



CITY OF
Tulsa
A New Kind of Energy.

FAX TRANSMITTAL

Date: November 29, 2016

To: Plan Holders

Company: Contractors

Number of Pages: 66 (Including Cover)

From:

RE: Project No.

164003

EAST CAMERON STREET STREETScape

ADDENDUM NO. 1

Please fax or email a signed cover sheet to 918 699-3158 or
KristaSmith@cityoftulsa.org as acknowledgement of receipt.

Thank you,

Krista Smith

Signature

Company

Date



ENGINEERING SERVICES DEPARTMENT

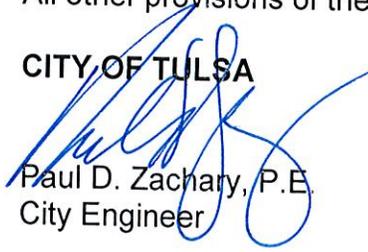
November 23, 2016

ADDENDUM NO. 1
TO
PROJECT NO. 164003
EAST CAMERON STREET STREETScape

This Addendum No. 1 consisting of five (5) items submitted by Wallace Engineering, is hereby made a part of the Contract Documents to the same extent as though it were originally included therein, and shall supersede anything contained in the Plans and Specifications with which it might conflict. **This Addendum shall be attached to the Index Sheet of the Contract Documents and submitted with bid. Failure to do so shall result in the bid being deemed non-responsive.**

All other provisions of the Plans and Specifications shall remain in full force and effect.

CITY OF TULSA


Paul D. Zachary, P.E.
City Engineer


HAS/DDH/PEB/peb



November 22, 2016

**ADDENDUM NO. 1
TO
EAST CAMERON STREET STREETScape
PROJECT NO. 164003**

This Addendum No. 1, consisting of five (5) items submitted by Wallace Engineering is hereby made a part of the Contract Documents to the same extent as though it were originally included therein, and shall supersede anything contained in the Plans and Specifications with which it might conflict. **This Addendum shall be attached to the Index Sheet of the Contract Documents and submitted with the bid. Failure to do so shall result in the bid being deemed non-responsive.**

1. The attached Special Provisions apply to this project.

- 800 Decorative Lighting
- 820 Streetscape Amenities
- 830 Structural Soil
- 831 Trees, Shrubs and Ground Cover
- 832 Sodding
- 833 Landscape Maintenance
- 840 Underground Sprinkler System

2. Delete the existing proposal in its entirety and replace with the revised Proposal found at [www.cityoftulsa.org \Our City\Doing Business With The City\Construction Bids\Project No. 040710-1](http://www.cityoftulsa.org/Our%20City/Doing%20Business%20With%20The%20City/Construction%20Bids/Project%20No.%20040710-1). Bidders will need to download the revised proposal onto the existing thumb drive.

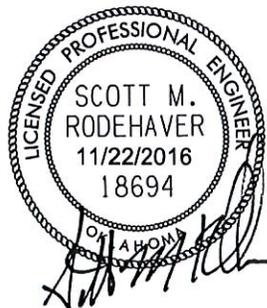
3. There are no alternates on this project. Notes referring to alternates on detail 5, Sheet 9 shall be deleted.

4. Light Pole and Fixture Long Lead Items: Field Engineering typically will require bases to be installed along with all related undergrounds and agree that substantially complete. Contractor will install poles/ fixtures following substantial completion.

5. Gas relocation is included as an allowance and will be performed by ONG if needed. Include the allowance as part of the bid as shown on the revised proposal.

All other provisions of the Plans and Specifications shall remain in full force and effect.

Scott Rodehaver, P.E.
Wallace Engineering, Structural Consultants, Inc.



Wallace Engineering
Structural Consultants, Inc.
200 East Brady Street
Tulsa, Oklahoma 74103
918.584.5858, Fax 918.584.8689
www.wallacesc.com

**PROPOSAL
PROJECT NO 164003
EAST CAMERON STREET STREETSCAPE**

TO: HONORABLE MAYOR
CITY OF TULSA, OKLAHOMA

THE UNDERSIGNED BIDDER, having carefully examined the drawings, specifications, and other Contract Documents of the above project presently on file in the City Clerk, City of Tulsa Oklahoma:

CERTIFIES THAT he has inspected the site of the proposed work and has full knowledge of the extent and character of the work involved, construction difficulties that may be encountered, and materials necessary for construction, class and type of excavation, and all other factors affecting or which may be affected by the specified work; and

CERTIFIES THAT he has not entered into collusion with any other bidder or prospective bidder relative to the project and/or bid: and

HEREBY PROPOSES: to enter into a contract to provide all necessary labor, materials, equipment and tools to completely construct and finish all the work required by the Contract Documents referred to therein; to complete said work within 60 calendar days after the work order is issued; and to accept in full payment therefore the amount set forth below for all work actually performed as computed by the Engineers as set forth in the Contract.

Basis of Award

IT SHOULD BE NOTED THAT THE LOWEST RESPONSIBLE BID SHALL BE DETERMINED BY THE TOTAL BASE BID.

Note: - Item numbers omitted are not a part of the Contract.

**PROPOSAL FOR
PROJECT NO. 164003
EAST CAMERON STREET STREETSCAPE**

ITEM NUMBER	SPEC NUMBER	ITEM DESCRIPTION	UNIT	QTY	DATA INPUT UNIT PRICE	AMOUNT
1	201(A)	CLEARING AND GRUBBING	AC	0.3		\$0.00
2	202(A)	UNCLASSIFIED EXCAVATION	CY	100		\$0.00
3	221(C)	TEMPORARY SILT FENCE	LF	585		\$0.00
4	221(F)	TEMPORARY SILT DIKE	LF	75		\$0.00
5	225	SWPPP DOCUMENTATION AND MANAGEMENT	LSUM	1		\$0.00
6	230(A)	SOLID SLAB SODDING (LIKE KIND)	SY	70		\$0.00
7	303(A)	AGGREGATE BASE, TYPE A	CY	198		\$0.00
8	310(B)	SUBGRADE METHOD B	SY	594		\$0.00
9	325	SEPARATOR FABRIC	SY	782		\$0.00
10	411(B)	ASPHALT CONCRETE TYPE S3 (PG 64-22 OK)	TON	120		\$0.00
11	411(C)	ASPHALT CONCRETE TYPE S4 (PG 64-22 OK)(INSOLUBLE)	TON	120		\$0.00
12	501(E)	SELECT BORROW	CY	25		\$0.00
13	608(A)	GROUND SIGN	SF	48		\$0.00
14	608(B)	1 1/2" SQUARE TUBE POST	LF	16		\$0.00
15	608(C)	1 3/4" SQUARE TUBE POST	LF	64		\$0.00
16	608(D)	2" SQUARE TUBE POST	LF	16		\$0.00
17	609(B)	COMBINED CURB AND GUTTER (6" BARRIER)	LF	552		\$0.00
18	610(A)	4" CONCRETE SIDEWALK	SY	657		\$0.00
19	610(B)	6" CONCRETE DRIVEWAY	SY	83		\$0.00
20	610(I)	TACTILE WARNING DEVICE	SF	56		\$0.00
21	611(G)	CAST IRON CURB INLETS (DESIGN 3), COMPLETE IN PLACE	EA	1		\$0.00
22	612(F)	METER BOX, ADJUST TO GRADE	EA	5		\$0.00
23	613(A)	6" PVC, COMPLETE IN PLACE	LF	51		\$0.00
24	619(B)	REMOVAL OF INLET	EA	1		\$0.00
25	619(B)	REMOVAL OF SIDEWALK	SY	133		\$0.00
26	619(B)	REMOVAL OF CURB	LF	423		\$0.00
27	619(B)	REMOVAL OF ASPHALT PAVEMENT	SY	582		\$0.00
28	619(B)	REMOVE STRIPING	LF	342		\$0.00
29	619(C)	SAWING PAVEMENT	LF	100		\$0.00
30	COT 625	REMOVAL OF TRAFFIC ITEMS	LSUM	1		\$0.00
31	641	MOBILIZATION	EA	1		\$0.00
32	642	CONSTRUCTION STAKING	EA	1		\$0.00
33	855(A)	TRAFFIC STRIPE (PLASTIC)	LF	2488		\$0.00
34	855(A)	TRAFFIC STRIPE (PLASTIC)(SYMBOLS)	EA	1		\$0.00
35	880(B)	CONSTRUCTION SIGNS 0 TO 6.25 SF	SD	480		\$0.00
36	880(B)	CONSTRUCTION SIGNS 6.25 TO 15.99 SF	SD	240		\$0.00
37	880(B)	CONSTRUCTION SIGNS 16.00 TO 32.99 SF	SD	240		\$0.00
38	880(C)	BARRICADES (TYPE III)	SD	240		\$0.00
39	880(E)	WARNING LIGHTS (TYPE A)	SD	1440		\$0.00
40	880(E)	WARNING LIGHTS (TYPE C)	SD	2640		\$0.00
41	880(F)	DRUMS	SD	1320		\$0.00
42	880(G)	TUBE CHANNELIZERS	SD	1320		\$0.00
43	SPECIAL	RECTANGULAR RAPID FLASH BEACON	EA	4		\$0.00
44	SPECIAL	TREES, COMPLETE IN PLACE	EA	11		\$0.00
45	SPECIAL	TREE GRATE, COMPLETE IN PLACE	EA	11		\$0.00
46	SPECIAL	IRRIGATION SYSTEM, COMPLETE IN PLACE	EA	1		\$0.00
47	SPECIAL	CURB RAMP	EA	6		\$0.00
48	SPECIAL	URBAN RIGHT OF WAY RESTORATION	EA	1		\$0.00
49	SPECIAL	STRUCTURAL SOIL	CY	45		\$0.00
50	SPECIAL	QUICK SET FLOWABLE FILL	CY	10		\$0.00
51	SPECIAL	RELOCATION OF GAS LINE ALLOWANCE	EA	1	\$20,000.00	\$20,000.00
52	SPECIAL	OWNER ALLOWANCE	EA	1	\$10,000.00	\$10,000.00
		CIVIL SUBTOTAL				\$30,000.00
53	COT 601(A)	FLUSH MOUNT SIZE 1 PULL BOX	EA	4		\$0.00
54	COT 602(A)	2" PVC SCH 40 PLASTIC CONDUIT (TRENCHED)	LF	700		\$0.00
55	COT 602(C)	2" HDPE SCH 40 CONDUIT (DIRECTIONAL BORE)	LF	60		\$0.00
56	COT 611(A)	#12 THHN ELECTRICAL CONDUCTOR (INSTALLED IN POLES) INCLUDING GROUND	LF	1400		\$0.00
57	E611(B)	1/C NO. 4 ELECTRICAL THHN/THWN CONDUCTION PULLED IN BURIED CONDUIT FOR SERVICES	LF	2400		\$0.00
58	E611(C)	1/C NO. 8 ELECTRICAL THHN/THWN CONDUCTOR PULLED IN BURIED CONDUIT FOR SERVICES	LF	1250		\$0.00
59	E803(A)	CONCRETE BASE ONLY FOR 15' PEDESTRIAN LIGHT POLE	EA	11		\$0.00
60	E803(B)	CONCRETE BASE ONLY FOR 22' INTERSECTION LIGHT POLE	EA	3		\$0.00
61	E804	15' PEDESTRIAN LIGHT POLE AND FIXTURE (TYPE II)	EA	11		\$0.00
62	E806	22' INTERSECTION LIGHT POLE AND FIXTURE (TYPE I)	EA	3		\$0.00
63	E807	INSTALLATION OF POWER PEDESTAL AND METER FOR NEW SERVICE FOR IRRIGATION CONTROLLER AND BACKFLOW PREVENTER HEAT TRACE CIRCUIT ON CAMERON	EA	1		\$0.00
64	E808	INSTALLATION OF TWO NEW OUTDOOR GFCI RECEPTACLE FOR IRRIGATION CONTROLLER AND ASSOCIATED HEAT TRACING	EA	1		\$0.00
65	E811	MODIFICATION TO EXISTING LIGHTING CONTROLLER	EA	1		\$0.00
66	E812	FEE TO BE PAID TO PSO FOR ELECTRICAL WORK ASSOCIATED WITH THIS PROJECT. ELECTRICAL CONTRACTOR TO INCLUDE AMOUNT IN BID	ALLOW	1	\$2,500.00	\$2,500.00
		ELECTRICAL SUBTOTAL				\$2,500.00
		TOTAL				\$32,500.00

