCALE)

LEGEND

- EXISTING TREE
- EXISTING SHRUB TO REMAIN
- EXISTING SHRUB TO BE REMOVED
- EXISTING CONCRETE
- EXISTING PAVERS
- PAVING TO BE REMOVED
- NEW CONCRETE
- NEW PAVERS



NORTH
0 10 20 30
1"=10'-0"

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No.	Revision	Drawn	Approved	Date

REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

SITE PLAN

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT | CK. ABF | JOB No. 15-958

SHEET L4.4 OF 20

STATE OF TEXAS
ANDREW B. FERNANDEZ
1218
REGISTERED LANDSCAPE ARCHITECT
12/11/2015

DEMOLITION/CONSTRUCTION NOTES KEY NOTES

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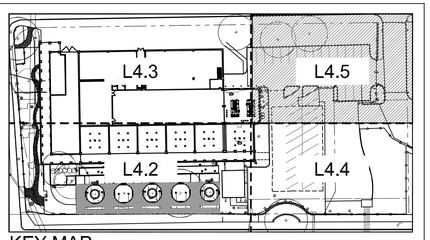
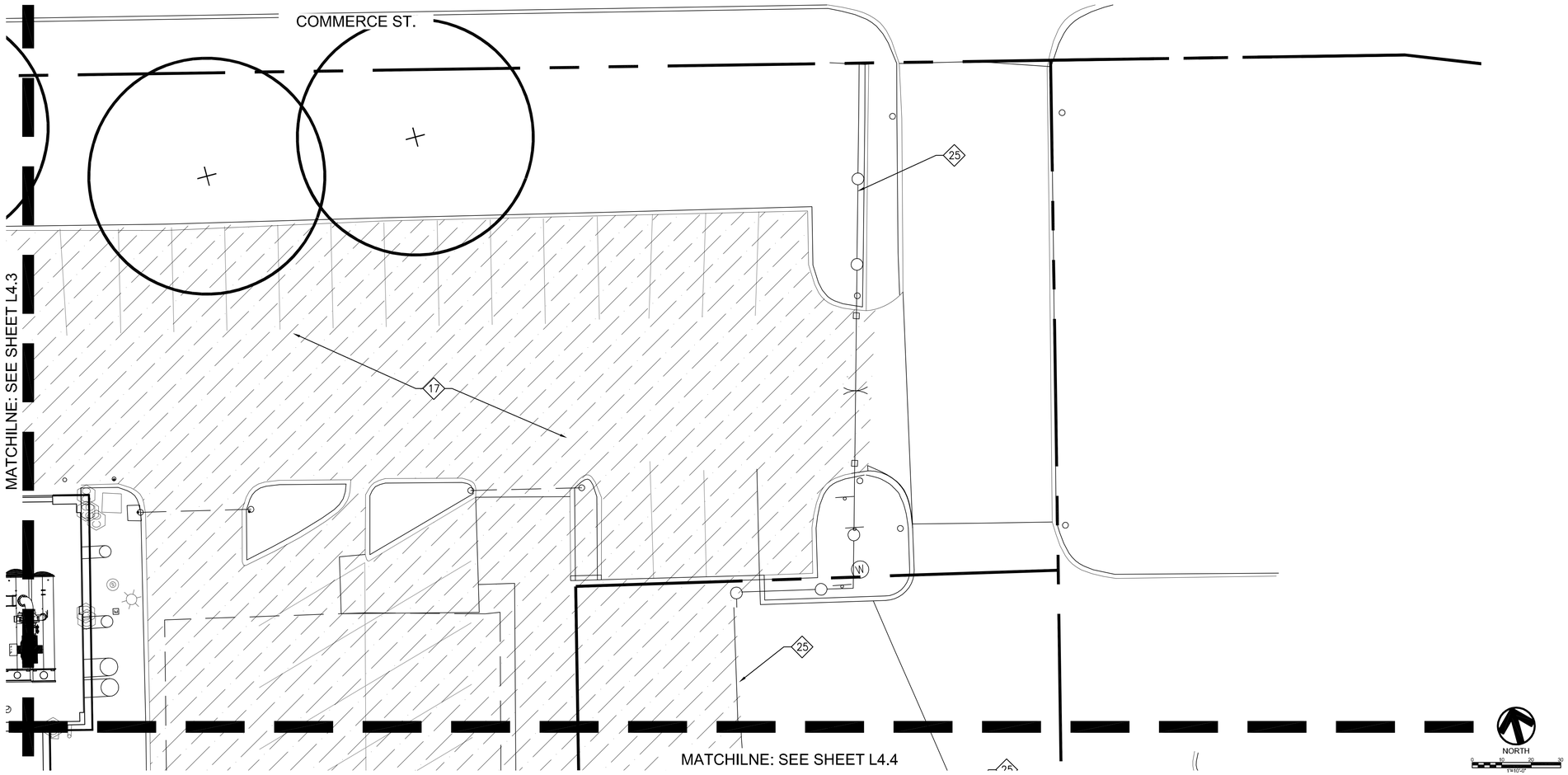


KEY MAP
(NOT TO SCALE)

LEGEND

- EXISTING TREE
- EXISTING SHRUB TO REMAIN
- EXISTING SHRUB TO BE REMOVED
- EXISTING CONCRETE
- EXISTING PAVERS
- PAVING TO BE REMOVED
- NEW CONCRETE
- NEW PAVERS



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San Antonio, Texas 78229
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No.	Revision	Drawn	Approved	Date

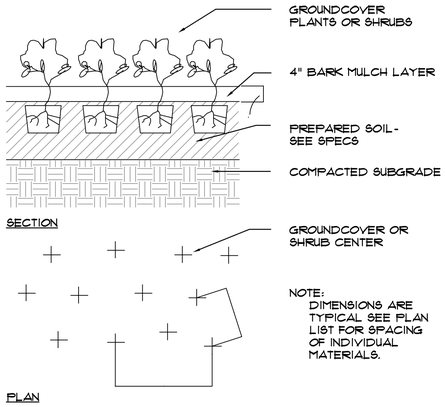
REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

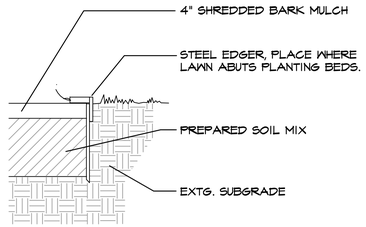
SITE PLAN

DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT CK. ABF JOB No. 15-958
SHEET L4.5 OF 20

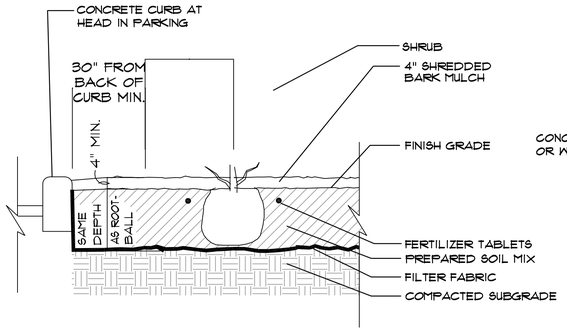
STATE OF TEXAS
ALBERT B. FERNANDEZ JR.
1218
REGISTERED LANDSCAPE ARCHITECT
12/11/2015



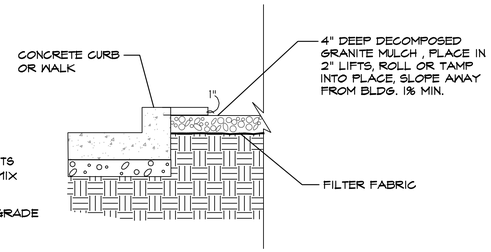
1 TRIANGLE SPACING PLANTING DETAIL
NTS



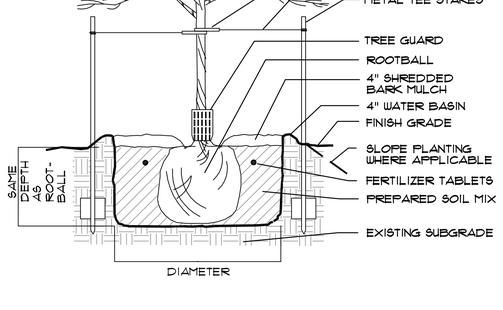
2 STEEL EDGER
NTS



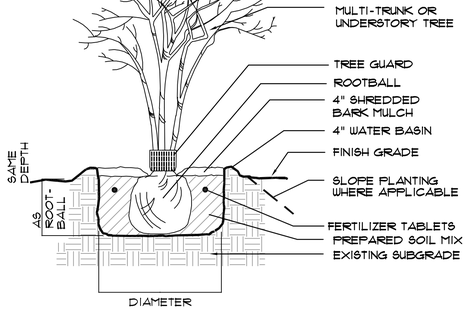
3 SHRUB BED DETAIL
NTS



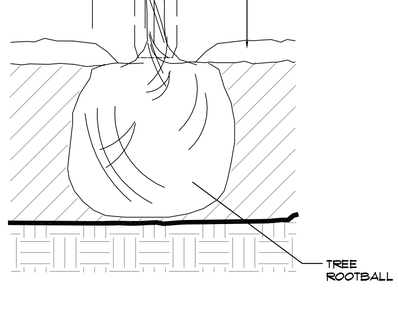
4 GRANITE MULCH
NTS



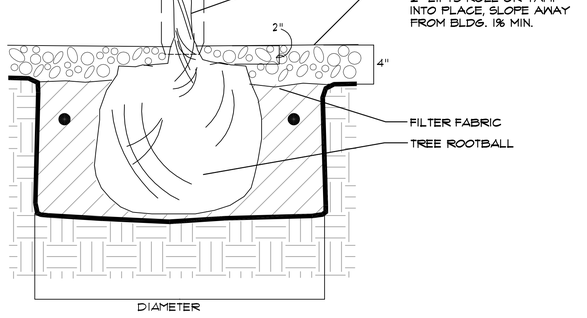
5 SHADE TREE PLANTING
NTS



6 MULTI-TRUNK TREE PLANTING
NTS



7 TREE MULCH DETAIL
NTS



8 TREE DETAIL AT GRANITE MULCH
NTS

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Landscape Architecture & Planning
7410 John Smith Dr., Suite 208
San Antonio, Texas 78229
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No.	Revision	Drawn	Approved	Date

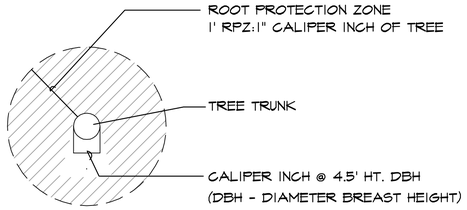
REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

LANDSCAPE DETAILS

STATE OF TEXAS · ABBY F. FERNANDEZ · 1218 · REGISTERED LANDSCAPE ARCHITECT
12/11/2015

DEVELOPER:			
CONT.		BUDGET PROJ.	
SUBMITTED			
APPROVED			
MAP No.			SHEET L5.1
SECT. No.			OF 20
DR. SDT	CK. ABF	JOB No. 15-958	

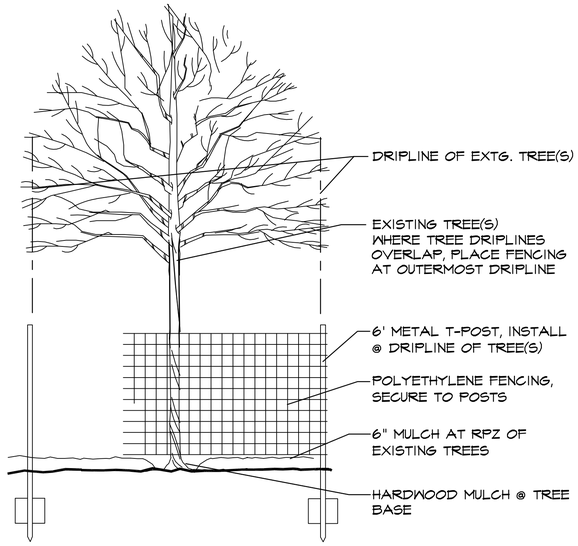


PLAN VIEW

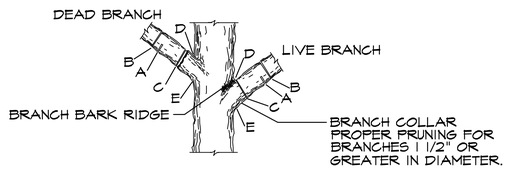
TREE PROTECTION NOTES:

1. All trees to be preserved shall be protected against injury or damage, including soil compaction, breaking or skinning of roots, trunks, or branches during construction operations. A minimum of 50% of the RPZ shall be preserved at natural grade. No cutting, filling, trenching, root disturbance, soil disturbance, or construction impacts shall occur closer to the trunk than 1/2 the RPZ radius.
2. Protect designated tree with a temporary min. 4' ht fencing. See Detail 2/L3.6.
3. Erect temporary fencing before commencing site preparation work. Maintain fencing during full construction period. Remove fencing only when all hardscape construction work is completed.
4. Protect all existing trees from disposal or storage of construction materials or vehicle parking. Protect trees from spreading of spoiled soil over RPZ.
5. Install and maintain minimum of 6" mulch at RPZ. See Detail 2/L3.6.
6. Repair preserved trees damaged by construction operations per aborist industry standards. All broken branches and exposed roots of existing trees shall be cut cleanly. All oak species must be painted with tree wound dressing within 30 minutes.
7. The proposed finished grade and elevation within the RPZ of any existing tree shall not be raised or lowered more than three (3) inches. Finished grade and elevation above or below 3" shall included tree wells/retaining walls outside the RPZ.
8. Replace trees scheduled to remain that are removed or damaged beyond repair by construction operations, as determined by Landscape Architect or City Representative, with tree(s) of similar size and species. Cost for tree replacement shall be determined in accordance with the Tree Evaluation Formula as described in "A Guide to the Professional Evaluation of Landscape Trees, Specimen Shrubs, and Evergreens" as published by the International Society of Arboriculture.
9. All costs for repair and replacement of preserved trees damaged by construction operations or lack of adequate protection during construction shall be borne by Contractor.

1 ROOT PROTECTION ZONE (RPZ)
NTS



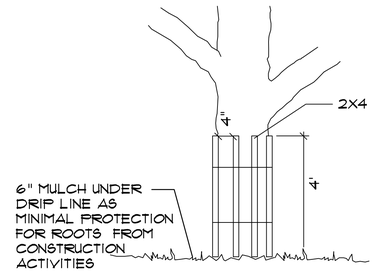
2 TREE BARRICADE FENCING
NTS



NOTE: DO NOT CUT FROM D to E.

A. FIRST CUT - TO PREVENT THE BARK FROM BEING PEELED WHEN THE BRANCH FALLS.
B. SECOND CUT - TO REDUCE THE WEIGHT OF BRANCH.
C. FINAL CUT - ALLOW FOR HEALING COLLAR BUT NO STUBS
D. BRANCH RIDGES - INDENT PROPERLY BRANCH RIDGES WHICH ARE SITE FOR DECAY.

FOR OAKS ONLY: PAINT ALL WOUNDS OR CUTS WITH PRUNING PAINT WITHIN 30 MIN TO PREVENT THE SPREAD OF OAK WILT.



NOTE:
WRAP TREE TRUNK WITH 2"X4" STUDS AND ROPE OR BAND IN PLACE AS NEEDED TO PROTECT TREES IN WORK AREAS.

4 TREE ARMOR
NTS

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210-366-1911/210-366-0044 fax

No.	Revision	Drawn	Approved	Date

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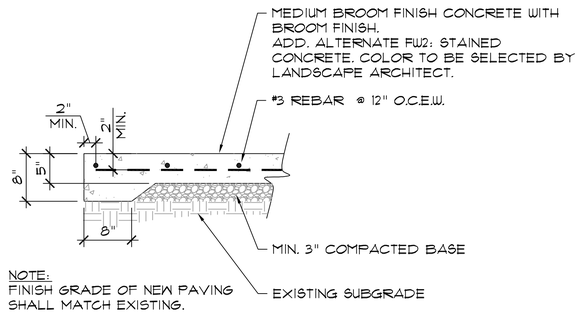
CHILLED WATER PLANT IMPROVEMENTS
TREE PRESERVATION DETAILS

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. SDT | CK. ABF | JOB No. 15-958

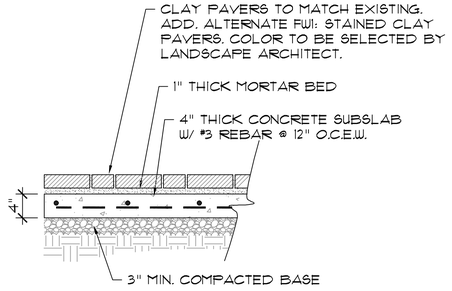
STATE OF TEXAS · ANDREW B. FERNANDEZ · 5218 · REGISTERED LANDSCAPE ARCHITECT
12/11/2015

SHEET L5.2 OF 20

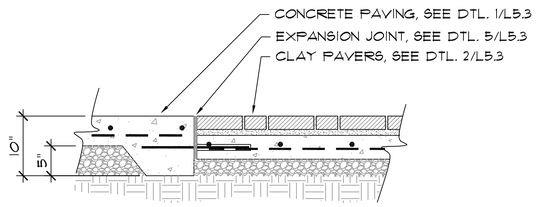


NOTE:
FINISH GRADE OF NEW PAVING SHALL MATCH EXISTING.

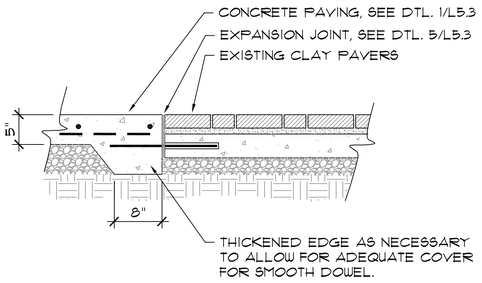
1 CONCRETE PAVING
SCALE: 1"=1'-0"



2 CLAY PAVERS ON CONCRETE BASE
SCALE: 1"=1'-0"

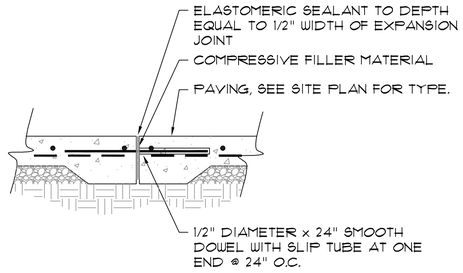


3 NEW CONCRETE @ NEW PAVERS
SCALE: 1"=1'-0"

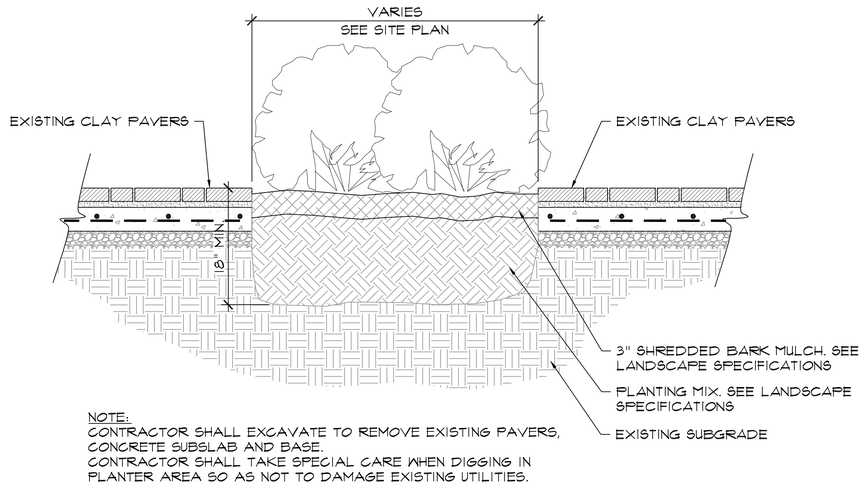


4 NEW CONCRETE @ EXISTING PAVERS
SCALE: 1"=1'-0"

NOTE:
WHERE NEW PAVING ABUTS EXISTING PAVING, PLACE SLIP TUBE IN NEW PAVING. CORE DRILL AND EPOXY GROUT SMOOTH DOWEL INTO EXISTING PAVING.

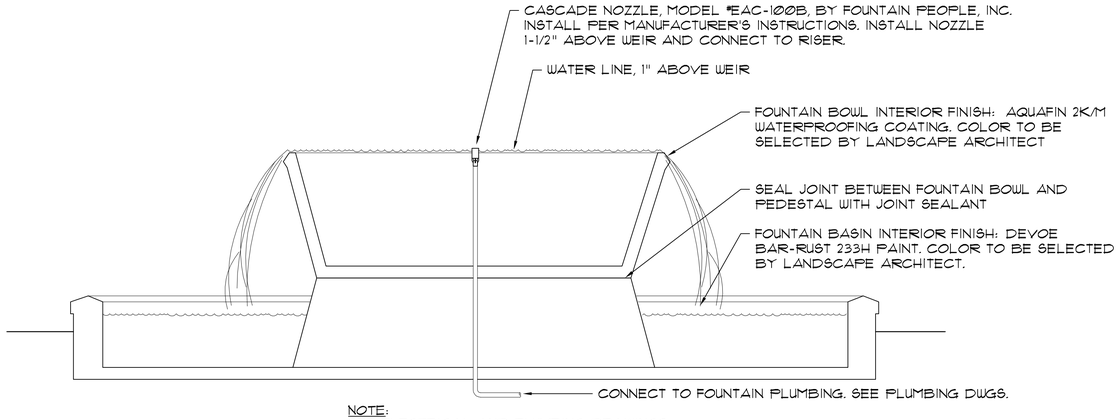


5 EXPANSION JOINT
SCALE: 1"=1'-0"



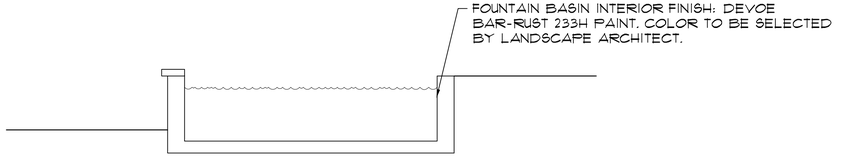
NOTE:
CONTRACTOR SHALL EXCAVATE TO REMOVE EXISTING PAVERS, CONCRETE SUBSLAB AND BASE.
CONTRACTOR SHALL TAKE SPECIAL CARE WHEN DIGGING IN PLANTER AREA SO AS NOT TO DAMAGE EXISTING UTILITIES.

6 PLANTER IN PAVERS
SCALE: 1"=1'-0"



NOTE:
SEE ELECTRICAL AND PLUMBING DRAWINGS FOR DRAINAGE, PIPING, POWER, ETC.

7 FOUNTAIN FINISH DETAIL
NOT TO SCALE



NOTE:
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8 REFLECTING POOL FINISH DETAIL
NOT TO SCALE

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Coltrane • Fernandez • Zavala
Landscape Architecture & Planning
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REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

HARDSCAPE DETAILS

DEVELOPER:

CONT.	BUDGET PROJ.
SUBMITTED	
APPROVED	
MAP No.	SHEET L5.3
SECT. No.	
DR. SDT CK. ABF	JOB No. 15-958 OF 20

STATE OF TEXAS · ROBERT A. FERNANDEZ · 1218 · REGISTERED LANDSCAPE ARCHITECT · 12/11/2015

ELECTRICAL SYMBOLS AND ABBREVIATIONS

NOTE: NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT. REFER TO SPECIFICATIONS MANUAL FOR ADDITIONAL REQUIREMENTS.

POWER SYMBOLS

- MOTOR, HP AS INDICATED
- CONTROLLER TO BE FURNISHED UNDER DIVISION 15
- DISCONNECT SWITCH
- MAGNETIC MOTOR STARTER
- COMBINATION MOTOR STARTER
- C — CONTACTOR
- J — JUNCTION BOX, CEILING MOUNTED
- J — JUNCTION BOX, WALL MOUNTED
- R — RELAY
- SIMPLEX RECEPTACLE
- DUPLEX RECEPTACLE
- GFCI WP — DUPLEX RECEPTACLE; GFI=GROUND FAULT CIRCUIT INTERRUPTER; WP=WEATHERPROOF; IG=ISOLATED GROUND
- DOUBLE DUPLEX (QUADRUPLEX) RECEPTACLE
- FLOOR OUTLET DUPLEX RECEPTACLE
- FLOOR OUTLET SIMPLEX RECEPTACLE
- FLOOR OUTLET QUADRUPLEX RECEPTACLE
- D — DROP CORD RECEPTACLE
- SPECIAL PURPOSE OUTLET AS DESIGNATED
- SINGLE FACE PEDESTAL
- DOUBLE FACE PEDESTAL RECEPTACLE
- EQUIPMENT CONNECTION
- CONNECT TO EXISTING

LIGHTING CONTROL SYMBOLS

- S_3 — SINGLE POLE SWITCH, SUBSCRIPT INDICATES ASSOCIATED CIRCUITRY
- S_D — DIMMABLE SWITCH
- S_2 — DOUBLE POLE SWITCH
- S_3 — THREE-WAY SWITCH
- S_4 — FOUR-WAY SWITCH
- S_K — KEY OPERATED SWITCH
- S_P — SWITCH WITH PILOT LIGHT IN HANDLE (ON=LIGHTED UNLESS OTHERWISE NOTED)
- S_{WP} — WEATHERPROOF SWITCH
- S_M S_{MT} — MANUAL MOTOR STARTER (T=THERMAL OVERLOAD, SIZED FOR MOTOR)
- DS — DOOR SWITCH
- S_T — TIME SWITCH
- S_{SC} — SPEED CONTROL
- S_{PB} — PUSH BUTTON
- S_O — SWITCH, OCCUPANCY SENSOR, WALL MOUNT
- S_{LV} — MOMENTARY CONTACT OVERRIDE SWITCH

LIGHTING CONTROL SYMBOLS (CONT.)

- OCCUPANCY SENSOR, CEILING MOUNTED, DUAL TECHNOLOGY. THE CONTRACTOR SHALL PROVIDE ALL REQUIRED POWER PACKS
- OCCUPANCY SENSOR WALL MOUNTED, DUAL TECHNOLOGY. THE CONTRACTOR SHALL PROVIDE ALL REQUIRED POWER PACKS

LIGHTING SYMBOLS

- INCANDESCENT OR HID FIXTURE, CEILING MOUNTED
- INCANDESCENT OR HID FIXTURE, WALL MOUNTED
- FLUORESCENT TROFFER, RECESSED OR SURFACE MOUNTED
- EXIT SIGN – SINGLE FACE
- EXIT SIGN – SINGLE FACE WITH ONE-WAY DIRECTIONAL ARROW
- EXIT SIGN – SINGLE FACE WITH TWO-WAY DIRECTIONAL ARROWS
- EXIT SIGN – DOUBLE FACE
- EXIT SIGN – DOUBLE FACE WITH 2 ONE-WAY DIRECTIONAL ARROWS
- EMERGENCY LIGHT, BATTERY TYPE WITH CHARGER
- EXTERIOR FLOOD LIGHT
- POLE MOUNTED LUMINAIRE (SQUARE)
- POLE MOUNTED LUMINAIRE (ROUND)
- TRACK LIGHT WITH HEADS AS INDICATED
- LC — LIGHTING CONTACTOR
- PP — POWER PACK

ELECTRICAL RACEWAYS

- CONDUIT CONCEALED IN WALL OR CEILING
- CONDUIT UNDER FLOOR OR UNDERGROUND
- SWITCH LEG
- SURFACE MOUNTED RACEWAY WITH ALL REQUIRED FITTINGS AND HARDWARE. PROVIDE RECEPTACLES AS INDICATED.
- SURFACE MOUNTED RACEWAY RISER SECTION WITH ALL REQUIRED FITTINGS AND HARDWARE
- BUS DUCT WITH TAKE OFF DEVICE
- UGE — UNDERGROUND ELECTRICAL (APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXACT LOCATION IN FIELD)
- UGT — UNDERGROUND TELEPHONE (APPROXIMATE LOCATION, CONTRACTOR TO VERIFY EXACT LOCATION IN FIELD)
- PIA-2,4,6 — BRANCH CIRCUIT HOMERUN SUBSCRIPT 'PIA' INDICATES PANEL AND 2,4,6 INDICATES BREAKER POSITION

CABLE TRAY AND RELATED ITEMS

- CABLE TRAY – 90 DEGREE FITTING
- CABLE TRAY – TEE FITTING
- CABLE TRAY – X FITTING
- CABLE TRAY – 90 DEGREE VERTICAL BENDS: IN & OUT FOR ELEVATION CHANGE
- CABLE TRAY – 90 DEGREE VERTICAL BEND: IN OR OUT FOR TRAY UP OR DOWN
- CABLE TRAY

FIRE ALARM SYSTEM SYMBOLS

- FACP — FIRE ALARM CONTROL PANEL
- ANN — REMOTE ANNUNCIATOR PANEL
- FAEX — FIRE ALARM EXPANSION PANEL
- F — MANUAL PULL STATION (G=VANDAL PROOF GUARD)
- AV — AUDIOVISUAL ANNUNCIATOR (G=VANDAL PROOF GUARD) □ = WALL MOUNT ○ = CEILING MOUNT
- V — VISUAL ANNUNCIATOR (G=VANDAL PROOF GUARD) □ = WALL MOUNT ○ = CEILING MOUNT
- A — AUDIBLE ANNUNCIATOR (G=VANDAL PROOF GUARD) □ = WALL MOUNT ○ = CEILING MOUNT
- SD — SMOKE DETECTOR (G=VANDAL PROOF GUARD)
- SD D — SMOKE DETECTOR, DUCT MOUNTED
- HD — HEAT DETECTOR (G=VANDAL PROOF GUARD)
- SMOKE FIRE DAMPER
- TS — TEST SWITCH
- FS — FLOW SWITCH
- TS — TAMPER SWITCH
- PS — FIRE SPRINKLER PRESSURE SWITCH
- FS — FIRE ALARM SPEAKER ANNUNCIATOR
- PJ — FIRE FIGHTERS PHONE JACK
- FF — FIRE FIGHTERS TELEPHONE
- DH — MAGNETIC DOOR HOLDER
- H — WALL MOUNTED AUDIBLE ANNUNCIATOR (HORN) (G= VANDAL PROOF GUARD, WP=WEATHERPROOF)

CLOCKS SYSTEM SYMBOLS

- CEILING MOUNTED CLOCK
- H — WALL MOUNTED CLOCK HEIGHT AS DESIGNATED BY ARCHITECT
- WALL MOUNTED DOUBLE FACE HEIGHT AS DESIGNATED BY ARCHITECT