TOTAL BASE BID

\$32,500.00
Figures

Enclosed is a () Bidder's Surety Bond, () Certified Check, () Cashier's Check for

_____ Dollars (\$ _____)
Words

which the City of Tulsa may retain or recover as liquidated damages in the event that the undersigned fails to enter into contract for the work covered by this proposal., provided the Contract is awarded to the undersigned within thirty (30) days, or within ninety (90) days if Federal funds are utilized, from the date fixed for opening of bids and the undersigned fails to execute said Contract and furnish the required bonds and other requirements as called for in these Contract Documents within thirty (30) days after award of Contract.

Dated at Tulsa, Oklahoma, this _____ day of _____, 201_____.

Respectfully submitted,

(Complete legal name of company)

By: _____
Title: _____

ATTEST: _____
Title: Corporate Secretary

(SEAL)

Address: _____

Telephone Number: _____ Fax Number: _____

The undersigned acknowledge receipt of the following Addenda (give number and date of each):

DIVISION VIII

STREETSCAPE SPECIFICATIONS

PART 833 LANDSCAPE MAINTENANCE

833.1 GENERAL

833.1.1 SUMMARY

- 1) Work includes furnishing of necessary labor, tools, equipment, materials, supplies and miscellaneous items required for accomplishing landscape maintenance as specified.
- 2) Certain items of work included but not necessarily limited to the following are:
 - A) Mowing, watering, edging, trimming, weed control, fertilization, trash and debris removal and repair of lawn areas.
 - B) Pruning and fertilization and watering of trees and shrubs.
 - C) Mulching, weed control, cultivation and trash removal from shrub, groundcover and tree beds and saucers.
- 3) For Seasonal Color planting areas, includes furnishing all labor, materials, services, and equipment to plant and maintain seasonal color beds as herein specified except as follows:
 - A) 1" depth layer of compost to be incorporated into upper 6" of soil profile by tilling. To be performed once annually in between spring and fall plantings.
 - B) At end of each season, upon approval by owner or representative, spent or dead plants to be removed.
 - C) Fertilize beds at time of spring planting at rate of 1 pound of N per 100 SF of bed.

833.1.2 RELATED WORK

- 1) Section 831 – Trees, Shrubs and Ground Cover.
- 2) Section 832 – Sodding
- 3) Section 840 – Underground Sprinkler System

833.1.3 QUALITY ASSURANCE

- 1) All maintenance operations shall be accomplished as required to maintain standards as herein specified. Frequencies indicated herein are general guidelines and are not intended to restrict accomplishment of work as dictated by existing conditions or contractual agreements.

- 2) Maintenance operations shall not be performed when existing weather or ground conditions would adversely affect quality of work or result in damage to grounds.
- 3) Contractor shall protect all existing facilities and plant material and repair or replace any damage due to landscape maintenance operations.
- 4) It is the Contractor's responsibility to report in writing to the Owner any and all conditions that may exist or occur which detract from the appearance of the landscaping and is beyond the scope of this contract.
- 5) Clean up shall occur during and after all maintenance operations and debris shall be disposed of legally off-site.

833.1.4 SUBMITTALS

- 1) Submit type and manufacturer's data for fertilizer.

833.2 PRODUCTS

833.2.1 MATERIALS

- 1) Fertilizer: Shall be a commercial fertilizer furnished in standard factory sealed containers conforming to specified analysis. The term analysis shall mean the percentages of "total nitrogen", "available phosphoric acid", and "soluble potash".
- 2) Water: Shall be furnished by the Contractor and transported to the site, or via irrigation system or hydrants on site, and paid for by Contractor. Contractor shall furnish all other equipment necessary for use of water.

833.3 EXECUTION:

833.3.1 LAWN AREAS

- 1) Mowing: To be accomplished as growth rate indicates, approximately four (4) times a month; during the growing season, approximately April 1- November 1. Thirty (30) times per year total.
 - A) Mow at a height of 2"-2-1/2". Not more than 1" of the leaf blade shall be removed at one mowing unless otherwise directed by the Owner.
 - B) Remove visible buildup of grass clippings from lawn areas after each mowing.
 - C) After each mowing, promptly remove grass clippings from sidewalks, streets, driveways and gutters. Clippings shall not be allowed to remain on such areas overnight.
 - D) Surface of mowed grass to be even without ridges of irregularities.

- E) A mowing cycle shall be completed within two (2) days.
 - F) In the event of drought conditions which necessitate water curtailment, height of mowing shall be raised to three inches (3") and frequency decreased as approved by the Owner's Representative.
- 2) Watering: During the growing season, adjust for amount of rainfall to provide approximately 1-1/2" - 2" of moisture every ten days.
 - A) Newly planted lawn areas should be watered as necessary to keep the upper two inches (2") of soil moist.
 - B) During lawn dormancy watering shall be accomplished once a month.
 - 3) Fertilization: Fertilization requirements will be as follows for lawn areas:
 - A) All lawns 1 pound of actual nitrogen per 1000 SF 4 to 6 weeks after planting and thereafter one pound of nitrogen/1000 SF per every six weeks. Test all turf areas for requirements at second growing season.
 - 4) Edging: All lawns shall be edged where areas meet curbs, sidewalks or other non-lawn surfaces.
 - A) Shall be accomplished every other mowing, except cutb of Site Entries and Ring Road which will be accomplished every 4th mowing.
 - B) All resulting debris to be removed and disposed of by contractor. No grass clippings or trimmings will be allowed to remain overnight.
 - 5) Trimming: All grass around trees, shrubs, building, benches, light poles, stairs, mow strips, pavement inserts, etc., that is not cut by mowing shall be trimmed to height of adjacent mowed area.
 - 6) Trash Removal: All trash and litter shall be removed from lawn areas prior to each mowing.
 - 7) Pest, Insect, and Disease Control: Apply proper chemicals by certified personnel to control pests, insects, and diseases and to maintain lawns and planting in a healthy condition. Application should be performed at a time that public and tenants will not be in contact or have any real or imagined harm done to them by application and apply only during times of favorable weather.
 - 8) Repair:
 - A) Repair erosion by top-dressing with topsoil and re-vegetation.
 - B) Maintenance shall include all temporary protection barriers and signs as necessary.
 - C) Dethatching to occur once (1) per year.

833.3.2 TREES, SHRUBS AND GROUNDCOVERS

- 1) Watering: Normally, trees and shrubs will not require water in addition to that provided for lawns as hereinbefore specified. Should lawn water be suspended, trees, shrubs and groundcover will be deeply watered as frequently as possible to approach rates set for lawn irrigation.
- 2) Weeding and Cultivation:
 - A) Area around all trees within saucer rim as per planting details should be cultivated and freed of all grass and weed growth. Saucer rim shall be maintained around the cultivated area to hold water. During the growing season, weeds and grass should be removed each time lawn is mowed.
 - B) Shrub beds and groundcovers should be kept weed-free by weeding to occur each lawn mowing. Weeds may be chemically removed and/or controlled.
- 3) Fertilization: Apply evenly within saucer rim. Time of application to be April or May.
 - A) Trees 2-1/2" caliper and greater: 1 pound.
 - B) Trees less than 2-1/2" caliper: 1/2 pound.
 - C) Shrubs: 1 pound/1000 SF of bed area.
- 4) Pruning:
 - A) Trees: Prune as necessary to remove broken or dead branches and maintain natural character in accordance with acceptable horticultural standards. Pruning should be accomplished at least once a year.
 - B) Shrubs:
 1. Remove broken or dead branches and prune (not shear) as necessary to maintain natural form. Pruning should be accomplished at least once a year.
 2. Shearing will be permitted for the following species: Buxus, Euonymus alata and kiautschovica, and Taxus media 'Hicksi'. Encourage growth to ultimate height of 4 to 5' for Euonymus and Taxus, and 18" for Buxus, by shearing lightly during the first few growing seasons.
 - C) Cleanup: Remove all debris created by pruning as work proceeds.
- 5) Trash Removal: All litter and trash in shrub beds and groundcover areas shall be removed each time lawn is mowed.

- 6) Re-mulching: Shrub beds and groundcover areas shall be mulched as necessary to maintain a 2" mulch depth. This item shall be performed at least every six (6) months if replenishment is necessary.

833.3.3 SEASONAL COLOR

- 1) Beds for seasonal color to be maintained as herein specified. Plantings shall be changed twice per year, with the material, and at the times specified herein.

833.3.4 IRRIGATION SYSTEM

- 1) Maintain irrigation materials and equipment per manufacturer's current recommendations for maximum efficiency.
- 2) Set, adjust and clean heads to maintain proper moisture content of soil.

833.3.5 ROADS, WALKS AND PARKING

- 1) Clean trash, glass, leaves and dirt from all planting beds and surrounding areas.