INTERCOM SYSTEM SYMBOLS

- SP — INTERCOM SPEAKER, CEILING MOUNTED (G=VANDAL PROOF GUARD)
- H SP — INTERCOM SPEAKER, WALL MOUNTED (G=VANDAL PROOF GUARD)
- I — INTERCOM CALL SWITCH (V=VOLUME CONTROL)
- I — INTERCOM SPEAKER, EXTERIOR HORN-TYPE (G=VANDAL PROOF GUARD, WP=WEATHERPROOF)
- AMP — AMPLIFIER
- ISC — INTERCOM SYSTEM CABINET
- IC — INTERCOM CALL-IN SWITCH
- ACS — ADMINISTRATIVE CONTROL SYSTEM
- I — INTERCOM PUSHBUTTON (V=VOLUME CONTROL)

SECURITY & ACCESS CONTROL SYSTEM SYMBOLS

- SEC — SECURITY MAIN CONTROL PANEL
- DB — DURESS ALARM PUSHBUTTON
- DB — DURESS SYSTEM WIRELESS RECEIVER/ANTENNA
- PB — PUSH BUTTON
- EPB — EGRESS PUSHBUTTON
- CR — CARD READER
- CCTV — CLOSED CIRCUIT TELEVISION OUTLET
- DC — DOOR CONTACT
- ML — MAGNETIC DOOR LOCK
- MD — MOTION DETECTOR, ROUGH-IN ONLY, 90" AFF, MAXIMUM 6" FROM NEAREST CORNER TO CENTER OF BOX, 1/2" CONDUIT TO ABOVE ACCESSIBLE CEILING WITH BUSHINGS AND PULL-STRING UNLESS INDICATED OTHERWISE.
- GB — GLASS BREAK SENSOR ROUGH-IN ONLY, 90" AFF, MAXIMUM 6" FROM NEAREST CORNER TO CENTER OF BOX, 1/2" CONDUIT TO ABOVE ACCESSIBLE CEILING WITH BUSHINGS AND PULL-STRING UNLESS INDICATED OTHERWISE.
- REX — REQUEST TO EXIT SENSOR
- ES — ELECTRIC STRIKE
- CAMERA (OFOI) OWNER FURNISHED, OWNER INSTALLED
- CAM — CAMERA (CFCI) CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
- CAM — DOMED CAMERA

TELECOM. / TELEPHONE / DATA SYSTEM SYMBOLS

- PLYWOOD TELEPHONE BACKBOARD
- TELEPHONE OUTLET IN WALL, ROUGH-IN ONLY, 1" CONDUIT TO ABOVE ACCESSIBLE CEILING WITH BUSHINGS AND PULL-STRING UNLESS INDICATED OTHERWISE.
- 2 — DATA OUTLET IN WALL, ROUGH-IN ONLY, 1" CONDUIT TO ABOVE ACCESSIBLE CEILING WITH BUSHINGS AND PULL-STRING UNLESS INDICATED OTHERWISE.
- (2) REPRESENTS THE QUANTITY OF PORTS IN OUTLET
- 2 — PHONE AND DATA OUTLET IN WALL, ROUGH-IN ONLY, 1" CONDUIT TO ABOVE ACCESSIBLE CEILING WITH BUSHINGS AND PULL-STRING UNLESS INDICATED OTHERWISE.
- FLOOR TELEPHONE AND DATA OUTLET, POKE-THRU TYPE
- T — THERMOSTAT
- CABLE TELEVISION OUTLET, ROUGH-IN ONLY. 15" A.F.F. UNLESS INDICATED OTHERWISE.
- FLOOR CABLE TELEVISION OUTLET
- WAP — WIRELESS ACCESS POINT
- ANTENNA

ONE-LINE DIAGRAM SYMBOLS

- H-O-A SELECTOR SWITCH
- STOP/START PUSHBUTTON STATION
- LIGHTING ARRESTER AND SURGE CAPACITOR
- TRANSFORMER
- TRANSFORMER (SHIELDED)
- M — M — MOTOR STARTER RELAY AND CONTACTOR
- ETM — ELAPSED (RUNNING) TIME METER
- CONTROL POWER TRANSFORMER
- MCP — CIRCUIT BREAKER (MOTOR CIRCUIT PROTECTOR)
- DISCONNECT SWITCH
- BUS STAB
- CT — CURRENT TRANSFORMER
- MOTOR RESISTANCE TYPE WINDING HEATER
- THERMAL OVERLOAD CIRCUIT
- BREAKER (THERMAL MAGNETIC TYPE)
- FUSE
- CONTACT (NORMALLY OPEN)
- CONTACT (NORMALLY CLOSED)
- PUSHBUTTON (NORMALLY OPEN)
- PUSHBUTTON (NORMALLY CLOSED)
- LIMIT SWITCH (NORMALLY OPEN)
- TIME DELAY CONTACT
- PILOT LIGHT W/COLOR INDICATED (A-AMBER ,G-GREEN ,R-RED)
- S — SOLENOID VALVE
- DIFFERENTIAL PRESSURE SWITCH
- E N — AUTOMATIC TRANSFER SWITCH
- DISCONNECT SWITCH 400/3/400AF/N3R INDICATES FRAME SIZE/POLES/FUSE AMPACITY/ENCLOSURE

PANELS AND RELATED EQUIPMENT

- PANELBOARD SURFACE MOUNTED (REFER TO PANEL SCHEDULE)
- PANELBOARD FLUSH MOUNTED (REFER TO PANEL SCHEDULE)
- TRANSFORMER, WITH CONCRETE HOUSEKEEPING PAD (REFER TO ONE-LINE DIAGRAM)
- ATS — AUTOMATIC TRANSFER SWITCH (REFER TO ONE-LINE DIAGRAM)

ABBREVIATIONS

A	AMPERE
AC	ABOVE COUNTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AIC	AMPERE INTERRUPTING CAPACITY
BLDG	BUILDING
C	CONDUIT
CAB	CABINET
CKT	CIRCUIT
CONN	CONNECT OR CONNECTION
CT	CURRENT TRANSFORMER
EA	EACH
EF	EXHAUST FAN
ELEC	ELECTRIC
EMER	EMERGENCY
FACP	FIRE ALARM CONTROL PANEL
FLA	FULL LOAD AMPS
FLEX	FLEXIBLE CONDUIT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND	GROUND
HOA	HAND-OFF-AUTO
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HTR	HEATER
J-BOX	JUNCTION BOX
kVA	KILOVOLT AMPERE
kVAR	KILOVOLT AMPERE REACTIVE
kCM	THOUSAND CIRCULAR MILS
kV	KILOWATT
LTG	LIGHT OR LIGHTING
MFG	MANUFACTURER
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MIN	MINIMUM
MH	METAL HALIDE
MLO	MAIN LUG ONLY
MSB	MAIN SWITCHBOARD
MTD	MOUNTED
NEC	NATIONAL ELECTRICAL CODE
NTS	NOT TO SCALE
ø	PHASE
OL	OVERLOAD
OVHD	OVERHEAD
PA	PUBLIC ADDRESS
SC	SPLIT CIRCUIT
SFD	SMOKE FIRE DAMPER
SW	SWITCH
T/D	TELEPHONE & DATA
TTB	TELEPHONE TERMINAL BOARD
TYP	TYPICAL
UC	UNDER COUNTER
UG	UNDERGROUND
UNO	UNLESS NOTED OTHERWISE
V	VOLT
W	WATTS
W/	WITH
WP	WEATHER PROOF
XFMR	TRANSFORMER

PROJECT # 15085

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No.	Revision	Drawn	Approved	Date

REVISIONS

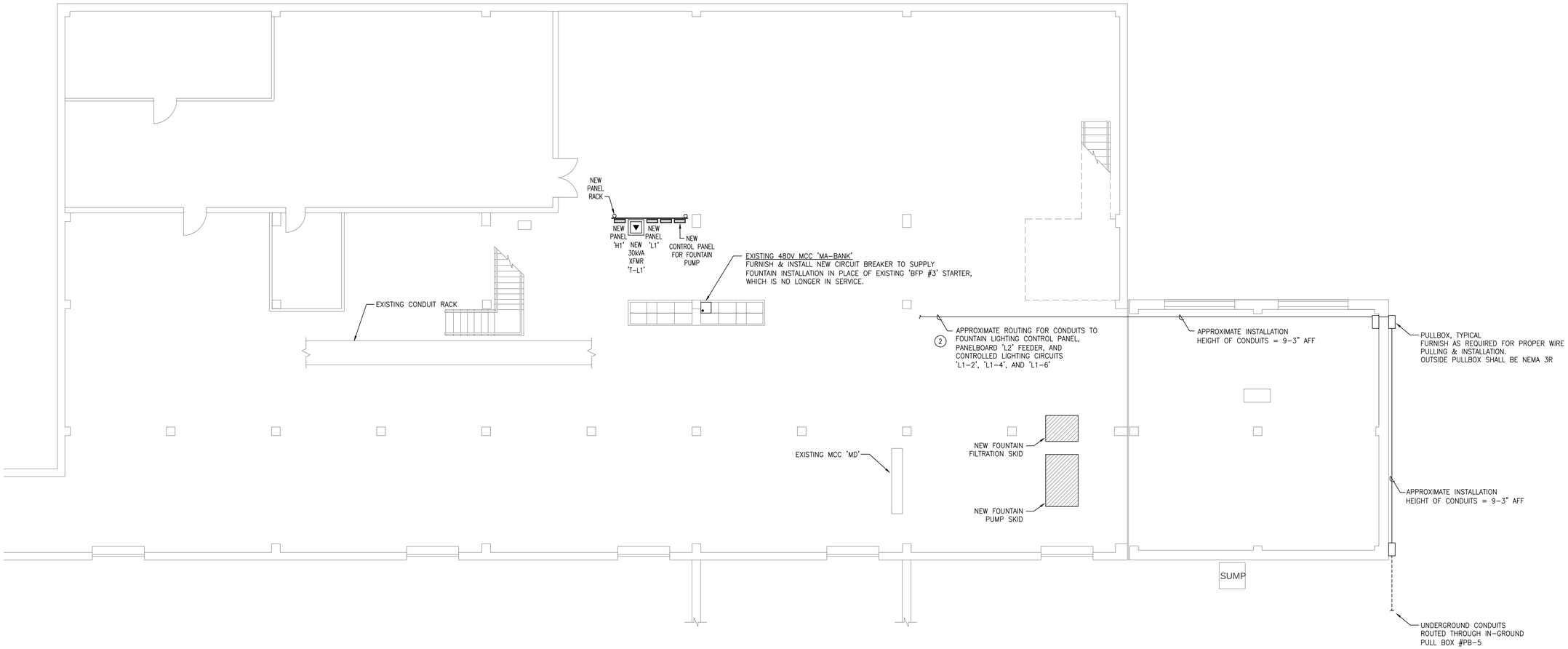
CHILLED WATER PLANT IMPROVEMENTS

ELECTRICAL SYMBOLS & ABBREVIATIONS

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. | CK. | JOB No.

SHEET **E0.0** Of

STATE OF TEXAS — LON M. CULBERTSON — 105679 — LICENSED PROFESSIONAL ENGINEER — 12-11-15
Alderson & Associates, Inc. F-1008



1 ELECTRICAL BASEMENT PLAN - NEW WORK

SCALE: 1/8" = 1'-0"

KEYED NOTES: (APPLIES TO THIS SHEET ONLY) ◯

1. SEE SHEET E1.1 FOR NEW WORK SCOPE AT FOUNTAINS AND ON FIRST FLOOR ABOVE.
2. CONTRACTOR SHALL PROVIDE ALL EQUIPMENT, MATERIALS, CONDUIT, WIRE & LABOR FOR A COMPLETE OPERATIONAL FOUNTAIN SYSTEM.
3. COORDINATE EXACT LOCATION OF ELECTRICAL PANELS, TRANSFORMERS AND CONTROL PANELS WITH OWNER'S REPRESENTATIVE.

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BASEMENT ELECTRICAL PLAN

DEVELOPER:

CONT. | BUDGET PROJ.

SUBMITTED

APPROVED

MAP No. | SHEET **E0.1**

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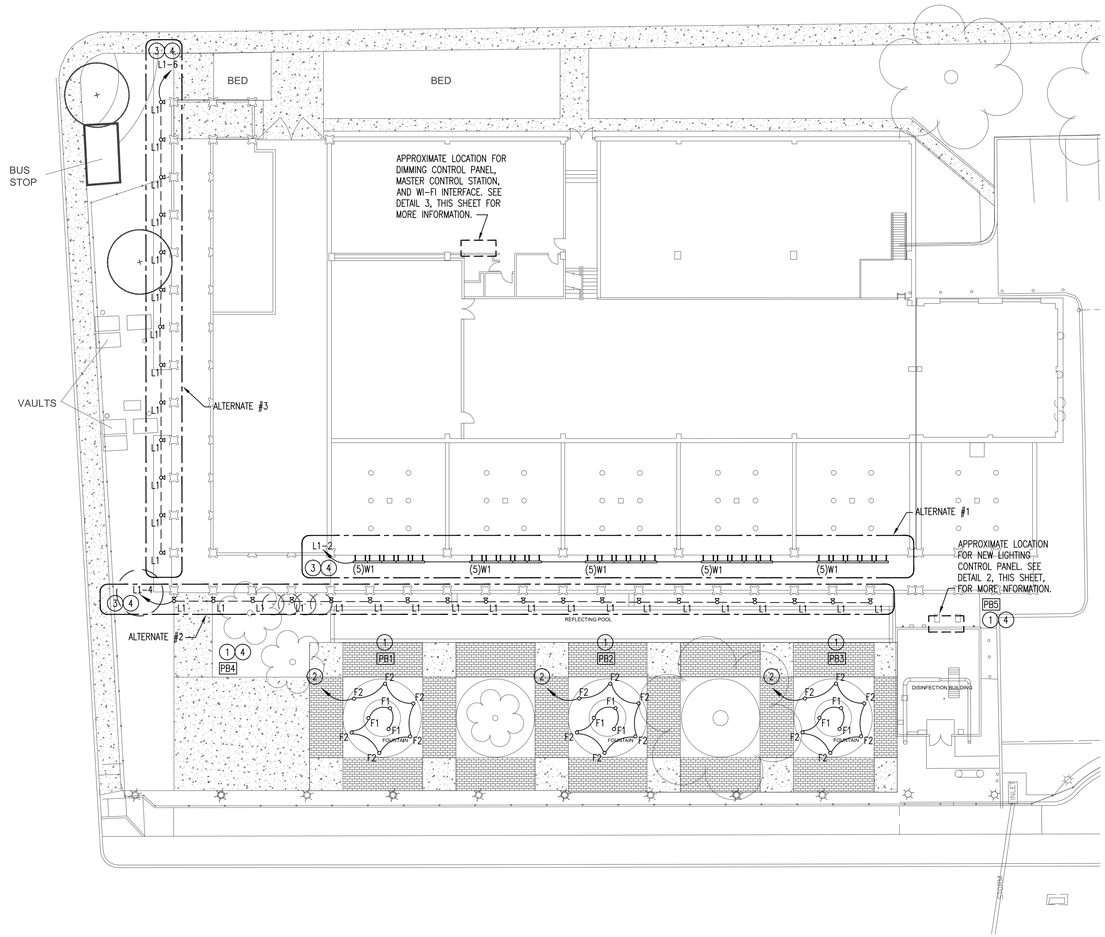
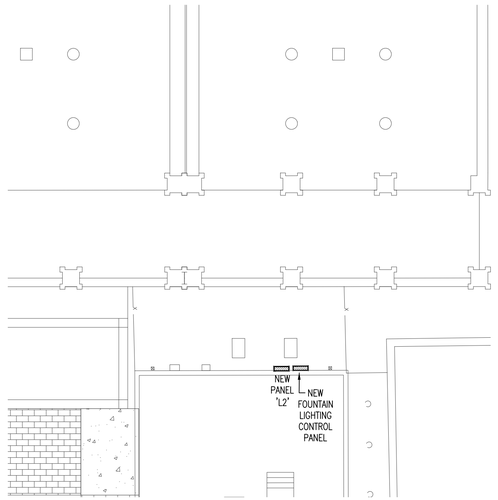


PLAN NORTH

1 **ELECTRICAL SITE PLAN**

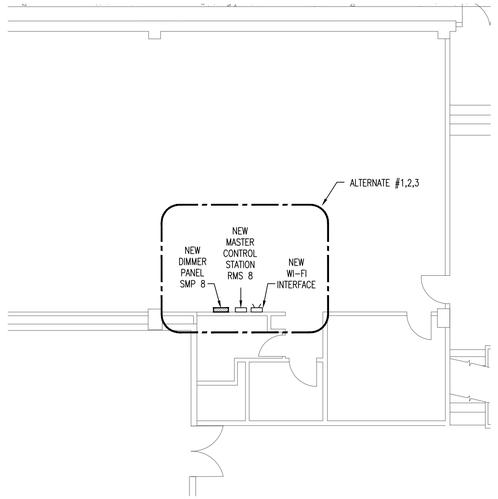
SCALE: 1" = 20'-0"



PLAN NORTH

2 **ELECTRICAL PARTIAL YARD PLAN**

SCALE: 1/8" = 1'-0"



PLAN NORTH

3 **ELECTRICAL PARTIAL FIRST FLOOR PLAN**

SCALE: 1/8" = 1'-0"

LIGHTING FIXTURE SCHEDULE

TYPE	MANUFACTURER	CATALOG NUMBER	LAMP QTY	LAMP TYPE	BALLAST QTY	BALLAST TYPE	MOUNTING	VOLTAGE	BALLAST INPUT WATTS	DESCRIPTION
F1	FOUNTAIN PEOPLE	LED-300P	1	LED RGB	N/A	DRIVER	FOUNTAIN	120	16	LED RGB FOUNTAIN SPOT LIGHTS, 15° BEAM SPREAD, THICK TEMPERED GLASS LENS, IP68 RATING, FIXTURE TO BE FURNISHED BY FOUNTAIN PEOPLE OR EQUAL
F2	FOUNTAIN PEOPLE	LED-180P	1	LED RGB	N/A	DRIVER	FOUNTAIN	120	27	LED RGB FOUNTAIN LINEAR LIGHTS, 15° BEAM SPREAD, THICK TEMPERED GLASS LENS, IP68 RATING, FIXTURE TO BE FURNISHED BY FOUNTAIN PEOPLE OR EQUAL
L1 ALTERNATE #2 & 3	VISTA PROFESSIONAL OUTDOOR LIGHTING	1057-G-NS-30-C-MV-RES-HS; STANCHION STM-G-24-S-LED	1	LED 3000K	N/A	DRIVER	STANCHION	120	43	LED ACCENT LIGHT, DIE-CAST CORROSION RESISTANT HOUSING, NARROW SPOT DISTRIBUTION, WITH HALF LIGHT SHIELD, RESISTANCE DIMMING DRIVER, VERDE FINISH, FIXTURE TO BE MOUNTED TO 24" STANCHION, STANCHION TO BE MOUNTED OVER J-BOLT ANCHOR ASSEMBLY (RECESSED IN CONCRETE)
W1 ALTERNATE #1	BL INNOVATIVE LIGHTING	FIXTURE BL-WWL-56W-RGB-45; CONTROLLER BL-DMX-USB512; DMX CABLE	1	LED RGB	N/A	DRIVER	WALL/ BRACKET	120	56	LED RGB LINEAR WALLWASHER, SPLASH PROOF, (1) DMX USB CONTROLLER FOR EVERY (5) FIXTURE SECTION, FIXTURE TO BE PROVIDED WITH CUSTOM MOUNTING BRACKET BY MANUFACTURER, MOUNTING BRACKET TO HAVE 180° ADJUSTABLE ROTATION AND BE 2'-0" IN LENGTH TO ALLOW FIXTURE TO BE MOUNTED OFF OF WALL AND AIMED TOWARDS CHILLER WATER.

NOTES:

1. REFER TO ARCHITECTURAL DRAWINGS FOR INFORMATION REGARDING CEILING TYPES. PROVIDE MOUNTING HARDWARE, FLANGES AS REQUIRED. CEILING TYPE INDICATED IN ARCHITECTURAL DRAWINGS WILL TAKE PRECEDENCE OVER MOUNTING OPTION INDICATED IN PART NUMBER.
2. REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
3. THE FIXTURES LISTED IN THE FIXTURE SCHEDULE HAVE BEEN SELECTED BASE ON A NUMBER OF FACTORS WHICH MAY OR MAY NOT BE UNIQUE TO THOSE FIXTURES. THE CONTRCTOR MAY PROPOSE SUBSTITUTIONS IN ACCORDANCE WITH THE REQUIREMENTS LISTED IN THE SPECIFICATIONS MANUAL.

KEYED NOTES: (APPLIES TO THIS SHEET)

1. IN GROUND PULLBOX, SEE DETAILS, SHEET E3.1.
2. ROUTE FOUNTAIN LIGHTS THROUGH IN GROUND PULL BOX TO FOUNTAIN LIGHTING CONTROL PANEL.
3. ROUTE INDICATED CIRCUIT THROUGH DIMMER PANEL TO PANELBOARD "L1" IN BASEMENT.
4. ROUTE CONDUITS UNDERGROUND IN PVC CONDUIT THROUGH IN GROUND PULL BOXES PB-4 AND PB-5. SEE SHEET E0.1 FOR CONDUIT ROUTING.

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SITE LIGHTING PLAN

DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. CK. JOB No.

SHEET **E1.1** OF

PANEL H1

PROJECT: CENTRAL COOLING PLANT
PROJECT #: 15-085
LOCATION: BASEMENT
MOUNTING: SURFACE
ENCLOSURE: NEMA 1
VOLTAGE: 480/277V, 3Ph., 4W
BUSSING: 225A CU
MAINS: 225A MLO
CODES: 0=RCPT 1=EQPT 2=LTG 3=A/C 4=HTG 5=LGST MTR 6=SUBPANEL
BREAKER MTG: BOLT ON
ACCESSORIES: GND BUS
INTERUPT RATING: 25,000 AIC

CODE	BRKR	CIRCUIT USE	CKT	LOAD		LOAD	CKT	CIRCUIT USE	BRKR	CODE
1	90/3	FOUNTAIN PUMPS CONTROL PANEL	1	20,000	A	4,348	2	PANELBOARD 'L1' VIA XFMR	45/3	
1	-	-	3	20,000	B	4,348	4	-	-	
1	-	-	5	20,000	C	4,348	6	-	-	
1	20/3	FOUNTAIN FILTER CONTROL PANEL	7	1,100	A		8	SPARE	20/3	
1	-	-	9	1,100	B		10	-	-	
1	-	-	11	1,100	C		12	-	-	
	40/3	SPARE	13		A		14	SPARE	30/3	
	-	-	15		B		16	-	-	
	-	-	17		C		18	-	-	
		EQUIPPED SPACE	19		A		20	EQUIPPED SPACE		
		EQUIPPED SPACE	21		B		22	EQUIPPED SPACE		
		EQUIPPED SPACE	23		C		24	EQUIPPED SPACE		
		EQUIPPED SPACE	25		A		26	EQUIPPED SPACE		
		EQUIPPED SPACE	27		B		28	EQUIPPED SPACE		
		EQUIPPED SPACE	29		C		30	EQUIPPED SPACE		

	SUBPNL VA	LTG VA	RCPT VA	EQPT VA	HVAC VA	MTR VA	CONN VA	CONN A	DIVERSIFIED VA	DIV A
PHASE A	-	-	4,348	21,100	-	-	25,448	92	24,941	90
PHASE B	-	-	4,348	21,100	-	-	25,448	92	24,941	90
PHASE C	-	-	4,348	21,100	-	-	25,448	92	24,941	90
TOTAL	-	-	13,045	63,300	-	-	76,345	N/A	74,823	N/A

NOTES:

1. IT IS THE CONTRACTOR AND MANUFACTURERS RESPONSIBILITY TO COORDINATE ALL LUG SIZES AND QUANTITIES, INCLUDING BUS LUGS, MAIN AND BRANCH CIRCUIT BREAKERS WITH FEEDERS INDICATED, SEE SINGLE LINE DIAGRAM.

PANEL L1

PROJECT: CENTRAL COOLING PLANT
PROJECT #: 15-085
LOCATION: BASEMENT
MOUNTING: SURFACE
ENCLOSURE: NEMA 1
VOLTAGE: 208/120V, 3Ph., 4W
BUSSING: 125A CU
MAINS: 100A MCB
CODES: 0=RCPT 1=EQPT 2=LTG 3=A/C 4=HTG 5=LGST MTR 6=SUBPANEL
BREAKER MTG: BOLT ON
ACCESSORIES: GND BUS
INTERUPT RATING: 22,000 AIC

CODE	BRKR	CIRCUIT USE	CKT	LOAD		LOAD	CKT	CIRCUIT USE	BRKR	CODE
	100/3	PANELBOARD L2	1	3,863	A	1,500	2	LANDSCAPE LIGHTS (GFCI) NOTE 2	20/1	
	-	-	3	3,863	B	1,500	4	LANDSCAPE LIGHTS (GFCI) NOTE 2	20/1	
	-	-	5	3,863	C	1,500	6	LANDSCAPE LIGHTS (GFCI) NOTE 2	20/1	
	20/1	SPARE	7		A		8	SPARE (GFCI) NOTE 2	20/1	
	20/1	SPARE	9		B		10	SPARE (GFCI) NOTE 2	20/1	
	20/1	SPARE	11		C		12	SPARE (GFCI) NOTE 2	20/1	
	20/1	SPARE	13		A		14	SPARE	20/1	
		EQUIPPED SPACE	15		B		16	EQUIPPED SPACE		
		EQUIPPED SPACE	17		C		18	EQUIPPED SPACE		
		EQUIPPED SPACE	19		A		20	EQUIPPED SPACE		
			21		B		22			
			23		C		24			
			25		A		26			
			27		B		28			
			29		C		30			

	SUBPNL VA	LTG VA	RCPT VA	EQPT VA	HVAC VA	MTR VA	CONN VA	CONN A	DIVERSIFIED VA	DIV A
PHASE A	-	-	5,363	-	-	-	5,363	45	4,348	36
PHASE B	-	-	5,363	-	-	-	5,363	45	4,348	36
PHASE C	-	-	5,363	-	-	-	5,363	45	4,348	36
TOTAL	-	-	16,090	-	-	-	16,090	N/A	13,045	N/A

NOTES:

1. IT IS THE CONTRACTOR AND MANUFACTURERS RESPONSIBILITY TO COORDINATE ALL LUG SIZES AND QUANTITIES, INCLUDING BUS LUGS, MAIN AND BRANCH CIRCUIT BREAKERS WITH FEEDERS INDICATED, SEE SINGLE LINE DIAGRAM.
2. PROVIDE GFCI TYPE CIRCUIT BREAKER FOR LANDSCAPE LIGHTS

PANEL L2

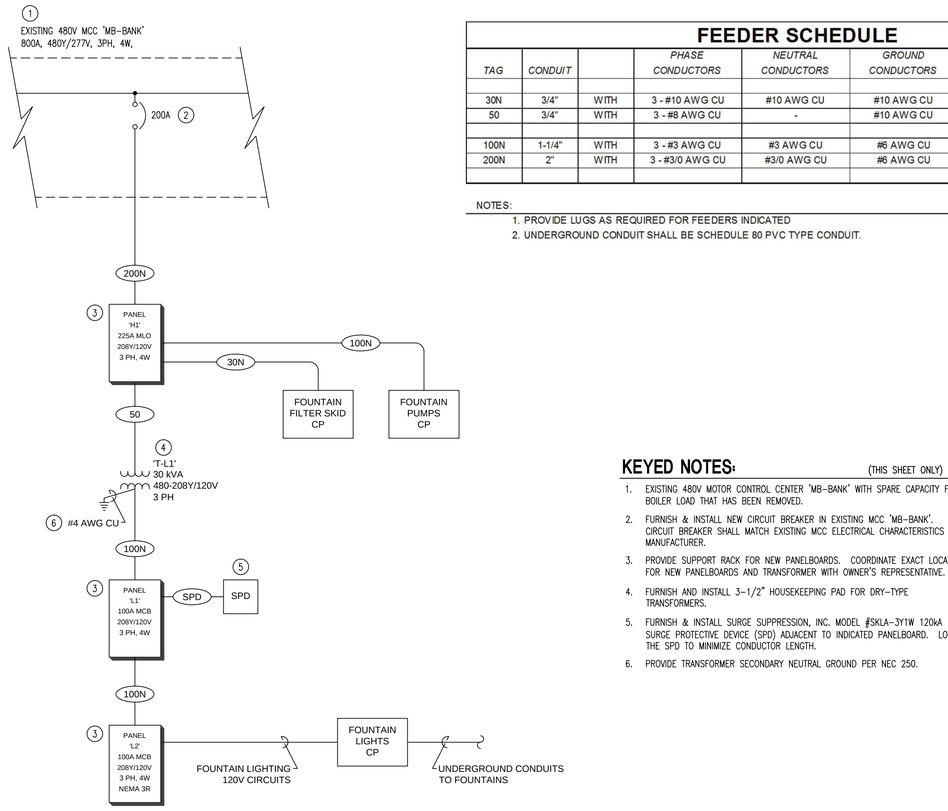
PROJECT: CENTRAL COOLING PLANT
PROJECT #: 15-085
LOCATION: EXTERIOR - N.DECHLOR BLDG
MOUNTING: SURFACE
ENCLOSURE: NEMA 3R
VOLTAGE: 208/120V, 3Ph., 4W
BUSSING: 125A CU
MAINS: 100A MCB
CODES: 0=RCPT 1=EQPT 2=LTG 3=A/C 4=HTG 5=LGST MTR 6=SUBPANEL
BREAKER MTG: BOLT ON
ACCESSORIES: GND BUS
INTERUPT RATING: 22,000 AIC

CODE	BRKR	CIRCUIT USE	CKT	LOAD		LOAD	CKT	CIRCUIT USE	BRKR	CODE
	50/1	FOUNTAIN LIGHTS CONTROL PANEL	1	4,000	A	1,500	2	HEAT TRACE-FOUNT PIPING (30 mA GFP) NOTE 2	20/1	
	20/1	HEAT TRACE-FOUNT PIPING (30 mA GFP) NOTE 2	3	1,500	B	1,500	4	HEAT TRACE-FOUNT PIPING (30 mA GFP) NOTE 2	20/1	
	20/1	HEAT TRACE-FOUNT PIPING (30 mA GFP) NOTE 2	5	1,500	C	1,500	6	HEAT TRACE-FOUNT PIPING (30 mA GFP) NOTE 2	20/1	
	20/1	HEAT TRACE-FOUNT PIPING (30 mA GFP) NOTE 2	7	1,500	A		8	SPARE (30 mA GFP) NOTE 2	20/1	
	20/1	RECEPT - GFCI @ PANEL (NOTE 3,4)	9	180	B		10	SPARE (30 mA GFP) NOTE 2	20/1	
	20/1	SPARE	11		C		12	SPARE GFCI (NOTE 3)	20/1	
	20/1	SPARE	13		A		14	SPARE GFCI (NOTE 3)	20/1	
		EQUIPPED SPACE	15		B		16	EQUIPPED SPACE		
		EQUIPPED SPACE	17		C		18	EQUIPPED SPACE		
		EQUIPPED SPACE	19		A		20	EQUIPPED SPACE		

	SUBPNL VA	LTG VA	RCPT VA	EQPT VA	HVAC VA	MTR VA	CONN VA	CONN A	DIVERSIFIED VA	DIV A
PHASE A	-	-	7,000	-	-	-	7,000	58	3,863	32
PHASE B	-	-	3,180	-	-	-	3,180	27	3,863	32
PHASE C	-	-	3,000	-	-	-	3,000	25	3,863	32
TOTAL	-	-	13,180	-	-	-	13,180	N/A	11,590	N/A

NOTES:

1. IT IS THE CONTRACTOR AND MANUFACTURERS RESPONSIBILITY TO COORDINATE ALL LUG SIZES AND QUANTITIES, INCLUDING BUS LUGS, MAIN AND BRANCH CIRCUIT BREAKERS WITH FEEDERS INDICATED, SEE SINGLE LINE DIAGRAM.
2. PROVIDE 30 mA GROUND FAULT PROTECTION FOR EQUIPMENT CIRCUIT BREAKER FOR HEAT TRACE CIRCUITS.
3. PROVIDE GFCI CIRCUIT BREAKER FOR OUTDOOR RECEPTACLE CIRCUITS.
4. PROVIDE 120V DUPLEX RECEPTACLE IN WEATHERPROOF ENCLOSURE ADJACENT TO PANELBOARD LOCATION.