833.4 PAYMENT

833.4.1 METHOD OF MEASUREMENT

- 1) Payment for maintenance of plant material and sod prior to Final Acceptance by the City shall be included in the unit price bid for the installation of plant material or sod.
- 2) When an additional maintenance period is required by the bid documents, the Engineer will review Pay Applications submitted by the Contractor and shall approve payment based on the Number of Months that additional maintenance is required and is properly and completely performed.

833.4.2 BASIS OF PAYMENT

- 1) Payment will be made for each Tree, and each Shrub at the contract unit price per specified pay unit:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
LANDSCAPE MAINTENANCE	PER MONTH

DIVISION VIII

STREETSCAPE SPECIFICATIONS

PART 831 TREES, SHRUBS, AND GROUND COVER

831.1 GENERAL

831.1.1 SUMMARY

- 1) Trees, shrubs, vines and ground cover as applicable.
- 2) Topsoil backfill.
- 3) Staking and guying.
- 4) Maintenance service.

831.1.2 RELATED WORK

- 1) 832 - Sodding.
- 2) 833 - Landscape Maintenance.
- 3) 840 - Underground Sprinkler System.

831.1.3 REFERENCES

- 1) Standardized Plant Names, 1942 edition, American Joint Committee on Horticulture Nomenclature.
- 2) American Standard for Nursery Stock (ANSI Z60), latest edition, American Association of Nurserymen.
- 3) FS O-F-241 - Fertilizer, Mixed, Commercial.

831.1.4 QUALITY ASSURANCE

- 1) Contractor to locate all utilities and be responsible for all damage to utilities resulting from demolition and planting operations.
- 2) Perform work with personnel experienced in the work required of this Section under direction of a skilled foreman.
- 3) Submit sources of plant materials. All materials to have name tags attached. Submit invoice with plant names noted if required.
- 4) Contractor shall locate all materials and be responsible for conformance with requirements of this Section. All plants not meeting requirements to be rejected.
- 5) All trees are to be reviewed by Engineer prior to planting.

- A) Trees will be reviewed at local growing or nursery site by Engineer or his appointed representative and approved before delivering to the site. Contractor shall schedule review of plant material in such a manner that no single review period will exceed one working day with a maximum of two review periods. Contractor shall be responsible for notification and coordination with all parties prior to scheduling review sessions.
 - B) Prior to review by Engineer, Contractor shall have pre-selected all trees and identified each with a "locking" tree tag. Additional tree tags will be provided by Contractor for changes at time of visit. Tree tags will have permanent, non-reproducible identifying notation unique to this project.
- 6) Submit analysis of topsoil to be imported for backfill. Test performed by accredited soils laboratory.

831.1.5 DELIVERY, STORAGE, AND HANDLING

- 1) Move B&B plant materials with solid balls wrapped in burlap. Plants to be lifted only by ball or container.
- 2) Deliver plant materials immediately prior to placement. Keep plant materials not immediately installed moist and protect from freezing by covering ball or container with mulch. Any plants not planted within 2 days of delivery are to be heeled-in in a vertical position, root balls fully encompassed by mulch and a temporary watering system installed.
- 3) Reject plants when ball or container of earth surrounding roots has been cracked, broken or frozen preparatory to or during process of planting.

831.1.6 WARRANTY

- 1) Warrant all plants to be living, healthy specimens for a period of one year commencing upon Final Acceptance by City. Warranty period shall terminate only if plants have been in full leaf for 30 days at end of warranty period. Termination of warranty period shall be extended as necessary to comply. All materials to be in vigorous condition at end of warranty period.
- 2) Immediately remove dead plants and plants not in a vigorous condition and replace as soon as weather conditions permit. Each replacement shall be covered with one year warranty commencing at time of planting.
- 3) Replacements: Match with adjacent plants of the same species in size and form.

831.1.7 MAINTENANCE SERVICE

- 1) Begin maintenance of plant materials immediately after planting and continue until Final Acceptance by City.

- 2) Maintenance shall include measures necessary to establish and maintain plants in a vigorous and healthy growing condition. Include the following:
 - A) Cultivation and weeding of plant beds and tree pits. When herbicides are used for weed control, apply in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
 - B) Watering sufficient to maintain optimum moisture level.
 - C) Pruning, including removal of dead or broken branches.
 - D) Disease and insect control.
 - E) Maintaining plants in an upright, plumb position, and repair of settling.
 - F) Maintenance of wrappings, guys, turnbuckles and stakes. Adjust turnbuckles or otherwise keep guy wires tight. Repair or replace accessories when required.
- 3) Contractor to be responsible for pruning or removing trees that become an obstruction to safe traffic flows or the open view of traffic signalization.

831.2

PRODUCTS

831.2.1 MATERIALS

- 1) Trees, Shrubs, Vines, and Ground Cover: Species and size identified in plant list. Plant materials shall be true to name, in good health, free of disease and insects, excellent in form and in complete conformance with ANSI Z60. All materials to be nursery grown.
- 2) Topsoil: Friable loam, typical of cultivated topsoils locally, containing at least 2% of decayed organic matter (humus) secured from a well drained, arable site, reasonably free of subsoil, stones, earth clods, sticks, roots or other objectionable extraneous matter or debris and containing no toxic materials. Topsoil to have acidity range of 6.0 to 7.0.
- 3) Mulch: Shredded cedar, cypress or hardwood; dyed brown in color. Submit type and source for approval.
- 4) Fertilizer: Osmocote 18-6-12.
- 5) Compost: "Back to Earth Composted Cotton Burrs", premium compost, course screened, as manufactured by Soil Mender Products, LP, www.soilmender.com. "Hu-More Plant and Soil Builder" manufactured by Humalfa, Inc., P.O. Box 878, Shattuck, OK 73858, (580)938-2514.
- 6) Peat Moss: Spagnum peat moss.

- 7) Metal Edging: 3/16 inch x 4 inch steel landscape edging with steel stakes as manufactured by Col-Met, 3333 Miller Park South, Garland, Texas 75042, Phone 972/494-3900, www.colmet.com.

831.2.2 ACCESSORIES

- 1) Wrapping Materials: Heavy paper manufactured for tree wrapping purpose.
- 2) Stakes: Green Metal Fence posts (3 per tree) - 6 foot height.
- 3) Hardware (cables, wire, eye bolts, and turnbuckles): Noncorrosive; of sufficient strength to withstand wind pressure.
- 4) Tie straps: Soft polypropylene material equal to ArborTie, by Deep Root Partners, L.P., 31 Langston St., Suite 4, San Francisco, CA, 94103, 1-800-277-7668.

831.3 EXECUTION

831.3.1 PREPARATION

- 1) Locate trees so they do not obstruct safe traffic flow, or the open view of traffic signalization.
- 2) Verify topsoil is ready to receive the work of this Section. All areas to be planted with shrub or ground cover masses to have minimum 12 inch depth of topsoil.
- 3) Remove all weeds and grasses from planting beds. Bermuda grass, if present, to be exterminated by approved means or all soil removed to 6 inch depth and replaced with topsoil free of bermuda grass.
- 4) Stake tree locations and place shrubs, vines, and ground covers for review and final orientation by Owner's Representative prior to installation.
- 5) Outline bed edges for approval.
- 6) Prepare topsoil for shrub and ground cover beds, after removing any vegetation with approved procedure, by tilling 2 inch layer (165 CF per 1000 sq. ft.) of compost into the upper 6 inches of soil.

831.3.2 INSTALLATION

- 1) Excavate for plant materials. Tree pits shall be as indicated in the details. Slope cut edge to 6" depth and bottom of pit to depth required to accommodate tree rootball. Shrub pits shall be 12 inches greater in diameter than root ball. Topsoil or structural soil from excavation may be retained for backfill if it is friable and free of rock and clods greater than 2" in dia. Remove all subsoil, rock, and debris from site.

- 2) Set trees and other plant materials with top of root ball 2" below adjacent paving, after settlement.
- 3) Remove containers from container-grown stock. Set plants in center of pits and backfill with topsoil in 6 inch layers. Pull away ropes, wires, etc. from the top of the ball.
- 4) Remove any soil from the top of the rootball, to the level of the root flare.
- 5) Final 6 inch layer of backfill around trees to consist of 1:1 mixture of compost and topsoil.
- 6) Thoroughly water soil when the hole is half-full and again when full.
- 7) Apply 1/2 pound fertilizer evenly over cultivated area around each tree and 1 pound per 100 square feet to shrub and ground cover plantings.
- 8) Evenly spread a 3 inch layer of mulch over tree pits and planting beds.
- 9) Prune trees and shrubs after planting to remove dead and broken branches.
- 10) 8' diameter circular area around trees to be mulched and free of vegetation. For trees 2 inch and greater in caliper, area to be 8 feet in diameter. For trees less than 2 inch caliper, area to be 6 feet in diameter. Circle to be centered on tree and true in form.
- 11) Wrap trunks of all trees of the Acer and Gledetsia genus.
- 12) After planting trees, form a 3' diameter ridge of topsoil around edge of excavation to retain water.

831.3.3 PLANT SUPPORT

- 1) Brace plants upright in position by staking and guying as detailed. Guys to be secured to tree with loops as detailed.

831.3.4 FINISHING

- 1) Install pavers or tree grates as indicated on the plans and details.
- 2) Provide edge restraint to maintain the position of the pavers.
- 3) Install mulch or gravel as indicated on details.

831.4 PAYMENT

831.4.1 METHOD OF MEASUREMENT

- 1) The Engineer will review Pay Applications submitted by the Contractor and shall approve payment based on the quantity of trees and shrubs that

is properly and completely installed according to the drawings, including planting, backfilling, and finishing.

831.4.2 BASIS OF PAYMENT

- 1) Payment will be made for each Tree, and each Shrub at the contract unit price per specified pay unit:

PAY ITEM
TREE
SHRUB

PAY UNIT
PER EACH
PER EACH

DIVISION VIII

STREETSCAPE SPECIFICATIONS

PART 840 UNDERGROUND SPRINKLER SYSTEM

840.1 GENERAL

840.1.1 SUMMARY

- 1) Furnishing of materials and installation of a complete automatic sprinkler system providing uniform moisture coverage. The work shall include all materials, equipment and labor required to complete the project as outlined in the project drawings, documents and this specification.
- 2) Install sleeves for irrigation pipe and wires. Coordinate work with City of Tulsa.
- 3) Supply and install one 1" water meter and one 1" reduced pressure backflow preventer meeting City of Tulsa Ordinances and Specifications.
- 4) Excavation and Backfill
- 5) Installation of irrigation lines (pressurized), automatic control valves, valve boxes, control and common wiring, lateral lines, sprinkler heads, automatic controller(s) and electrical supply to controller and backflow preventer as shown on the project drawings and irrigation plan.
- 6) Tests including system pressure and performance test.

840.1.2 RELATED WORK

- 1) Section 830 – Structural Soil
- 2) Section 831 – Trees, Shrubs and Ground Cover.

840.1.3 REFERENCES

- 1) ANSI/ASTM D2564 - Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings.
- 2) ASTM D2241 - Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR).
- 3) ASTM - American Society of Testing Materials
- 4) AWWA - American Water Works Association
- 5) NSF - National Sanitary Foundation
- 6) NEC - National Electric Code

840.1.4 SYSTEM DESCRIPTION

- 1) Electric solenoid controlled underground irrigation system consisting of PVC plastic pipe and fittings, with fixed spray pop-up heads in a multi-station electric control system, programmed as approved by Engineer.

840.1.5 SUBMITTALS

- 1) For planting within the Right-of-Way, an automatic irrigation system must be provided for plant maintenance unless otherwise approved by the City of Tulsa. The irrigation system may be designed and sealed by a licensed professional authorized to do business in the state of Oklahoma, as a part of the Construction Documentation submittal, or an irrigation design may be submitted as a design/build drawing by the contractor. As part of the Construction Documentation set, the irrigation design be reviewed only for general compliance with the standards set forth in this document, and related details. If a design/build drawing is provided through the submittal process, the design professional will review and approve the drawing. The licensed professional will attest by approving the plan, that to the best of their ability and knowledge, the system is designed to provide complete coverage with minimal overspray. No construction on the irrigation system will be allowed until plans are approved.
- 2) The design shall include the piping layout, location and coverage of sprinkler heads, plant and landscaping features, site structures, list of fittings to be used, and control system and wiring diagrams and data; and shall note water pressure at the project site.
- 3) Upon award of contract, Contractor shall provide the following:
 - A) Three (3) copies of manufacturer's product data for each type of sprinkler head, swing joint assemblies, electric control valves, automatic and manual drain valves, isolation valves, air relief valves, pressure regulators, valve boxes, pipe, fittings including tapping tees and saddles, control wire, waterproof wire connectors, backflow preventer, booster pump, irrigation controllers, rain sensors, freeze sensors and moisture sensors proposed for use.
 - B) Provide one(1) of each sprinkler head of each type to be used on the project, one (1) electric control valve, one (1) waterproof wire connector, sample of common and control wire and one (1) of each type of valve box. Accepted samples will be returned to Contractor for use in project.
- 4) Determine and submit to Engineer in writing the static water pressure at meter and/or other designated points of connection at least two (2) weeks prior to beginning of installation.
- 5) Upon project completion and final review of system by City of Tulsa, Contractor shall provide the following:

- A) Provide record or "as-built" drawings of completed facilities as installed. Drawings shall be provided to City of Tulsa in a) electronic form (CAD) b) in a reproducible form of mylar or vellum and c) three (3) copies of the as-built drawing in blueline or blackline form. As-built drawing shall show the measured distance from easily identified, fixed locations to isolation valves, electric control valves, manual drain valves and wire splices. Two dimensions from fixed point per location are required.
 - B) Three (3) binders containing manufacturer's installation, operational and maintenance instructions as well as a parts breakdown and catalog for each piece of equipment installed on the project. As a minimum the binders shall include information for the irrigation controller, booster pump, backflow preventer, pressure regulators, isolation valves, electric control valves, drain valves, air relief valves, all spray and rotary sprinkler heads, rain and freeze and moisture sensors.
 - C) A plastic laminated (sealed) reduced drawing of the irrigation system indicating the areas or zones of the irrigation system controlled by each electric control valve. For clarity, drawing may be divided into two sections and shown on both sides of the laminated sheet. Reduced drawing shall be placed on the inside of the controller door. Drawing shall be approved for clarity by City of Tulsa prior to acceptance of system.
- 6) Upon project completion and prior to the certificate of occupancy and/or Final Acceptance, the design professional noted in paragraph 1.5 A., shall review the system and submit a written certification that the automatic irrigation system was installed per the plan, and provides full coverage of the landscaped area with minimal overspray.

840.1.6 OPERATION AND MAINTENANCE INSTRUCTION AND DEMONSTRATION

- 1) Provide a schedule indicating length of time each electric control valve is required to be open to provide determined amount of water.
- 2) Provide a recommended schedule for station run times and frequency of watering for the first two weeks, the first two months and the first twelve months (including all seasonal change requirements) after completion of the installation.
- 3) Instruct City of Tulsa's personnel in operation and maintenance of system, including adjusting of sprinkler heads.

840.1.7 EXTRA STOCK

- 1) Provide the following extra stock items:
 - A) Two sprinkler heads of each type and size.

- B) Two valve keys for manual valves.
- C) Two keys for valve boxes or markers.
- D) Two adjustment tools for each type sprinkler head and any tool required to remove or disassemble each type head.
- E) Two couplers keys for each size of quick coupling valve with brass hose swivels.
- F) Two replacement diaphragms and solenoids for each size and type of valve installed on the project.

840.1.8 WARRANTY

- 1) Entire sprinkler system will be unconditionally guaranteed against defects in material and workmanship, including repair of settling of backfilled areas below grade and adjusting heads to proper level for a period of one year from final acceptance.
- 2) Minor adjustments, any defective electrical controls, valves, sprinkler heads or other working parts will be repaired or replaced without cost to the City of Tulsa for a period of one year from the date of acceptance.
- 3) Damage by others during the one year guarantee period will be City of Tulsa's responsibility.
- 4) Warrant sprinkler system to have 100 percent uniform moisture coverage of areas shown to be irrigated.

840.1.9 SYSTEM SERVICE

- 1) Inspect system at two and four weeks after Date of Final Acceptance and make necessary adjustments. Drain System in fall following installation and turn on system the following spring, providing complete system inspection and adjustment.

840.2 PRODUCTS

840.2.1 MATERIALS – GENERAL

- 1) The specific materials to be used shall be as designated on the project drawings and this specification. All materials to be incorporated in this work shall be new and of the best quality, meeting the requirements for such materials and for the purpose intended. Since the irrigation lines on the contract drawings are essentially diagrammatical, the Contractor shall be responsible for computing and supplying the required pipe, fittings, control wires and electrical accessories according to the contract documents.

2) ACCEPTABLE MANUFACTURERS

- A) Weather-matic.
- B) Rainbird.
- C) Hunter.
- D) Toro.

840.2.2 PIPE AND FITTING MATERIALS

1) PRESSURIZED MAIN LINE PIPE

- A) All 2" and smaller main line pipe shall meet the latest requirements of ASTM D 1785 Standard Specification for Schedule 40 Poly (vinyl chloride) PVC pipe with size as shown on the project drawings.
- B) All main line pipe to be installed in curved sleeves shall be copper, Type L Soft and shall be the size shown on the project drawings. All transition fittings to PVC shall be copper sweat socket with threaded MIPT or FIPT connections to the PVC main line pipe.

2) LATERAL PIPE

- A) All lateral pipe, downstream of the control valves, shall be have solvent weld joints and shall meet the latest requirements of ASTM D 2241 Standard Specification for Poly (vinyl chloride) (PVC) Plastic Pipe with standard dimension ratio (SDR) of 21 and a Pressure Rating (PR) of 200 PSI.

3) SLEEVING PIPE

- A) The contractor is responsible for the location and placement of all sleeves on the project whether shown on the drawings or not. Sleeves under sidewalks and concrete other than City of Tulsa streets shall be PVC SCH 40 for straight sections and shall be HD Polyethylene for curved sections. Sleeves shall be sized two (2) times the nominal diameter of the largest pipe passing through the sleeve. Minimum sleeve size shall be 2". Sleeves shall be installed at a minimum cover depth of twenty (2) inches from finish grade. Coordinate horizontal and vertical elevations with utilities and footings. A separate minimum 2" diameter sleeve shall be provided for the control wires to pass through at each crossing. All sleeves passing under City of Tulsa streets shall be steel or ductile iron pipe and shall meet the requirements of the governing departments of the City of Tulsa including but not limited to the Street Departments and the Water and Sewer Departments.

4) FITTINGS

- A) Main line Fittings (2" and Smaller) All pressurized main line fittings at all points of direction change such as 22.5, 45, tees or 90 degree turns shall be solvent weld with a minimum of Schedule 40 dimensions and shall meet the requirements of ASTM Specification D 2466-78. Schedule 40 fittings shall be Spears Manufacturing or approved equal.

Main Line Installation of Electric Control Valves and Quick Coupling Valves (2" and smaller) onto the main line shall be PVC Schedule 80 solvent welded or threaded fittings and shall meet ASTM D 2467 and ASTM D 2464 respectively. PVC Schedule 80 fittings and nipples shall be used on all fittings required between the mainline tap and the electric control valve as well as the threaded connection between the electric control valve and the lateral piping. Schedule 80 fittings shall be Spears Manufacturing or approved equal. Contractor shall use manufacturer's recommended sealing compounds and/or teflon tape according to manufacturer's recommended practice for the specific application.

- B) Lateral line Fittings - Solvent welded fittings shall be Schedule 40 dimensions and wall thickness and shall meet the requirements of ASTM Specification D 2466 and shall be used on all piping downstream of electric control valves.

- 5) Solvent Cement: ANSI/ASTM D2564 for PVC pipe and fittings.
- 6) All 1/2" inlet spray heads and 3/4" inlet rotary heads shall be connected to the irrigation piping utilizing 1/2" thick walled polyethylene tubing (Rain Bird Model SPX-100 or approved equal) and appropriate insert fittings (Rain Bird Models SBE-050, SBE-075, SBA-050, SBA-075 or approved equal). Sufficient lengths of flexible pipe shall be used to form a sweeping arc to insure that spray heads are supported properly and allow for vertical adjustment and movement during service.
- 7) All 1" inlet quick coupling valves shall be installed on prefabricated, manufactured swing joint assembly rated for 315 psi with pre-lubricated buttress threads and O-ring seals equal to Spears Manufacturing Co. Series 5807-01012.
- 8) Swing Joints: Prefabricated, schedule 80 PVC, equal to Spears. Use for ground level pop-up impact driven heads, gear-driven rotary heads, hydrant and quick-coupler valves.
- 9) Drip Irrigation: Pipe and fittings equal to Rain Bird 1/2" Pressure Compensating Emitter Tubing, or Netafin U.S.A. A Drip Operation Indicator Kit equal to #17500 as supplied by Rain Bird shall be installed at each drip irrigation zone, or each tree well (where portions of the drip zone is separated from others with solid line).