1 PARTIAL ELECTRICAL SINGLE LINE DIAGRAM

SCALE: NONE

FEEDER SCHEDULE

TAG	CONDUIT		PHASE CONDUCTORS	NEUTRAL CONDUCTORS	GROUND CONDUCTORS	REMARK
30N	3/4"	WITH	3 - #10 AWG CU	#10 AWG CU	#10 AWG CU	
50	3/4"	WITH	3 - #8 AWG CU	-	#10 AWG CU	
100N	1-1/4"	WITH	3 - #3 AWG CU	#3 AWG CU	#6 AWG CU	
200N	2"	WITH	3 - #3/0 AWG CU	#3/0 AWG CU	#6 AWG CU	

NOTES:

1. PROVIDE LUGS AS REQUIRED FOR FEEDERS INDICATED
2. UNDERGROUND CONDUIT SHALL BE SCHEDULE 80 PVC TYPE CONDUIT.

KEYED NOTES: (THIS SHEET ONLY)

1. EXISTING 480V MOTOR CONTROL CENTER 'MB-BANK' WITH SPARE CAPACITY FROM BOILER LOAD THAT HAS BEEN REMOVED.
2. FURNISH & INSTALL NEW CIRCUIT BREAKER IN EXISTING MCC 'MB-BANK'. CIRCUIT BREAKER SHALL MATCH EXISTING MCC ELECTRICAL CHARACTERISTICS AND MANUFACTURER.
3. PROVIDE SUPPORT RACK FOR NEW PANELBOARDS. COORDINATE EXACT LOCATION FOR NEW PANELBOARDS AND TRANSFORMER WITH OWNER'S REPRESENTATIVE.
4. FURNISH AND INSTALL 3-1/2" HOUSEKEEPING PAD FOR DRY-TYPE TRANSFORMERS.
5. FURNISH & INSTALL SURGE SUPPRESSION, INC. MODEL #SKLA-3Y1W 120kA SURGE PROTECTIVE DEVICE (SPD) ADJACENT TO INDICATED PANELBOARD. LOCATE THE SPD TO MINIMIZE CONDUCTOR LENGTH.
6. PROVIDE TRANSFORMER SECONDARY NEUTRAL GROUND PER NEC 250.

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No.	Revision	Drawn	Approved	Date

REVISIONS

CHILLED WATER
PLANT IMPROVEMENTS
ELECTRICAL
ONE LINE & SCHEDULES

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. | CK. | JOB No.
SHEET E2.1 OF

STATE OF TEXAS
LON M. CULBERTSON
105679
LICENSED
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12-11-15
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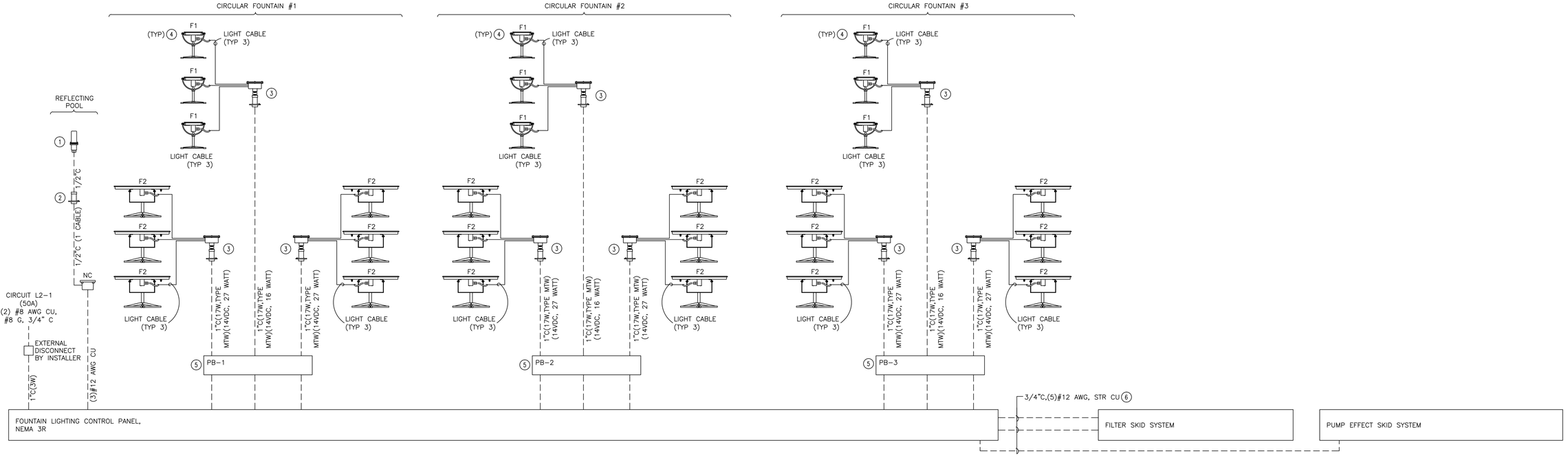

1 FOUNTAIN LIGHTING DIAGRAM

SCALE: NOT TO SCALE

KEYED NOTES: (APPLIES TO THIS SHEET)

1. WATER LEVEL SENSOR AND HOUSING.
2. WATER STOP FITTING.
3. UNDERWATER JUNTION BOX.
4. REFER TO LIGHTING FIXTURE SCHEDULE FOR MORE INFORMATION.
5. IN GROUND PULL BOX. LOCATE ADJACENT TO EACH FOUNTAIN. SEE SHEET E1.1.
6. ROUTE CONDUIT AND WIRE FROM FOUNTAIN LIGHTING CONTROL PANEL TO EQUIPMENT IN BASEMENT. SEE SHEET E0.1 FOR MORE INFORMATION.

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No.	Revision	Drawn	Approved	Date

REVISIONS

CHILLED WATER PLANT IMPROVEMENTS ELECTRICAL FOUNTAIN LIGHTING CONTROLS

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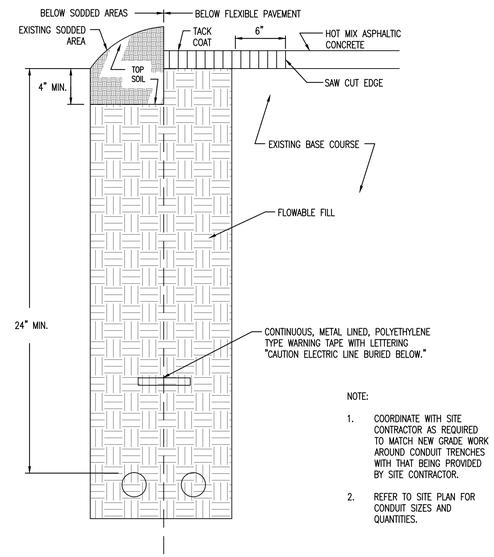
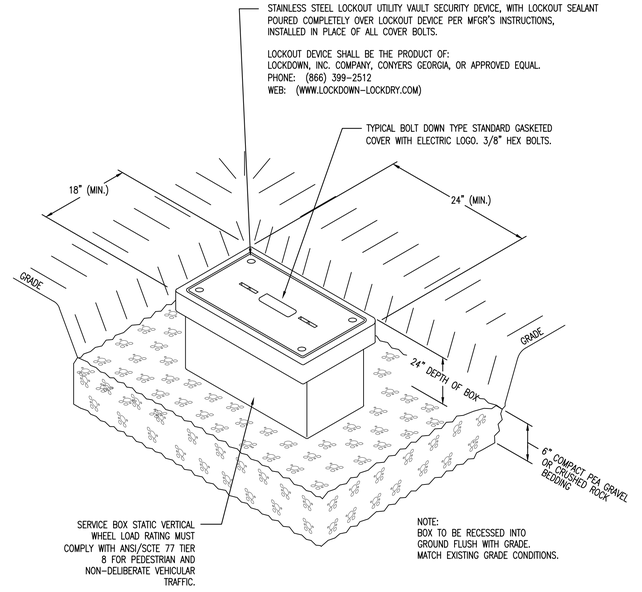


NOTE:

1. COORDINATE WITH SITE CONTRACTOR AS REQUIRED TO MATCH NEW GRADE WORK AROUND CONDUIT TRENCHES WITH THAT BEING PROVIDED BY SITE CONTRACTOR.
2. REFER TO SITE PLAN FOR CONDUIT SIZES AND QUANTITIES.

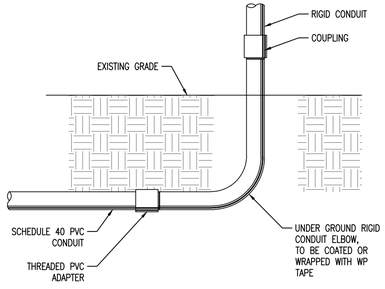
1 CONDUIT BURIAL DETAIL / PARKING LOTS / DRIVEWAYS

SCALE: NOT TO SCALE



2 SITE - TYPICAL RECESSED PULL BOX INSTALLATION - T8

SCALE: NOT TO SCALE



3 UG CONDUIT STUBUP

SCALE: NOT TO SCALE

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REVISIONS

CHILLED WATER PLANT IMPROVEMENTS

ELECTRICAL DETAILS

DEVELOPER:

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PLUMBING SYMBOLS AND ABBREVIATIONS

(NOT ALL ITEMS INDICATED APPLY TO THIS PROJECT)

ABBREVIATIONS

A

A	AIR (COMPRESSED)
ABV	ABOVE
AC	ABOVE CEILING
AD	ACCESS DOOR, AREA DRAIN
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AL	ALUMINUM
AP	ACCESS PANEL
ARCH	ARCHITECT, ARCHITECTURAL
AS	AIR SEPARATOR
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS
AV	ACID VENT
AVG	AVERAGE
AW	ACID WASTE
AWS	AMERICAN WELDING SOCIETY
AUX	AUXILIARY

B

B	BOILER
BC	BELOW COUNTER
B/C	BACK OF CURB
BF	BELOW FLOOR
BFV	BUTTERFLY VALVE
BH	BOX HYDRANT
BLDG	BUILDING
BM	BENCHMARK
BOF	BOTTOM OF FOOTING
BOS	BOTTOM OF STRUCTURE
BT	BATH TUB
BTU	BRITISH THERMAL UNIT
BV	BALL VALVE
BWV	BACK WATER VALVE

C

C	CELSIUS
CAB	CABINET
CB	CATCH BASIN
CD	CONDENSATE DRAIN LINE
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CH	CHILLER
CP	CIRCULATING PUMP
CI	CAST IRON
CIRC	CIRCULATING
CL	CENTERLINE
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
CPI	CAST IRON PIPE INSTITUTE
CPVC	CHLORINATED POLYVINYL CHLORIDE
CO	CLEAN OUT
COL	COLUMN
COMB	COMBINATION
COMP	COMPRESSOR
CONC	CONCRETE, CONCENTRIC
CONN	CONNECTION
CONT	CONTINUOS, CONTINUATION
CONTR	CONTROLLER, CONTRACTOR
CRAC	COMPUTER ROOM A/C UNIT
CTR	CENTER
CU	COPPER
CW	COLD WATER

D

D	DEPTH, DRAIN, DRYER
DESIG	DESIGNATION
DTL	DETAIL
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIM	DIMENSION
DISC	DISCONNECT
DN	DOWN
DS	DOWNSPOUT, DOUBLE SUCTION
DW	DISHWASHER
DWG	DRAWING
DWH	DOMESTIC WATER HEATER
DWP	DOMESTIC WATER PUMP

E

EA	EACH
EC	ELECTRICAL CONTRACTOR
ECC	ECCENTRIC
EDF	ELECTRIC DRINKING FOUNTAIN
EFF	EFFICIENCY
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EMERG	EMERGENCY
ENCL	ENCLOSURE
ENGR	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
ET	EXPANSION TANK
ETR	EXISTING TO REMAIN
EXT	EXTERNAL
EXTG	EXISTING

F

F	FAHRENHEIT, FIRE
FBO	FURNISHED BY OTHERS
FCO	FLOOR CLEAN OUT
FCS	FLOOR CONTROL STATION
FD	FLOOR DRAIN, FIRE DAMPER
FDSC	FIRE DEPARTMENT SIAMESE CONNECTION
FDV	FIRE DEPARTMENT VALVE
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FIXT	FIXTURE
FLEX	FLEXIBLE
FL	FLOW LINES
FLR	FLOOR
FP	FIRE PUMP
FRZR	FREEZER
FS	FLOW SWITCH, FIRE SPRINKLER
FSK	FLOOR SINK
FT	FOOT, FEET
FUT	FUTURE

G

G	GAS
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GLV	GLOBE VALVE
GND	GROUND
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GV	GATE VALVE

H

HB	HOSE BIBB
HD	HEAD, HUB DRAIN
HORIZ	HORIZONTAL
HP	HORSEPOWER
HKP	HOUSEKEEPING PAD
HSC	HORIZONTAL SPLIT CASE
HT	HEIGHT
HTG	HEATING
HTR	HEATER
HW	HOT WATER
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HZ	HERTZ