840.2.3 SPRINKLER HEADS AND NOZZLES

- 1) Sizes and types required to provide complete, even coverage with minimum overspray as noted on the drawings.
- 2) Shrub/Ground Cover Beds: 12" Pop-up - Rain Bird 1812-PRS with pressure regulator incorporated into stem with necessary 1800-EXT extensions or approved equal.

840.2.4 VALVES

- 1) The irrigation system control valves shall be contamination resistant, glass filled high strength nylon body and bonnet, electrical solenoid operated, normally closed, diaphragm globe valves. The valve shall have a 200 psi CWP rating. The valve shall be activated by a 24 V.A.C. solenoid. Flow control stem shall be non-rising. The valve cover shall be secured to the body with stainless steel threaded studs and nuts. Bleeding of water during manual operations shall be either internal or external. Valves shall be as manufactured by Weather*matic, Inc. Model Series 11000 with size as shown.
- 2) Irrigation drip zone control valve to be specifically designed commercial applications with medium flow requirements and incorporating a pressure-regulating filter.
- 3) Gate valves (isolation shut off valves): 2" and smaller - shall be bronze, threaded, screw-in bonnet with non-rising stem rated for a 125 psi WSP and 200 psi non-shock WOG. The valve shall be of domestic manufacture, shall meet Federal Specifications MSS SP-80 equal to Hammond Model IB645.
- 4) Isolation valves for the electric control valves shall be of the ball type, plastic construction, threaded ends and have a maximum pressure rating of 235 psi at 73 degrees F. The valves shall be equal to Spears Model 2131-0XX size the same as the control valve.
- 5) Automatic drain valves: King Technology, Inc. Model 22, 1/2" inlet or approved equal.
- 6) Quick coupling valves: Equal to Weather*matic V100RL-NP with "Non-Potable" purple rubber cover and locking cover. Contractor shall supply two (2) model 44K keys w/ bronze hose swivel adapters, Buckner model 45002. Quick coupling valve shall be prevented from rotation with Leemco Model LS-120 valve stabilizer or approved equal.
- 7) Backflow Preventer: Reduced pressure device Equal to Wilkens Model 975XL meeting the requirements of the City of Tulsa for irrigation system use. The backflow preventer shall be installed using Type L copper pipe and shall incorporate two (2) unions for ease of construction. The contractor shall provide freeze protection for the backflow preventer and

pipng by using thermostatically controlled "heat tape". The backflow preventer shall be placed in a protective cabinet along with the controller.

- 8) Backflow Preventer and Controller Protective Cabinet: The backflow preventer and controller shall be installed in an aluminum cabinet. The protective cabinet shall be installed on a concrete base or sidewalk as indicated on Standard Detail 840 - 842. The contractor is responsible for supplying a connection of 120 Volt power to the cabinet for the controller and backflow preventer. Source of 120 Volt power to be from new project circuitry. Submit proposed connection to engineer for approval.

840.2.5 WATER METER

- 1) New, 1" as provided by the City of Tulsa (1 Required).

840.2.6 CONTROLLER

- 1) Electronic, compatible with valves, multi-station, programmable, in U.L. approved rainproof housing. The controller shall be installed inside the cabinet at the specified location according to the manufacture's recommendations. The contractor is responsible for supply and connection of 120 volt power to the controller. Source of 120 Volt power to be from new project circuitry. Submit proposed connection to engineer for approval. The controller shall be as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California Model ESP-12LX+ or approved equal.

840.2.7 VALVE BOXES AND MARKERS

- 1) For automatic control valves: Equal to Carson Industries Inc. model 1419E-13 with 1419E extensions as required.
- 2) For quick coupling valves and isolation gate and ball valves: Equal to Carson Industries Inc. model 910-12 w/ 8" corrugated plastic pipe for extension.
- 3) For main line isolation valves: Carson Industries, Inc. model 910-12 with 8" I.D. corrugated polyethylene pipe, as manufactured by Advanced Drainage Systems, Inc. (ADS) or approved equal, cut to length as required.
- 4) For 24 volt (low voltage) electrical splices: Carson Industries, Inc. model 910-12 with 8" I.D. corrugated polyethylene pipe, as manufactured by Advanced Drainage Systems, Inc. (ADS) or approved equal, cut to length as required.

840.2.8 WIRING

- 1) Wire: All control wiring to be used for connecting the remote control valves to the controller shall be 14 gauge and all common wiring shall be 14 gauge. The wire shall be Type UF, 600 Volt, single or stranded solid

copper wire with PVC insulation and shall bear UL approval for direct underground burial feeder cable.

- 2) Splicing Materials - All electrical connections shall be waterproof so that there is no chance for leakage of water and corrosion build-up in the joint. The type of connection to be used shall be 3M DBY direct bury splice kits or King Silicon-Filled Safety Connectors.

840.2.9 ENVIRONMENT CONDITION SENSORS

- 1) Rain Sensor - Equal to Mini-Clik II manufactured by Mini-Clik, Inc.
- 2) Freeze Sensor - Equal to Freeze-Clik manufactured by Mini-Clik, Inc.

840.3 EXECUTION

840.3.1 PREPARATION

- 1) Contractor shall call and notify the local utility location center before any excavation to request the exact location of all utility lines. Contractor is responsible for the protection of all utility lines located on the site.
- 2) Design system to provide coverage of turf and planting beds on separate zones. Route piping to avoid plants and structures. All planting beds with sun exposure shall be zoned separately from shaded planting bed areas. All planting beds with shrubs and perennial plantings shall be zoned separately from beds with annual or seasonal planting. Turf rotor heads to be zoned separately from turf spray heads.
- 3) Head locations and pipe routing are diagrammatic only and shall be adjusted during installation to compensate for prevailing winds, gradient and landscaping to insure proper coverage with minimal overthrow.
- 4) Review layout requirements with other affected work. Location of heads to be coordinated with planting bed and lawn edges. Verify location and installation of sleeves (under paving and other improvements) to accommodate system.
- 5) Contractor shall insure that his equipment, materials, tools, excavations, backfills, any obstruction and in general, the job site, are properly barricaded, posted and lighted to prevent unnecessary risk to the public, municipal or construction employees that may encounter the job site.
- 6) Protect landscaping and other features remaining as final work.

840.3.2 IRRIGATION DESIGN

- 1) Spray heads shall be spaced no further than for "Head to Head" coverage based on the sprinkler head performance published by the head

manufacturer. Rotary heads (3/4" inlet) shall be spaced no further than 85 percent of the published radius for the design pressure.

- 2) Valves shall be sized according to the flow through the valve as follows:
 - 3-18 GPM - 1" Valve
 - 28-54 GPM - 1 1/2" Valve
 - 55-80 GPM - 2" Valve
- 3) All components of the irrigation system are to be designed and specified to maintain the design pressure and performance at the sprinkler heads with a fluctuation of static water pressure of plus or minus ten percent.
- 4) Pressurized main line pipe shall have maximum velocity of five (5) feet per second.
- 5) Lateral line pipe shall have maximum water velocity of five (5) feet per second.
- 6) The maximum pressure differential between the sprinkler head nearest the control valve and the sprinkler head furthest from the control valve shall not exceed 10 percent of the pressure at the control valve.
- 7) Review layout requirements with other affected work. Location of heads to be coordinated with planting bed and lawn edges. Verify location and installation of sleeves (under paving and other improvements) to accommodate system.
- 8) Protect landscaping and other features remaining as final work.

840.3.3 TRENCHING

- 1) Trenches for pipe shall be excavated to a sufficient width and depth to permit proper handling and installation of the pipe and fittings. All manifold, main lines, and lateral lines shall be installed at a minimum cover depth of 18 inches. The minimum cover specifications shall govern regardless of variations in ground surface profile. Trenches shall be graded and sloped to lowest drain points.
- 2) All water, sewer, drainage, electrical and all other utility lines shall be protected where encountered in trenching and, where cut or damaged by Contractor, shall be repaired at the expense of the Contractor and to the satisfaction of the City of Tulsa.
- 3) Concrete and asphalt crossings shall be sleeved prior to their installation. No cutting of existing sidewalks or roadways shall be permitted.

840.3.4 INSTALLATION

- 1) Contractor is responsible for the placement and installation of all sleeves whether shown on the drawings or not. Install sleeves under paving and

other improvements prior to construction. Install where required to accommodate piping at proper depth to prevent damage by other construction activities and to provide specified burial depth for irrigation pipe. Location of sleeves to be recorded and marked.

- 2) Arrange and coordinate installation of water meter. Cost paid by Contractor.
- 3) Install backflow preventer inside the cabinet at the specified location as approved by the City of Tulsa.
- 4) Install pipe, valves, controls and sprinklers in accordance with manufacturer's instructions. Connect to water and electrical service. All work to be accomplished in accordance with applicable codes.
- 5) Provide for thermal movement due to expansion and contraction of the pipe.
- 6) Solvent weld pipe and fitting connections shall be made according to ASTM D 2855-83 Standard Practice for making solvent-cemented joints with Poly (Vinyl Chloride) (PVC) pipe and fittings. Special care shall be taken to:
 - A) Cut pipe square, remove burrs and chamfer 2 inch pipe and larger.
 - B) Apply uniform coating on all parts with lighter coats on sockets.
 - C) Avoid pockets of cement left in joints.
 - D) Use small cans to maintain cement's original viscosity.
 - E) Make joints immediately and hold to prevent pipe from pushing out.
- 7) After piping is installed, before sprinkler heads are installed and backfilling commences, open valves and flush system with full head of water.
- 8) Set valve box covers level at finish grade. Rectangular valve boxes to be placed parallel to nearby curbs and walks or other improvements. Valves and valve boxes shall be installed where shown or directed, and shall be set plumb. Valve boxes shall be centered on the valves. Where feasible, valves shall be located outside the area of natural walkways or paths and shall be placed in groundcover areas where possible.. Earth fill shall be carefully tamped around each valve box. Valve boxes should be supported or blocked such that any surface loads on the valve boxes will not be transmitted below to the pipe or valves. Washed gravel sumps shall be provided below all valve boxes to permit drainage of water away from valves. Minimum depth of gravel sump is 8 inches.

- 9) Install at least two (2) automatic drain valves per zone at all low points sections of lateral piping (lines downstream from valves) to insure complete drainage of system when not in use.
- 10) All sprinklers shall be installed on flexible connections or swing joints as specified in Section 2.2 "Pipe and Fitting Materials" and shall be set plumb and level with the final grade.
- 11) Install control wiring. Place the excess wire in a 10 inch expansion coil at each valve to which controls are connected and at 100 foot intervals. Control wiring may be installed in the same trenches with the irrigation piping. Wiring shall be bundled and taped with electrical tape at 10 foot intervals the entire length of each run. Wiring shall be installed on the north or east side of the pipes. Wire shall not be taut in the trench and expansion loops shall be provided to prevent the wire from being tensioned by backfilling or other subsequent construction. The side of the trench in which the wires are located shall be free of stones and other hard material which might injure the wire insulation. Backfill material placed against the wires shall be select material especially free from stones or other material with might injure the insulation.
- 12) A minimum of 24" of wire for an expansion loop shall be allowed at each valve for contraction of wire or tightening of wire due to back-filling of trenches or possible valve service or replacement.
- 13) Splices outside of valve locations are not desirable and are discouraged. However, should splices be necessary, all splices shall be made in a minimum 10" round valve box. All connections at the electric control valves and splice points shall be water-proofed with the system specified in Section 2.8 "Wiring".
- 14) All trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, soft shale, or other approved materials, free from large clods of earth or stone. Rock, broken concrete or pavement, and large boulders shall not be used as backfill material. The backfill shall be thoroughly compacted and evened off with the adjacent soil level. Selected fill dirt or sand shall be used if soil conditions are as discussed above. The fill dirt or sand shall be used in filling four (4) inches above the pipe. The remainder of the backfill shall contain no lumps or rocks larger than one (1) inch. The top six (6) inches of backfill shall be free of rocks or gravel particles over one-half (1/2) inch in diameter, subsoil or trash. Open trenches or partially backfilled trenches shall be kept to a minimum and effort shall be made to completely backfill that trench opened each day. The Contractor will be responsible for restoration of all settlement for a period of one year from acceptance.
- 15) The irrigation controller shall be mounted level and plumb at the specified location shown on the contract drawings according to manufacturer's

recommendations. Electrical conduit PVC sweep ells shall be used for the entering and exiting of the 24 volt control wires into the conduit entering the controller. Controllers shall be connected to the appropriate valves as indicated on the contract drawings. Electrical power supply to the controller shall be installed according to local electrical codes and shall be provided by contractor.

16) Rain and freeze sensors shall be installed according to manufacturer's recommendations and shall be installed at locations approved by the design professional.

17) Clean area and remove all debris and excess materials from site.

840.3.5 TESTS

1) Static Pressure Test

- A) The entire main line system shall be constructed to successfully withstand, when completed, a full static pressure of 125 psi (whichever is greater) for a period of 6 hours with no resulting flow or pressure loss.
- B) The testing for leakage shall be conducted with the observation of the City of Tulsa and all pipe, joints and appurtenances will be inspected while the system is under test pressure and leaks corrected as directed. The testing shall extend over a period of up to six (6) hours to allow for a complete inspection.

2) Performance Test

- A) Upon completion of the irrigation system including all pressure tests, Contractor shall perform a 48 hour performance test of the complete system to insure that all components are functioning properly. Contractor shall keep a technically qualified person and necessary crew on the job site during this period of testing.
- B) The Contractor shall balance and adjust the various components of the system so that overall operation of the system is most efficient. This includes adjustments to pressure regulators, part-circle sprinkler heads and individual station adjustments on the controllers.
- C) Repair grades and re-dress mulch in planted areas disturbed by final testing and adjustment.

840.4 PAYMENT

840.4.1 BASIS OF PAYMENT

- 1) Underground Sprinkler System will be paid for at the contract unit price by lump sum for the system, or as indicated on the Contract Documents and approved by the City of Tulsa.

SPECIAL – IRRIGATION LUMP SUM (or as otherwise indicated on Contract Documents)

Such payment shall be full compensation for all equipment, tools, labor, and incidentals necessary to complete the work as specified.

DIVISION VIII

STREETSCAPE SPECIFICATIONS

PART 800 DECORATIVE LIGHTING

800.1 GENERAL

800.1.1 SUMMARY

- 1) This Section includes specific requirements for lighting and control for street and sidewalk lights to be installed in the City of Tulsa.
- 2) Section Includes:
 - A) Exterior Lighting Poles for support of luminaires, poles and accessories.
 - B) Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
 - C) Luminaire supports.
 - D) Lighting control equipment
 - E) Details are provided primarily to illustrate style and appearance of light fixtures. Performance of the lights is detailed on the drawings in regard to lumen output, light color temperature, efficacy and testing requirements. All lights and poles provided shall be identical (within noted tolerances) in appearance to fixtures and poles specified in the standard details. Before approval for purchase, current test data as specified in this document is to be provided to the City of Tulsa.
- 3) Related Documents and Requirements:
 - A) Drawings and general provisions of the Contract, including General, Supplementary Conditions and City of Tulsa Special Conditions, apply to this Section.

800.1.2 DEFINITIONS

- 1) The following terms are used within the text of this Section.
 - A) BUG: Backlight, Uplight and Glare
 - B) CCT: Correlated color temperature.
 - C) CRI: Color rendering index.
 - D) EPA: Equivalent projected area. This is important to verify wind loads if a new light is submitted

- E) Fixture: See "Luminaire".
 - F) IPP: International Protection or Ingress Protection Rating.
 - G) Lumen: Measured output of lamp and luminaire, or both.
 - H) Luminaire: Complete lighting unit, including lamp, reflector, and housing.
 - I) Pole: Luminaire-supporting structure.
 - J) LED Module: LED assembly including circuit board, LEDs and electronic components that plug into the fixture and produce light.
 - K) IES: Illumination Engineering Society
 - L) NRTL: National Recognized Testing Laboratory
 - M) NIST: National Institute of Standards and Technology
 - N) PMMA: Poly (methyl methacrylate)
 - O) IESNA: Illuminating Engineering Society of North America
 - P) ISTMT: In-situ Temperature Measurement Testing
 - Q) UL: Underwriters Laboratories
- 2) The following items are included in the decorative lighting specifications and all equipment referenced is to be in compliance with this document.
- A) All light fixtures, light poles, and pole bases associated with street lighting including those on street right-of ways and sidewalks.
 - B) All underground conduit and wire or above ground electrical service for powering lights and receptacles associated with the light poles.
 - C) All lighting controllers, contactors, photocells and other components associated with the referenced lighting equipment.
 - D) Electrical Service provided by AEP-PSO for powering street lighting and associated receptacles.

800.1.3 ACTION SUBMITTALS

- 1) Product Data (Poles): For each pole, accessory, and luminaire-supporting device, arranged as indicated.
 - A) Include data on construction details, profiles, EPA, materials, dimensions, weight, rated design load, and ultimate strength of individual components.

- B) Include finishes for lighting poles and luminaire-supporting devices.
 - C) Anchor bolts.
- 2) Project Data (Luminaires): For each type of luminaire.
- A) Arrange in order of luminaire designation.
 - B) Include data on features, accessories, and finishes. Include data on performance specification items identified in this document.
 - C) Include physical description and dimensions of luminaire.
 - D) For LEDs, include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - E) Before approval for purchase, provide for review IES LM-79, LM80 and TM21 test results. Data to be provided from an independent UL Certified laboratory.
 - F) Provide means of attaching luminaires to supports and indication that the attachment is suitable for components involved and is consistent with detail drawings.

800.1.4 CLOSEOUT SUBMITTALS

- 1) Operation and Maintenance Data:
- A) For luminaires include an operation and maintenance manual.

800.1.5 MAINTENANCE MATERIAL SUBMITTALS

- 1) Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- A) Poles: Furnish one spare pole to owner for every twenty poles installed. Furnish at least one pole of each type.
 - B) LED Modules: 1 for every 10 of each type and rating installed. Furnish at least one of each type.
 - C) Lens Covers and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - D) Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.
 - E) Internal House Side Shield for acorn style luminaires: Furnish one spare house shield to owner for every 5 luminaires installed. Furnish at least one of each type.

800.1.6 QUALITY ASSURANCE

- 1) Luminaire Photometric Data Testing Laboratory Qualifications:
 - A) Provided by an independent UL Certified testing agency , with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 for Energy Efficient Lighting Products and complying with applicable IES testing standards.
- 2) Provide luminaires from a single manufacturer for each luminaire type.
- 3) Each luminaire type shall be binned within a four-step MacAdam Ellipse to ensure color consistency among luminaires, or use other processes to ensure light color is as specified by CCT and CRI values.
- 4) Installer Qualifications: An authorized representative who is a licensed electrician and is trained and approved by manufacturer is to be responsible for construction of the lighting system.
- 5) Manufacturer Qualifications:
 - A) Supplier of poles and fixtures must have documentation that they have been in the business of manufacturing poles and LED fixtures for at least 5 years.
 - B) Lighting fixture manufacturers must have a minimum of 5 years experience building LED fixtures.
 - C) The City of Tulsa reserves the right to investigate the size and financial capacity of any potential supplier to ensure they can meet the warranty terms of this specification.

800.1.7 DELIVERY, STORAGE, AND HANDLING

- 1) Protect finishes of exposed surfaces by applying a strippable, temporary protective covering prior to shipping. Retain factory-applied pole wrappings on poles until right before pole installation.
- 2) Store poles on decay-resistant skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- 3) Retain factory-applied pole wrappings on metal poles until right before pole installation. Handle poles with web fabric straps.

800.1.8 WARRANTY

- 1) Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in performance, materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk

due to effects of weather or solar radiation within specified warranty period.

- A) Warranty Period for Luminaires: Seven years from date of Substantial Completion.
 - B) Warranty Period for Metal Corrosion: Seven years from date of Substantial Completion.
 - C) Warranty Period for Color Retention: Seven years from date of Substantial Completion.
 - D) Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within seven years from date of Substantial Completion.
 - E) Warranty Period for Entire System: Seven years from date of Substantial Completion.
- 2) Warranty to include all parts and labor as required to bring failed products back into compliance with the lighting system as originally specified.
 - 3) Contractor to identify a local source for providing the warranty repair work. If necessary to expedite repairs, the owner may furnish spare parts to the warranty provider, with the understanding these parts shall be replaced at the earliest date possible.
 - 4) City of Tulsa and the vendor are required to examine parts and mutually agree to when to declare damage to any fixture is the result of an electrical surge or lightning strike or other act not covered by the warranty.