I

ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IN	INCH
INSUL	INSULATION
INT	INTERNAL, INTERIOR
IW	INDIRECT WASTE

J

JP	JOCKEY PUMP

K

KEC	KITCHEN EQUIPMENT CONTRACTOR
KO	KNOCKOUT
KVA	KILOVOLT- AMPS
KW	KILOWATT

L

L	LENGTH, LAVATORY
LAV	LAVATORY
LF	LINEAR FEET
LP	LOW PRESSURE
LRA	LOCKED ROTOR AMPS
LVL	LEVEL
LWCO	LOW WATER CUT OFF

M

MAX	MAXIMUM
MBTUH	THOUSAND OF BTU'S
MC	MECHANICAL CONTRACTOR
MECH	MECHANICAL
MFR	MANUFACTURER
MH	MANHOLE
MI	MALLEABLE IRON
MIN	MINIMUM
MP	MEDIUM PRESSURE
MS	MOP SINK
MTD	MOUNTED
MU	MAKE-UP

N

N.C.	NORMALLY CLOSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
N.O.	NORMALLY OPEN
NO.	NUMBER
NTS	NOT TO SCALE

O

OC	ON CENTER
OD	OUTSIDE DIAMETER, OVERFLOW DRAIN
OFCU	OUTSIDE AIR FAN COIL UNIT
OPG	OPENING
OS&Y	OPEN STEM AND YOLK
O	MEDICAL OXYGEN

P

P	PUMP, PLUMBING EQUIPMENT
PC	PLUMBING CONTRACTOR
PD	PRESSURE DROP, PLANTER DRAIN
PH	PHASE, POST HYDRANT
PIV	POST INDICATOR VALVE
PLBG	PLUMBING
PNEU	PNEUMATIC
PNL	PANEL
PNTH	PENTHOUSE
PP	POLYPROPYLENE
PPM	PART PER MILLION
PRI	PRIMARY
PRS	PRESSURE REDUCING STATION
PRV	PRESSURE REDUCING VALVE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIG	POUNDS PER SQUARE INCH GAUGE
PT	PLUMBING TRIM
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE

Q

QTY	QUANTITY

R

RCP	REFLECTED CEILING PLAN, REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
RE	REFERENCE, REFER
RECIRC	RECIRCULATE
RED	REDUCER
REFR	REFRIGERATOR
REINF	REINFORCING
REQD	REQUIRED
REV	REVISION, REVISE
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RTU	ROOFTOP UNIT
RV	RELIEF VALVE

S

SCHED	SCHEDULED
SD	STORM DRAIN
SE	SEWAGE EJECTOR
SEC	SECONDARY
SECT	SECTION
SF	SQUARE FEET
SFCS	SPRINKLER FLOOR CONTROL STATION
SH	SHOWER
SHT	SHEET
SIM	SIMILAR
SK	SINK
SP	SUMP PUMP, STATIC PRESSURE
SPEC	SPECIFICATION
SPR	SPRINKLER
SQ	SQUARE
SS	SERVICE SINK
SSD	SUBSURFACE DRAIN
SSFU	SANITARY SEWER FIXTURE UNITS
STD	STANDARD
STL	STEEL
STR	STRAINER
SURF	SURFACE
SUSP	SUSPEND
SV	SANITARY VENT
SW	SOFT WATER

T

TD	TRENCH DRAIN
TDH	TOTAL DYNAMIC HEAD
TH BLK	THRUST BLOCK
TP	TRAP PRIMER
TPD	TRAP PRIMER DEVICE
TYP	TYPICAL

U

U	URINAL
UCD	UNDER CUT DOOR
UG	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES, INC.
UNO	UNLESS NOTED OTHERWISE
U/F	UNDERFLOOR
U/S	UNDERSLAB

V

V	VOLT, VENT
VAC	VACUUM(MEDICAL)
VB	VALVE BOX, VACUUM BREAKER
VCP	VITRIFIED CLAY PIPE
VEL	VELOCITY
VERT	VERTICAL
VIB	VALVE IN BOX
VOV	VALVE ON VERTICAL
VP	VACUUM PUMP
VTR	VENT THRU ROOF

W

W	WATT, WASTE, WIDTH, WASHER
W/	WITH
W/O	WITHOUT
WC	WATER CLOSET
WCO	WALL CLEANOUT
WH	WALL HYDRANT
WM	WATER METER
WP	WEATHERPROOF
WPD	WATER PRESSURE DROP
WWF	WELDED WIRE FABRIC
WT	WATERTIGHT, WEIGHT

Y

Y	YARD HYDRANT

Z

Z	ZONE

PIPING FITTINGS

- SPRINKLER FLOOR CONTROL STATION
- MANUAL AIR VENT
- AUTOMATIC AIR VENT
- T&P RELIEF VALVE
- LINE CLEANOUT/ WALL CLEANOUT
- FLOOR CLEANOUT
- YARD CLEANOUT
- PRESSURE GAUGE WITH GAUGE COCK
- THERMOMETER
- WATER METER
- FLEXIBLE CONNECTION
- PRESSURE AND TEMPERATURE TAP
- FLOW VENTURI
- VACUUM BREAKER
- VACUUM RELIEF VALVE
- BACKFLOW PREVENTOR
- CIRCULATING PUMP

SYMBOLS

PLUMBING SYSTEMS

- SANITARY DRAIN BELOW FLOOR
- SANITARY DRAIN ABOVE FLOOR
- SANITARY VENT
- GW — GREASE WASTE(ABOVE CEILING)
- GW — GREASE WASTE(BELOW FLOOR)
- SD — STORM DRAIN(ABOVE CEILING)
- SD — STORM DRAIN(BELOW FLOOR)
- OD — OVERFLOW DRAIN(ABOVE CEILING)
- OD — OVERFLOW DRAIN(BELOW FLOOR)
- AW — ACID WASTE(ABOVE CEILING)
- AW — ACID WASTE(BELOW FLOOR)
- AV — ACID VENT(ABOVE CEILING OR BELOW FLOOR)
- COLD WATER
- 110° — HOT WATER(FINAL DELIVERY TEMPERATURE AS NOTED)
- 110° — HOT WATER RECIRCULATION(TEMPERATURE AS NOTED)
- G — NATURAL GAS
- T 110° — TEMPERED WATER(FINAL DELIVERY TEMPERATURE AS NOTED)
- CA — COMPRESSED AIR
- A — MEDICAL AIR
- O — MEDICAL OXYGEN
- V — MEDICAL VACUUM
- F — FIRE STANDPIPE, FIRE LINE
- FS — WET AUTOMATIC FIRE SPRINKLER
- TP — TRAP PRIMER
- D — DRAIN LINE
- SW — SOFT WATER

PIPING FITTINGS

- CAP ON END OF PIPE
- ELBOW UP
- ELBOW DOWN
- VALVE IN DROP
- VALVE IN RISE
- DIRECTION OF FLOW
- DIRECTION OF SLOPE DOWN
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- TEE OUTLET UP
- TEE OUTLET DOWN
- UNION
- FLANGE
- PIPE ANCHOR
- EXPANSION JOINT
- STRAINER WITH BLOWDOWN VALVE
- GATE VALVE, HVAC BALANCING/STOP VALVE
- GLOBE VALVE
- BALL VALVE
- BALANCING VALVE WITH DIFFERENTIAL PRESSURE TAPS
- OS&Y VALVE
- CHECK VALVE
- BUTTERFLY VALVE
- TWO-WAY MODULATING CONTROL VALVE
- THREE-WAY MODULATING CONTROL VALVE
- SOLENOID VALVE
- PRESSURE REDUCING VALVE
- GAS REGULATOR
- GAS COCK

MISCELLANEOUS

- DRAIN(TYPE AND SIZE AS NOTED ON PLANS)
- ROOF DRAIN OR OVERFLOW DRAIN
- ROOF DRAIN OR OVERFLOW DRAIN(FROM ABOVE)
- HOSE BIBB
- WALL HYDRANT
- PLUMBING FIXTURES
- POINT OF NEW CONNECTION TO EXISTING PIPING
- (1) PLUMBING DRAWING NOTE REFERENCE
- (2) / P2.1 DETAIL NUMBER OR PLAN / SHEET WHERE DETAIL OR PLAN IS SHOWN
- FS FLOW SWITCH
- TS TAMPER SWITCH
- FIRE HOSE CABINET
- FIRE DEPARTMENT SIAMESE CONNECTION(WALL MOUNTED)
- FIRE DEPARTMENT SIAMESE CONNECTION(FREE STANDING)

GENERAL PLUMBING NOTES

1. SANITARY SEWER PIPING 3" AND SMALLER TO BE INSTALLED AT A 2% SLOPE AND SANITARY SEWER PIPING 4" AND LARGER TO BE INSTALLED AT A 1% SLOPE.
2. GREASE WASTE PIPING TO BE INSTALLED AT A 2% SLOPE.
3. STORM DRAIN PIPING TO BE INSTALLED AT A 1% SLOPE.
4. OVERFLOW DRAIN PIPING TO BE INSTALLED AT A 1% SLOPE.
5. CONTRACTOR TO COORDINATE THE INSTALLATION OF THE PLUMBING SYSTEMS WITH ALL OTHER TRADES.
6. ACID WASTE PIPING TO BE INSTALLED AT A 1% SLOPE..

PROJECT # 10505

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No.	Revision	Drawn	Approved	Date

REVISIONS

CHILLED WATER PLANT IMPROVEMENTS PLUMBING SYMBOLS & ABBREVIATIONS

DEVELOPER:

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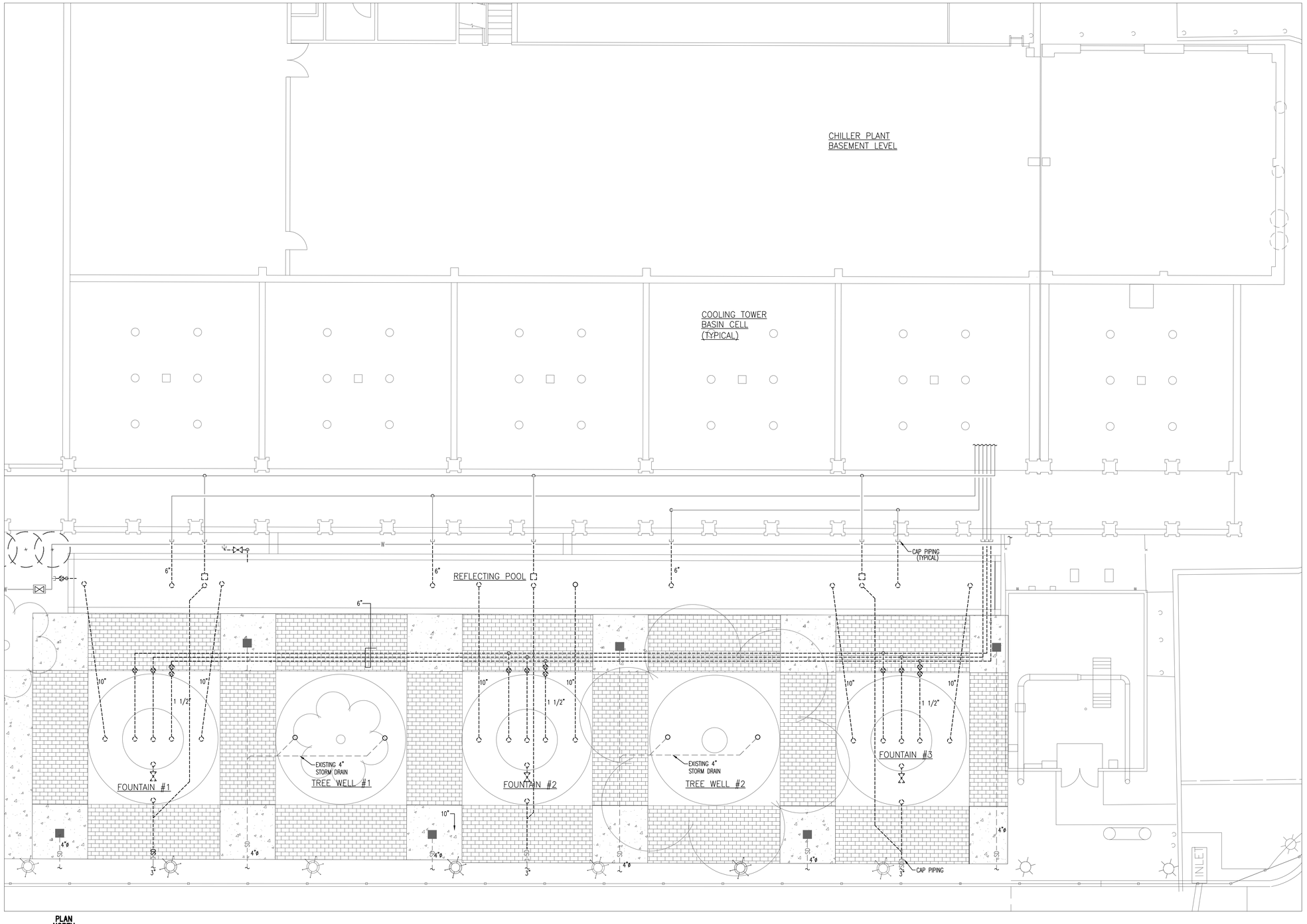

PLAN NORTH

1 **SITE PLAN - PLUMBING DEMOLITION**

SCALE: 1/8" = 1'-0"

PLUMBING GENERAL DEMOLITION NOTES:

1. IN GENERAL, THE PLUMBING DEMOLITION SCOPE OF THE WORK IS TO REMOVE ALL EXISTING WATER AND DRAIN PIPING SERVING THE THREE EXISTING FOUNTAINS AND THE REFLECTING POOL. THE PIPING IS TO BE REMOVED BACK TO THE CHILLER PLANT BUILDING PERIMETER. EXISTING PIPING UNDERNEATH THE BUILDING SHALL BE ABANDONED IN PLACE, WITH ENDS OF PIPE CAPPED.

2. THE EXISTING FOUNTAINS WERE DE-COMMISSIONED APPROXIMATELY 25 YEARS AGO. THE EXISTING PUMPS AND CONTROLS WERE REMOVED, HOWEVER THE UNDERGROUND PIPING REMAINED (ABANDONED IN PLACE). THIS PIPING IS TO BE REMOVED IN ITS ENTIRETY, EXCEPT FOR THE PIPING UNDERNEATH THE BUILDING.