800.2

MATERIALS

800.2.1 LIGHTING POLE TYPES

- 1) Foundation Design per latest AASHTO Standards for Structural Supports.
- 2) Structural Characteristics: Comply with AASHTO LTS-4-M.
 - A) Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated below.
 - 1. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.
 - 2. Basic wind speed for calculating wind load for poles is 90 mph.
- 3) Basis of design-Acorn Pole: Subject to compliance with requirements, provide the following:

- A) Tapered fiberglass composite core fluted pole
 - B) Nominal Height: 12 feet
 - 1. Wall thickness: 0.125 inches
 - 2. Base: 20 inch diameter
 - C) Anchor bolts: Per manufacturer standards and City of Tulsa Standard 804
 - D) Finish and Color: Powder Coated Black
 - E) Accessories:
 - 1. Duplex Receptacle GFCI type, 120V ac, 15A in a weatherproof assembly. Comply with requirements in Section on "Wiring Devices". Mount as indicated on Detail.
 - 2. See City of Tulsa Standard 800
 - 3. Banner Arms: Manufacturer's standard to match pole type. Two 30" banners per pole.
- 4) Basis of Design Product: "Blue Dome" Pole. Subject to compliance with requirements, provide the following:
- A) Pole:
 - 1. Aluminum or steel
 - 2. Nominal Height: 25.5 feet
 - 3. Base: 16.5 inches diameter.
 - B) Anchor Bolts: Per manufacturer's standards and City of Tulsa Standard 804
 - C) Finish & Color: Powder Coated, black.
 - D) Accessories:
 - 1. Duplex Receptacle GFCI type, 120V ac, 15A in a weatherproof assembly. Comply with requirements in Section on "Wiring Devices". Mount as indicated on Detail.
 - 2. Banner Arms: Manufacturer's standard to match pole type. Two 30" banners per pole.
- 5) Basis of Design-"Ball Field" Pole (Existing Poles in Brady and Greenwood Districts)

A) Pole:

1. Aluminum or steel
2. Nominal Height: 18 feet for 4 inch pole and 25 feet for 5 inch pole
3. Base: 18 foot pole has 16 inch base, 25 foot pole has 18 inch diameter base.

B) Anchor Bolts: Per manufacturer's standards and Design plans

C) Finish & Color: Powder Coated, black.

D) Accessories:

1. Duplex Receptacle GFCI type, 120V ac, 15A in a weatherproof assembly. Comply with requirements in Section on "Wiring Devices". Mount as indicated on Detail.
2. Banner Arms: Manufacturer's standard to match pole type. Two 30" banners per pole.

800.2.2 PERFORMANCE REQUIREMENTS (LUMINARIES)

- 1) Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an independent UL certified testing agency, and marked for intended location and application.
- 2) NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

800.2.3 LUMINAIRE TYPES

- 1) Basis of Design-Acorn Light: Subject to compliance with requirements, Provide the following:

A) Luminaire:

1. Diameter: 17.00 inches, +/- 1 inch
2. Height: 39.5 inches, +/- 1 inch
3. Lamp: LED modules

B) Optical System: IES Type V distribution, IP66 rated

1. Flat lens, optical grade PMMA acrylic refractor or,
2. Clear, tempered, shock-resistant glass or,
3. Prismatic globe

- C) Voltage: 120V to 277V
 - D) Mounting & Configuration: Pole top mount
 - E) Finish & Color: Powder Coated Black
 - F) Lumens: minimum 7600
 - G) EPA: 2.17
 - H) Luminaire Efficacy Rating (LM/W): minimum 96
 - I) BUG rating: B3-U3-G2
 - J) CRI = 70
 - K) CCT = 4000K
 - L) System (LED + Driver) Rated Life: minimum 100,000 hours.
 - M) Accessories
 - 1. Duplex receptacle GFCI type, 120V AC, 15A in weatherproof assembly. Comply with requirements in section on "Wiring Devices". Mount as indicated on detail.
 - 2. Provide fixture with "Dark Sky" compatible top shield to prevent spill light going upward.
 - 3. Fixture to have factory provided "house shields" that can be installed in the globe to prevent light from spilling into adjacent residences or businesses, where this creates a problem.
- 2) Basis of Design Product: Blue Dome Light Fixture. Subject to compliance with requirements, provide the following, or equal:
- A) Luminaire:
 - 1. Diameter: 27.5 inches, +/- 1 inch
 - 2. Height: 23.25 inches, +/- 1 inch
 - 3. Lamp: LED modules
 - B) Optical System: IES Type III distribution, Flat lens, optical grade PMMA acrylic refractor or clear, tempered, shock-resistant glass, IP66 rated
 - C) Voltage: 120V-277V
 - D) Finish & Color: Powder Coated, black.

- E) Lumens: minimum 9600
 - F) Luminaire Efficacy Rating (LM/W): minimum 96
 - G) BUG rating: B3-U0-G2
 - H) CRI = 70
 - I) CCT = 4000K
 - J) System (LED + Driver) Rated Life: minimum 100,000 hours.
- 3) Basis of Design Product: Ball Field Style Light Fixture.
- A) Luminaire:
 - 1. Diameter: +/- 1 inch
 - a. 18 inches on 18' pole
 - b. 26 inches on 25' pole
 - 2. Height: +/- 1 inch
 - a. 13 inches on 18' pole
 - b. 19 inches on 25' pole
 - 3. Lamp: LED modules
 - B) Optical System: IES Type III distribution, Flat lens, optical grade PMMA acrylic refractor or clear, tempered, shock-resistant glass, IP66 rated
 - C) Voltage: 120V-277V
 - D) Finish & Color: Powder Coated, black.
 - E) Lumens: minimum 7200 on 18' pole and minimum 9200 on 25' pole.
 - F) Luminaire Efficacy Rating (LM/W): minimum 96
 - G) BUG rating: B3-U0-G2
 - H) CRI = 80
 - I) CCT = 4000K
 - J) System (LED + Driver) Rated Life: minimum 100,000 hours.

800.2.4 SPECIAL LED LIGHTING REQUIREMENTS

- 1) The following requirements are made on all proposed LED light Fixtures:

- A) Fixtures must be comprised of modular components that are field replaceable; including glass lenses (where applicable), LED drivers and LED modules.
- B) Power supply shall have a minimum power factor of .90 and a total harmonic distortion (THD) of 20% or less at full input power and voltage. Line transient protection shall be 20 kv or greater for both common mode and differential mode, per IEEE C.6241-2-2002 Class A operation. Power supply shall meet consumer emissions limits as described in FCC 47 CFR Part 15/18. TVSS shall have visible indication of failure and shall be field replaceable. The power supply shall have a Class A sound rating per ANSI Standard C63.4.
- C) Luminaire to operate at temperature limits and have heat sinks and passive thermal management hardware that does not require fans or liquids. Thermal management systems to limit current when excessive temperatures are sensed. Thermal management system shall maintain LED temperature equivalent to the manufacturers rated specifications.

800.2.5 INFRASTRUCTURE STANDARDS

1) Conduit

- A) All buried conduit to be schedule 40 PVC. Wall thickness to be per ASME Standards B36.10M and B36.19M. All exposed conduit to be Rigid Galvanized Steel.
- B) Conduit for AEP-PSO service feeders to lighting controllers to be minimum 3" PVC or HDPE.
- C) Where boring is required, use minimum 3" HDPE.

2) Wire

- A) Wire to be installed in conduit for lighting.
- B) Wire to be sized for ampacity of connected lighting and derated per NEC for multiple circuits, and voltage drop.
- C) Minimum wire size is #12 for lighting and grounding circuits.

3) Pull Boxes

- A) Street Lighting pull boxes to be concrete or Prescolite (combination of plastic and fiberglass) flush mounted boxes with lids.
- B) Pull box lids to be permanently engraved with "LIGHTING".

4) Pole bases

- A) All light fixtures shall be installed on cast-in-place concrete pole bases, as shown on the design plans.
- B) Where special conditions are encountered, modified pole details shall be provided.
- C) All pole bases to have an 8' copper clad ground rod installed adjacent to them, and be bonded to the support steel using minimum #6 stranded wire. Connection is to be made via Cadweld.
- D) Concrete testing of material for pole bases is to be per the latest ODOT Specifications.

800.2.6 MOUNTING HARDWARE

- 1) Exterior hardware shall be stainless steel.

2) GENERAL FINISH REQUIREMENTS

- A) Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B) Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

800.3 EXECUTION

800.3.1 EXAMINATION

- 1) Examine areas and conditions, with Installer present, for compliance with pole manufacturer requirements for installation tolerances and other conditions affecting performance of the Work.
- 2) Examine poles, luminaire-mounting devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.
- 3) Examine rough-in for foundation and conduit to verify actual locations of installation.
- 4) Examine rough-in for luminaire electrical conduit to verify actual locations of conduit connections before luminaire installation.
- 5) Proceed with installation only after unsatisfactory conditions have been corrected.
- 6) Check architectural finishes and verify that luminaires are provided with proper trim, finishes, supports, and miscellaneous accessories regardless of catalog numbers prefixes or suffixes shown in fixture schedule.

- 7) Verify all circuits in the lighting controller are permanently labeled and a circuit description is included in the panel lid. Confirm timer settings are correct.

800.3.2 POLE INSTALLATION

- 1) Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
- 2) Orient access door away from curb.
- 3) Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings.
 - A) Fire Hydrants and Storm Drainage Piping: 60 inches.
 - B) Water, Gas, Electric, Communication, and Sewer Lines: 5 feet.
 - C) Trees: 15 feet from tree trunk.
 - D) From back of curb: 1'-6".
- 4) Concrete Pole Foundations:
 - A) Cast in place, with anchor bolts to match pole base flange. Structural steel complying with ASTM A36/A36M and hot-dip galvanized according to ASTM A123/A123M and with top plate and mounting bolts to match pole- base flange and strength required to support pole, luminaire, and accessories. Concrete, reinforcement, and formwork as specified in latest ODOT specification.
 - B) Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements as specified in latest ODOT specification.
- 5) Foundation-Mounted Poles: Mount poles with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
 - A) Grout void between pole base and foundation. Use non-shrink or expanding concrete grout firmly packed to fill space.
 - B) Install base covers unless otherwise indicated.
 - C) Use a short piece of ½ inch diameter PVC pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
- 6) The city of Tulsa field inspector shall inspect pole bases before they are poured.
- 7) Raise and set poles using web fabric slings (not chain or cable).

- 8) Where pole receptacles are used, verify proper function of receptacles with a portable receptacle tester.

800.3.3 LUMINAIRE INSTALLATION

- 1) Comply with NEC
- 2) Use fastening methods and materials as approved by manufacturer.
- 3) Supports:
 - A) Sized and rated for luminaire weight.
 - B) Able to maintain luminaire position after cleaning and relamping.
 - C) Support luminaires without causing deflection of finished surface.
 - D) Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- 4) Install luminaires level, plumb, and square with finished grade unless otherwise indicated.
- 5) Coordinate layout and installation of luminaires with other construction.
- 6) Verify proper operation of all luminaires and repair/replace any non-working material.
- 7) Adjust luminaires that require field adjustment or aiming.