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REVISIONS

CHILLED WATER PLANT IMPROVEMENTS SITE PLAN - PLUMBING DEMOLITION

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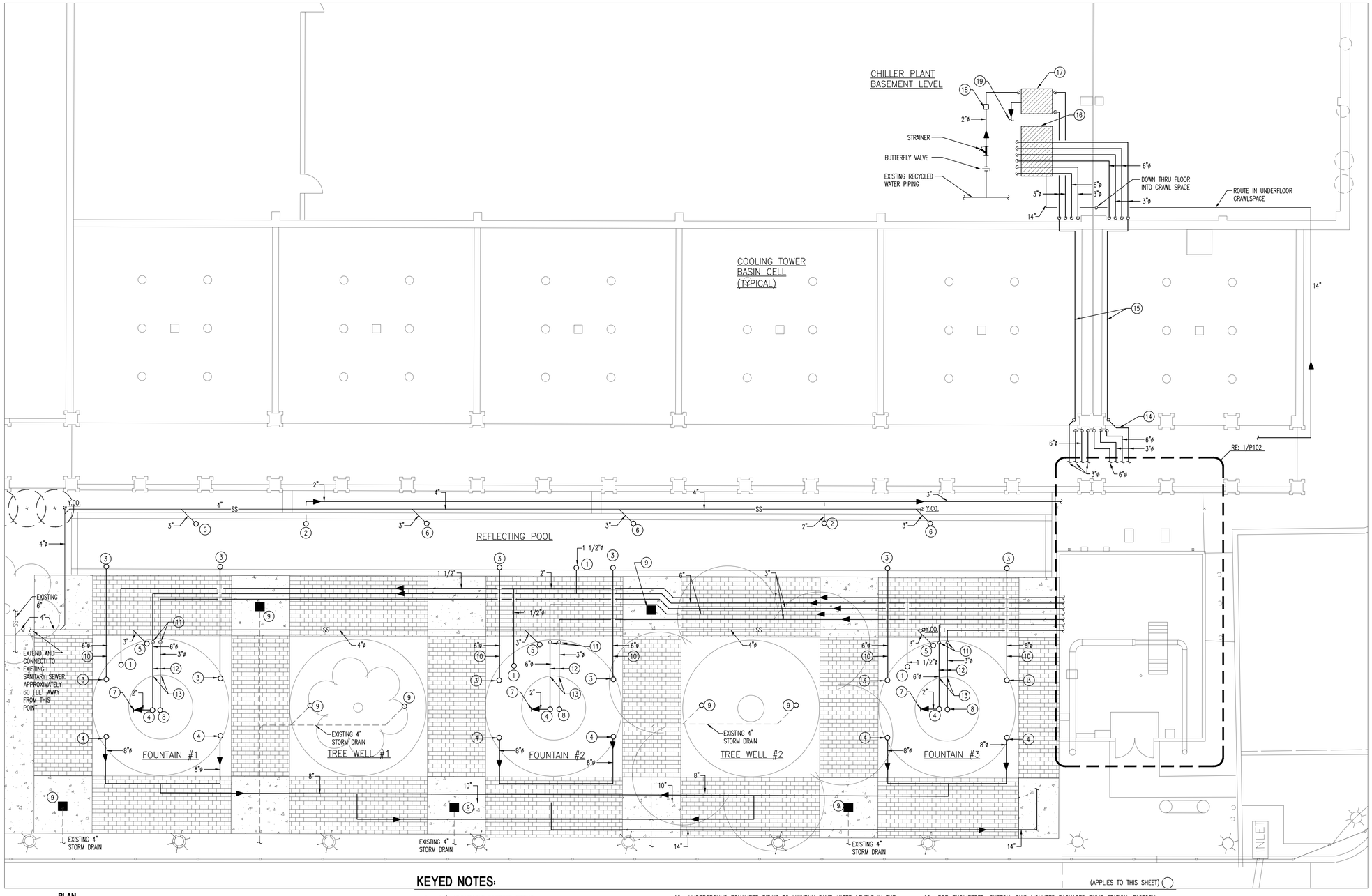

PLUMBING GENERAL NOTES:

1. COORDINATE ROUTING/ELEVATION OF UNDERGROUND PIPING WITH EXISTING UNDERGROUND STORM DRAINAGE PIPING SERVING EXISTING AREA DRAINS AND WITH EXISTING AND NEW UNDERGROUND CONDUITS.
2. PROVIDE A MINIMUM 6" SAND FILL ALL AROUND NEW UNDERGROUND PIPING.
3. COORDINATE TRENCHING/EXCAVATION LOCATIONS WITH LANDSCAPE DRAWINGS FOR REMOVAL/REINSTALLATION OF BRICK PAVERS AND CUTTING/PATCHING CONCRETE PAVEMENT.
4. WATERPROOF/SEAL PIPING PENETRATIONS INTO THE REFLECTING POOL AND THE FOUNTAINS.
5. PROVIDE DIMENSIONED RECORD DRAWINGS OF INSTALLED UNDERGROUND PIPING, INCLUDING DISCOVERED EXISTING PIPING.
6. FOR PIPING INSTALLATION UNDERNEATH THE REFLECTING POOL AND THE FOUNTAINS, EXCAVATE UNDER THE STRUCTURE TO MINIMIZE CUTTING DAMAGE OF STRUCTURE.
7. PROVIDE THRUST BLOCKING AT UNDERGROUND PIPING ELBOWS ON SUPPLY PIPING TO REFLECTING POOL AND THE THREE FOUNTAINS.
8. ALL RECYCLED WATER PIPING WITHIN A BUILDING OR EXPOSED SHALL BE EITHER PURPLE PIPE OR PAINTED PURPLE. ALL BURIED RECYCLED WATER PIPING SHALL BE ONE OF THE FOLLOWING: MANUFACTURED IN PURPLE, PAINTED PURPLE, TAPED WITH PURPLE METALLIC TAPE, OR BAGGED IN PURPLE. ALL EXPOSED PIPING SHOULD BE STENCILED IN WHITE WITH A WARNING READING " NON-POTABLE WATER."

PLAN NORTH

1 **SITE PLAN - PLUMBING NEW WORK**

SCALE: 1/8" = 1'-0"

EXISTING BRICK PAVERS

EXISTING CONCRETE PAVEMENT

KEYED NOTES:

(APPLIES TO THIS SHEET)

1. 1 ½" ADJUSTABLE DIVERTER FITTING.
2. 2" ANTI-VORTEX/DIVERTER PLATE AND SUMP
3. 6" SUCTION STRAINER
4. 8" ANTI-VORTEX/DIVERTER PLATE AND SUMP
5. 3" OVERFLOW STANDPIPE DRAIN
6. 3" FLOOR DRAIN WITH PLUG
7. 2" DRAIN-DOWN FITTING WITH PLUG
8. 3" SUPPLY FITTING
9. EXISTING AREA DRAIN. REPLACE GRATE WITH SAME SIZE/TYPE. UNPLUG PIPING. CLEAN AND FLUSH STORM DRAIN PIPING TO MAKE OPERATIONAL.
10. UNDERGROUND EQUALIZER PIPING TO MAINTAIN SAME WATER LEVELS IN THE CIRCULAR POOLS AND THE REFLECTING POOL. PROVIDE UPTURNED ELBOWS AT EACH END CONNECTED TO SUCTION STRAINER.
11. PIPING DOWN THRU FLOOR OF FOUNTAIN.
12. ROUTE PIPING ALONG FLOOR OF FOUNTAIN.
13. PIPING THRU INNER POOL WALL.
14. ELECTRIC HEAT TRACE EXTERIOR ABOVE GRADE PIPING. PROVIDE WITH 2" THICK INSULATION AND STAINLESS STEEL JACKET.
15. ROUTE PIPING (4 PIPES) ALONG COOLING TOWER CELL WALL, IN A STACKED CONFIGURATION.
16. PRE-ENGINEERED, CUSTOM, SKID MOUNTED PACKAGED PUMP STATION, FACTORY PRE-WIRED AND PRE-TESTED, COMPLETE WITH THREE CLOSE-COUPLED PUMPS (FRANKLIN ELECTRIC 6x8x10L), EACH DESIGNED FOR 750 GPM AT 30 FEET HEAD, 7.5 HP EACH, 1150 RPM, 480 VOLT, 3 PHASE, SIZED TO FIT WITHIN AVAILABLE SPACE (FIELD VERIFY) AND MAINTAINING SERVICE CLEARANCES, WITH STARTER/CONTROLLER PANEL.
17. PRE-ENGINEERED, CUSTOM, SKID MOUNTED PACKAGED WATER FILTRATION AND CHLORINATION INJECTION SYSTEM, FACTORY PRE-WIRED AND PRE-TESTED, COMPLETE WITH SAND FILTER, FILTER CIRCULATING PUMP, BACKWASH CONTROLS, CHLORINE TANK, CHLORINE INJECTION PUMP, STARTER/CONTROLLER PANEL, SIZED TO FIT WITHIN AVAILABLE SPACE (FIELD VERIFY) AND MAINTAINING SERVICE CLEARANCES.
18. SAWS FURNISHED 2" WATER METER.
19. 2" FILTER BACKWASH, EXTEND TO DISCHARGE INTO NEAREST SANITARY SEWER FLOOR DRAIN.

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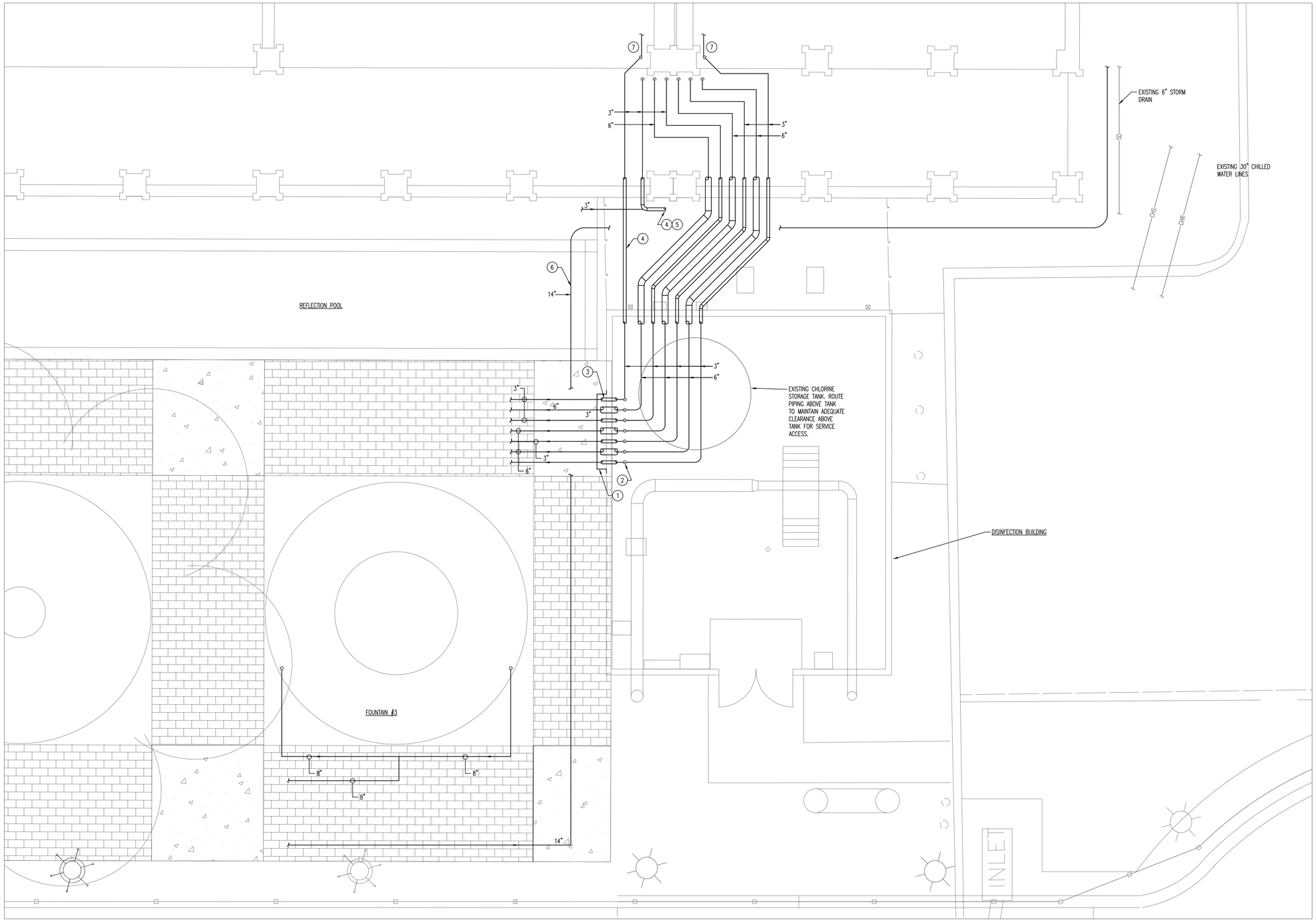
No.	Revision	Drawn	Approved	Date

REVISIONS

CHILLED WATER PLANT IMPROVEMENTS
SITE PLAN - PLUMBING NEW WORK

DEVELOPER:
CONT. BUDGET PROJ.
SUBMITTED
APPROVED
MAP No.
SECT. No.
DR. CK. JOB No.
SHEET P1.1 OF

STATE OF TEXAS
HECTOR M. CARRISALEZ
64007
LICENSED
PROFESSIONAL ENGINEER
12-11-2015
Alderson & Associates, Inc.
F-1008



PLAN NORTH

1

ENLARGED PARTIAL SITE PLAN - PLUMBING NEW WORK

SCALE: 1/4" = 1'-0"

PLUMBING GENERAL DEMOLITION NOTES:

1. IN GENERAL, THE PLUMBING DEMOLITION SCOPE OF THE WORK IS TO REMOVE ALL EXISTING WATER AND DRAIN PIPING SERVING THE THREE EXISTING CIRCULAR POOLS AND THE REFLECTION POOL. THE PIPING IS TO BE REMOVED BACK TO THE CHILLER PLANT BASEMENT LEVEL.
2. THE EXISTING FOUNTAINS WERE DE-COMMISSIONED APPROXIMATELY 25 YEARS AGO. THE EXISTING PUMPS AND CONTROLS WERE REMOVED, HOWEVER THE UNDERGROUND PIPING REMAINED (ABANDONED IN PLACE). THIS PIPING IS TO BE REMOVED.

KEYED NOTES: (APPLIES TO THIS SHEET)

1. PIPING DOWN ALONG EXTERIOR FACE OF WALL. CONCEAL PIPING WITHIN STAINLESS STEEL ENCLOSURE.
2. PIPING DOWN ALONG INTERIOR FACE OF WALL. EXTEND PIPING THRU EXTERIOR WALL AT FLOOR LEVEL.
3. ELECTRIC HEAT TRACE EXTERIOR ABOVE GRADE PIPING AND PROVIDE WITH 2" THICK INSULATION.
4. ELECTRIC HEAT TRACE EXTERIOR ABOVE GRADE PIPING. PROVIDE WITH 2" THICK INSULATION AND STAINLESS STEEL JACKETING.
5. PIPING DOWN ALONG COLUMN TO BELOW GRADE.
6. ROUTE PIPING UNDERNEATH REFLECTING POOL. EXCAVATE TO INSTALL PIPING.
7. ROUTE PIPING (4 PIPES) ALONG COOLING TOWER CELL WALL, IN A STACKED CONFIGURATION.

PROJECT # 10565

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No.	Revision	Drawn	Approved	Date
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CHILLED WATER PLANT IMPROVEMENTS
ENLARGED SITE PLAN - PLUMBING NEW WORK

DEVELOPER:
CONT. | BUDGET PROJ.
SUBMITTED
APPROVED

MAP No. | SHEET P1.2
SECT. No. | Of
DR. | CK. | JOB No.

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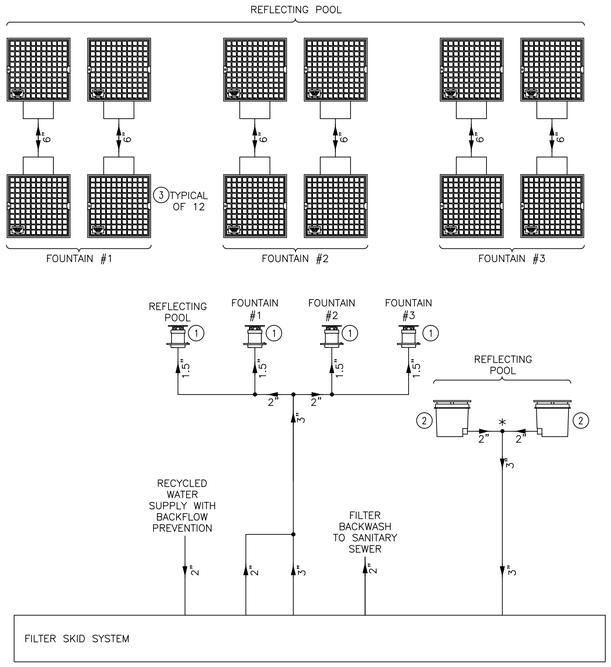
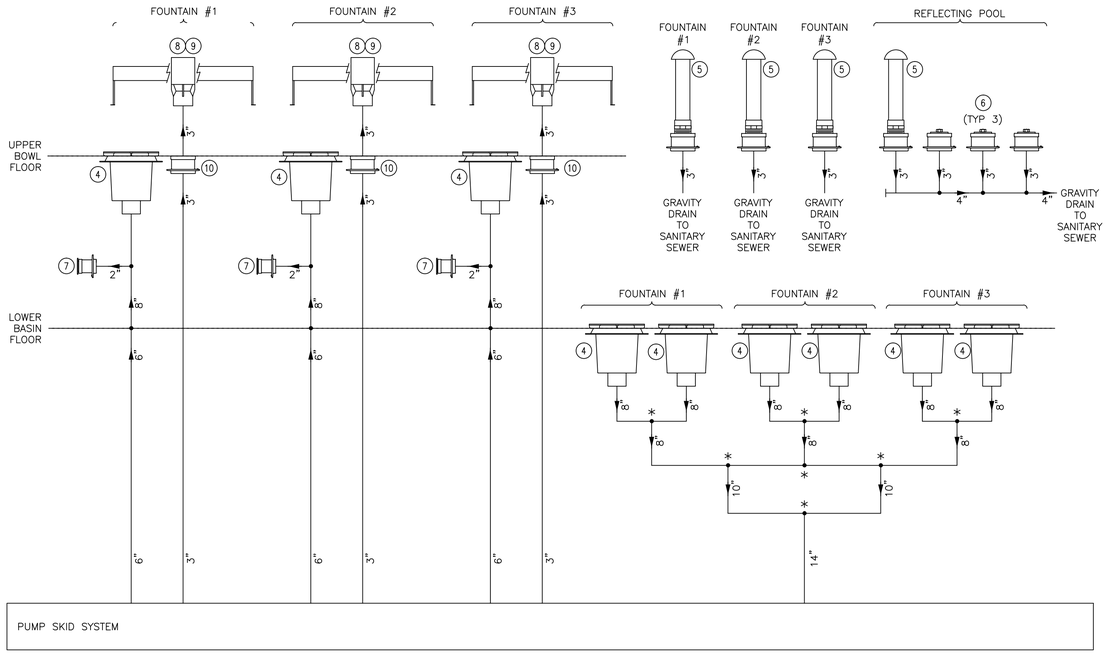
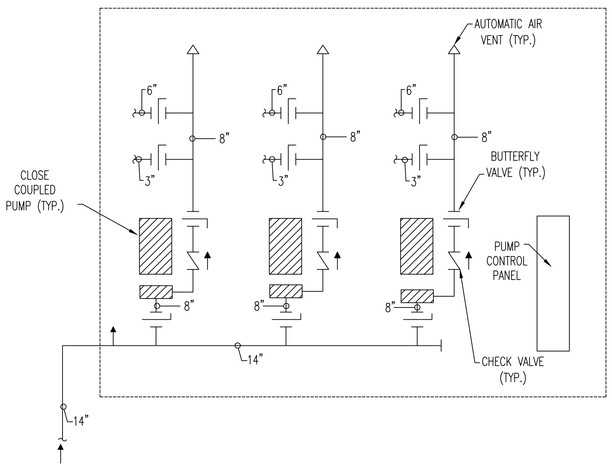




NOTES:
1. THIS DRAWING IS DIAGRAMMATIC IN NATURE.
2. PIPE IS SHOWN TO DEPICT QUANTITY AND SIZE ONLY.
3. INSTALL PIPE RUNS AS DIRECT AS POSSIBLE USING A MINIMUM NUMBER OF FITTINGS. SLOPE PIPE TO PUMP FOR DRAINAGE AND FREE OF AIR TRAPS OR LOOPS.
4. ✳INDICATES AN EVENLY DIVIDED PIPE RUN TO BALANCE PRESSURE AND FLOW.

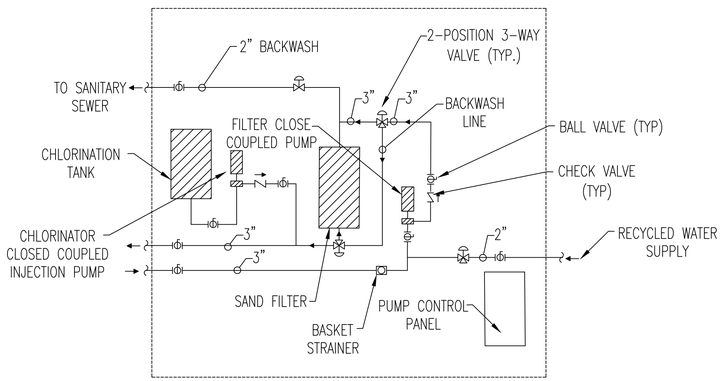
1 PIPING DIAGRAM

SCALE: N.T.S.



2 PIPING DIAGRAM PUMP SKID

SCALE: N.T.S.



3 PIPING DIAGRAM FILTER/CHLORINATOR SKID

SCALE: N.T.S.

KEYED NOTES:

(APPLIES TO THIS SHEET)

1. 1 ½"ADJUSTABLE DIVERTER FITTING (CAST BRASS BODY WITH INTEGRAL WATERSTOP FLANGE AND GROUND SCREWS, THREADED CONNECTION).
2. 2" ANTI-VORTEX/DIVERTER PLATE AND SUMP (CAST BRONZE PLATE, STAINLESS STEEL FASTENERS, MOLDED ABS SUMP WITH 2" FPT THREADED BOTTOM AND SIDE CONNECTIONS, SUPPLIED WITH THREADED ABS PLUG).
3. 6" SUCTION STRAINER (HEAVY-DUTY FRP SUMP WITH INTEGRAL WATERSTOP, HEAVY-DUTY FRP GRATE WITH SAFETY CLIP LATCH, STAINLESS STEEL REMOVABLE BASKET STRAINER WITH INTEGRAL HANDLE, PVC PIPE INLET CONNECTION).
4. 8" ANTI-VORTEX/DIVERTER PLATE AND SUMP (CAST BRONZE PLATE, HEAVY-DUTY FRP SUMP WITH INTEGRAL WATERSTOP, PVC PIPE INLET CONNECTION).
5. 3" OVERFLOW STAINDPIPE DRAIN (CAST BRONZE BODY WITH INTEGRAL WATERSTOP FLANGE AND GROUND SCREW, CAST BRONZE CAP, THREADED CONNECTION).
6. 3" FLOOR DRAIN WITH PLUG (CAST BRONZE BODY, INTEGRAL WATERSTOP WITH GROUNDING SCREW, REMOVABLE THREADED BRONZE PLUG, THREADED CONNECTION).
7. 2" DRAIN-DOWN FITTING WITH PLUG (CAST BRONZE BODY, INTEGRAL WATERSTOP FLANGE WITH GROUND SCREW, REMOVABLE PLUG WITH NEOPRENE GASKET, THREADED CONNECTION).
8. 3" SUPPLY NOZZLE
9. WATER BAFFLE (BRASS BAFFLE STRIP WITH FOUR ADJUSTABLE BRASS LEGS).
10. 3" WATERSTOP FITTING (CAST BRONZE WITH GROUND SCREW THREADED CONNECTION).
11. FACTORY PRE-ASSEMBLED PUMP SKID (MAX. 32" WIDE TO ALLOW ACCESS THROUGH 3'-0" DOOR, WELDED STEEL FRAME CONSTRUCTION FINISHED WITH AN INDUSTRIAL COATING SYSTEM, PRE-WIRED MOTOR-STARTER(S) AND DISCONNECT(S), BASKET STRAINER, BUTTERFLY ISOLATION VALVES, CHECK VALVE AT PUMP DISCHARGE, WATER FILTRATION, WATER TREATMENT.

WATER FEATURE NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING WATER FEATURE COMPONENTS, AS WELL AS PROVIDING LABOR AND MATERIALS REQUIRED EFFECTING THE INSTALLATION OF THE OPERATIONAL SYSTEMS.
2. THE PRIME WATER FEATURE INSTALLER SHALL FURNISH FOUNTAIN ELECTRICAL COMPONENTS TO THE ELECTRICAL INSTALLER FOR INSTALLATION AND CONNECTION.
3. A SINGLE MANUFACTURER SHALL SUPPLY ELECTRICAL AND MECHANICAL WATER FEATURE COMPONENTS IN ORDER TO ENSURE THE INTEGRITY OF THE WATER FEATURE DESIGN.
4. THE WATER FEATURE EQUIPMENT BASIS OF DESIGN SHALL BE DESIGNED AND MANUFACTURED BY FOUNTAIN PEOPLE, INC., P.O. BOX 807, 4600 HWY 123 EAST, SAN MARCOS, TX 78666 (512) 392-1155.
5. SUBSTITUTION OF WATER FEATURE MATERIALS SHALL REQUIRE WRITTEN APPROVAL BY THE PROJECT ARCHITECT OR LANDSCAPE ARCHITECT. INSTALLERS OFFERING SUBSTITUTIONS SHALL SUBMIT THREE COPIES OF THE FOLLOWING DATA AT LEAST TEN WORKING DAYS PRIOR TO THE BID DATE FOR REVIEW AND APPROVAL.
   a. COMPLETE WATER FEATURE SYSTEM FLOW DIAGRAM.
   b. COMPLETE WATER FEATURE ELECTRICAL CONTROL PANEL LADDER LOGIC DIAGRAMS.
   c. A COMPLETE BILL OF MATERIALS ALONG WITH SPECIFICATION CUTS OF PROPOSED SUBSTITUTE ITEMS.
   d. A WRITTEN DESCRIPTION OF THE WATER FEATURE'S OPERATIONAL CYCLE.
   e. A WRITTEN PERFORMANCE GUARANTEE BY THE ALTERNATE SYSTEM MANUFACTURER CERTIFYING THAT THE ALTERNATE SYSTEM WILL MEET THE SPECIFIED DESIGN CONCEPTS AND PERFORMANCE REQUIREMENTS.
6. FAILURE TO SUBMIT FOR PRIOR APPROVAL OF SUBSTITUTIONS WILL BE GROUNDS FOR REJECTION.
7. WITHIN TEN WORKING DAYS OF AWARD OF CONTRACT, INSTALLER SHALL SUBMIT FIVE COPIES OF MANUFACTURER'S DETAILED DATA SHEETS AND SUBMITTAL DRAWINGS OF WATER FEATURE COMPONENTS FOR APPROVAL PRIOR TO INSTALLATION.
8. UPON COMPLETION OF THE PROJECT, INSTALLER SHALL PROVIDE THREE COPIES OF OWNER'S OPERATION AND MAINTENANCE MANUALS. MANUALS SHALL BE PROVIDED ON COMPACT DISCS WITH ALL PORTIONS IN A PRINTABLE FORMAT, AND SHALL INCLUDE OPERATING AND MAINTENANCE PROCEDURES ALONG WITH MANUFACTURER'S DATA SHEETS AND SYSTEM DRAWINGS. INSTALLER SHALL PROVIDE ON-SITE OWNER TRAINING PERTAINING TO THE OPERATION AND RECOMMENDED MAINTENANCE OF THE WATER FEATURE SYSTEM.

GENERAL NOTES

1. THE WATER FEATURE DRAWINGS ARE DIAGRAMMATIC, INTENDED TO INDICATE THE SCOPE OF THE WORK TO BE DONE. EQUIPMENT AND MATERIAL LOCATIONS MAY BE DISTORTED FOR CLARITY IN PRESENTATION.
2. QUESTIONS PERTAINING TO WORK THAT DOES NOT APPEAR TO BE SUFFICIENTLY DETAILED OR EXPLAINED, OR PERTAINING TO THE TRUE MEANING OF A PART OF THE DRAWINGS OR SPECIFICATIONS, OR DISCREPANCIES FOUND EXISTING IN OR BETWEEN THE SPECIFICATIONS AND DRAWINGS, SHALL BE REFEREED TO THE ENGINEER OR LANDSCAPE ARCHITECT FOR CLARIFICATION.
3. THE INSTALLER SHALL FURNISH ALL MATERIALS, LABOR, TOOLS, EQUIPMENT, APPARATUS, AND SERVICES, WHICH ARE REQUIRED TO COMPLETE THE INSTALLATION OF THE WATER FEATURE SYSTEM.
4. THIS INSTALLATION SHALL COMPLY WITH THE 2015 INTERNATIONAL PLUMBING CODE AND ASSOCIATED CITY AMENDMENTS.
5. PIPING LOCATED WITHIN A POOL BASIN, AND STUB-UPS THROUGH A POOL FLOOR OR WALLS OF A BASIN, SHALL BE OF BRASS PIPE, TYPE K COPPER TUBING OR STAINLESS STEEL.
6. INSTALLER SHALL SUPPLY WATERSTOP PROTECTION FOR PIPING PENETRATING POOL FLOOR OR WALLS AND FOR FITTINGS CAST THEREIN UNLESS OTHERWISE SPECIFIED.
7. INTERCONNECTING PIPE AND FITTINGS BETWEEN THE POOL BASIN AND THE PUMP EQUIPMENT ROOM SHALL BE OF MINIMUM-SCHEDULE 40 PVC OR FIBERGLASS.
8. PRESSURIZED RECYCLED CITY WATER LINES SUPPLYING THE WATER FEATURE SYSTEM SHALL BE OF COPPER AND SHALL BE PROTECTED BY A BACKFLOW PREVENTION DEVICE AND PRESSURE REDUCTION VALVE SET AT 50 PSI MAXIMUM.
9. PIPING RUNS SHALL BE MADE AS DIRECT AS POSSIBLE USING THE MINIMUM NUMBER OF FITTINGS. PIPE SHALL SLOPE TO THE PUMP FOR DRAINAGE AND SHALL BE FREE OF TRAPS OR LOOPS THAT COULD TRAP WATER OR AIR.
10. PUMP SUCTION INTAKE AND SUCTION PIPING SHALL BE ROUTED TO AN ELEVATION BELOW THE WATER LEVEL OF THE LOWEST BASIN SO THAT BOTH THE PUMP AND THE SUCTION PIPING ARE COMPLETELY FLOODED WHEN THE WATER FEATURE SYSTEM IS FILLED UNLESS OTHERWISE SPECIFIED HEREIN.
11. PIPING SHALL BE PRESSURE TESTED PRIOR TO BACK-FILLING AND SHALL BE PROPERLY SUPPORTED.
12. INSTALLER SHALL PROVIDE DRAINAGE OF SPACE WHERE EQUIPMENT PUMPS ARE LOCATED IN ORDER TO PREVENT POTENTIAL FLOODING OF EQUIPMENT.

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CHILLED WATER PLANT IMPROVEMENTS
PIPING DIAGRAM

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