800.3.4 CORROSION PREVENTION

- 1) Aluminum: do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
- 2) Steel Conduit: Comply with City of Tulsa Electric Code. In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

800.3.5 GROUNDING

- 1) Ground metal poles and support structures according to City of Tulsa Electric Code.
 - A) Install grounding electrode for each pole unless otherwise indicated.
 - B) Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

- 2) Ground nonmetal poles and support structures according to the City of Tulsa Electric Code on "Grounding and Bonding for Electrical Systems".
 - A) Install grounding electrode for each pole.
 - B) Install grounding conductor and conductor protector.
 - C) Ground metallic components of pole accessories and foundations.

800.3.6 FIELD QUALITY CONTROL

- 1) Inspect each installed fixture for damage. Replace damaged fixtures and components with new.
- 2) Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
- 3) Verify operation of photoelectric controls.
- 4) Illumination Tests:
 - A) Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s).
 1. IESNA LM-50 – "Photometric Measurements of Roadway Lighting Installations".
 2. IESNA LM-64 – "Photometric Measurements of Parking Areas".
 3. IESNA LM-72 – "Directional Positioning of Photometric Data".

800.4 PAYMENT

800.4.1 METHOD OF MEASUREMENT

- 1) The City of Tulsa Inspector and the Project Architect or Engineer will review Pay Applications submitted by the Contractor and shall approve payment based on the quantity of lights that are properly and completely installed according to the drawings including footings, poles, fixtures and touch-up.

800.4.2 BASIS OF PAYMENT

- 1) Payment will be made for each site furnishing pay item at the contract unit price per specified pay unit:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
STREET LIGHT	EACH

DESIGN CRITERIA

- 1) In order to facilitate a uniform look for the City of Tulsa the following requirements are to be met in regard to street lighting:
- 2) LIGHTING DESIGN REQUIREMENTS
 - A) For LED lights, contractor must submit the following test information performed by a UL certified lab:
 1. LM-79 Fixture Test. This test is documentation of the fixture performed in a lab. Minimum acceptable efficacy for the fixture is to be 96 lumens/watt.
 2. Manufacturer to provide an ISTMT Thermal measurement test showing operation of the fixture in question under temperature, while current and light output are monitored. A test temperature of 25 degrees C is required. This is a test of the submitted fixture under temperature, with documented performance values.
 3. Independent 24 hour 40 degrees C thermal testing shall be performed. Thermal measurements shall not exceed LED and power supply rated maximum values
 - B) Provide TM-21 data. TM-21 is the IES-recommended method for projecting lumen degradation of an LED package, array or module based on data collected according to LM-80.
 - C) Lighting Correlated Color Temperature shall be 3,500 K to 4000 K nominal. Independent UL testing to confirm lighting color temperature of the selected fixture.
 - D) Minimum foot-candle illumination of 1.0 on sidewalk areas with a maximum average to minimum ratio of 3:1. Refer to IESNA standards or AASHTO Roadway Lighting Design Guide for other applications.
- 3) LIGHTING CONTROLLER AND LIGHT POLE CIRCUITING
 - A) Contractor to feed lighting controller below grade, from AEP-PSO power pedestal or service pole.
 - B) Power conduit for AEP-PSO service feed to be minimum of 3" diameter.
 - C) No power for traffic control or other loads shall be fed from the lighting controller or associated conduits, with the exception of irrigation power and pole receptacles.
 - D) Provide controller per drawing detail. Feed only decorative lights and receptacles for the controller.

- E) Traffic control equipment and AEP-PSO provided lights are not to be fed from lighting controller.
 - F) Receptacles on poles to be switched on with decorative lights.
 - G) Lighting controller is to be in a stand-alone NEMA 4X, hinged stainless steel box. Box dimensions are to be approximately 30" W x 40" H x 24"D and to be mounted on a 4' x 4' x 0.5' thick concrete base with conduits entering from the bottom. Box to be bolted to concrete foundation with four ¾ inch stainless steel bolts, length as required with 4 inch embedment. Use Hilti HIT-RE 500-SD epoxy or approved equal. Seal joint between cabinet and concrete pad with Dow Corning 795 Silicone Building Sealant with Limestone color or approved equal.
 - H) Lighting controller to have AEP-PSO approved meter installed on it. Meter is to be a minimum of 18" above grade.
 - I) Contractor to obtain permit and circuit for decorative street lighting in the name of the responsible party. Decorative lights and associated receptacles shall be metered.
 - J) Coordinate with AEP-PSO for electrical service for controller. Minimum service size is 240/120V 60A, single phase. Where needed, 3 phase panels are allowed. Size actual controller for connected load plus 20% additional load.
 - K) Astronomic timer must have at least 48 hours of internal backup to keep programmed times in the event of power loss.
 - L) Confirm exact location of lighting controller with owner before final installation.
 - M) All pole or fixture receptacles are to be GFCI rated in-use receptacles and be 120V single phase.
 - N) When pole mounted receptacles are used, the pole circuits and the receptacle circuits should match the same groupings.
 - O) All lights should have the same operating voltage.
- 4) PERFORMANCE REQUIREMENTS (POLES)
- A) Structural Characteristics: Comply with AASHTO LTS-6-M.
 - B) Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.
 - C) Ice Load: Load of 3 lbs/sq. ft. (145 Pa), applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

D) Minimum Design Life: 25 years.

DIVISION VIII

STREETSCAPE SPECIFICATIONS

PART 832 SODDING

832.1 GENERAL

832.1.1 SUMMARY

- 1) Preparation of planting surface.
- 2) Fertilizing.
- 3) Sod installation.
- 4) Maintenance service.

832.1.2 RELATED WORK

- 1) 831 - Trees, Shrubs and Ground Cover.
- 2) 833 - Landscape Maintenance.
- 3) 840 - Underground Sprinkler System.

832.1.3 REFERENCES

- 1) Standardized Plant Names, 1942 Edition, American Joint Committee on Horticulture Nomenclature.
- 2) ASPA (American Sod Producers Association) - Guideline Specifications to Sodding.
- 3) FSO-F-241 - Fertilizers, Mixed, Commercial.

832.1.4 DEFINITIONS

- 1) Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel and Brome Grass.

832.1.5 QUALITY ASSURANCE

- 1) Sod Producer: Company specializing in sod production and harvesting with a minimum of 5 years experience.
- 2) Sod: Root development that will support its own weight, without tearing, when suspended vertically by holding the upper two corners.

- 3) Submit sod certification for grass species and location of sod source.

832.1.6 REGULATORY REQUIREMENTS

- 1) Comply with regulatory agencies for fertilizer and herbicide composition.

832.1.7 TESTS

- 1) Provide soils tests and recommendations for areas to be sodded. Obtain from approved testing agency. Such tests shall be a composite of random samples. Test areas exhibiting different soil types separately. Provide separate tests for each 10,000 sq. ft. of sodded area.

832.1.8 MAINTENANCE DATA

- 1) Submit recommended maintenance procedures to be followed by City/Owner.
- 2) Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

832.1.9 DELIVERY, STORAGE, AND HANDLING

- 1) Deliver sod on pallets. Protect exposed roots from dehydration.
- 2) Do not deliver more sod than can be laid within 8 hours for Fescue Sod, or 24 hours for Bermuda Sod.

832.1.10 COORDINATION

- 1) Coordinate the work of this Section with installation of underground sprinkler system and plant material as applicable.

832.1.11 MAINTENANCE SERVICE

- 1) Maintain sodded areas immediately after placement until grass is well established, has achieved complete coverage, and exhibits a vigorous growing condition or until Final Acceptance by the City whichever is longer. Maintenance period shall include minimum of two mowings.

832.2 PRODUCTS

832.2.1 MATERIALS

- 1) Sod: Cultivated grass sod; type indicated on Drawings; with strong fibrous root system, free of stones, burned or bare spots, and weeds.

- 2) Fertilizer: Type recommended for grass; of proportions necessary to eliminate any deficiencies of topsoil as indicated in soils test or otherwise approved.
- 3) Soil Amendments: Lime, sulphur, or other material recommended by soil test.
- 4) Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.

832.2.2 ACCESSORIES

- 1) None

832.2.3 HARVESTING

- 1) Machine cut sod and load on pallets in accordance with ASPA guidelines.
- 2) Cut sod with minimum 1/2 inch and maximum one inch topsoil base.

832.3 EXECUTION

832.3.1 INSPECTION

- 1) Verify that prepared soil base is ready to receive the work of this Section.
- 2) Beginning of installation means acceptance of existing site conditions.

832.3.2 PREPARATION

- 1) Finish grade areas to be sodded so that the surface is smooth and is approximately 1 inch below adjoining sidewalks and other paved surfaces.
- 2) Remove all weeds and grasses from areas to be sodded. If Bermuda grass is present in areas to receive Fescue sod, to be exterminated by approved means or all soil removed to 6-inch depth and replaced with topsoil free of Bermuda grass.
- 3) Planting surface shall be made friable by approved method of scarification. Prepared surface shall be floated smooth and free of bumps and depressions. Remove stones and foreign matter over 2 inches in diameter from top 2 inches of sod bed. Plant immediately thereafter, provided the bed has remained in a friable condition and has not become muddy or hard. If it has become hard, till to a friable condition again.
- 4) Apply fertilizer per soil tests recommendation. Apply fertilizer prior to installation of sod. For fescue sod apply 6-24-24 fertilizer at a rate of 5 lbs. per 1000 sq. ft. and Milorganite at a rate of 5 lbs. per 1000 sq. ft. Fertilizer application to be done before laying sod.

- 5) Apply fertilizer no more than 48 hours before laying sod.
- 6) Lightly water to aid the dissipation of fertilizer.
- 7) Prior to laying sod, incorporate soil amendments such as lime and sulphur at rates recommended by soils tests to a 4 inch depth.
- 8) Fescue sod should be laid only when the temperature is below 90° and is expected to remain less than 90° for the following 12 hours.
- 9) Fescue sod to be laid only when the wind is less than 10 mph.

832.3.3 LAYING SOD

- 1) Moisten prepared surface immediately prior to laying sod.
- 2) Remove plastic netting from sod.
- 3) Lay sod immediately on delivery to site within 24 hours for Bermuda grass or 8 hours for Fescue after harvesting to prevent deterioration.
- 4) Lay sod tight with no open joints visible and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.
- 5) Finished sodding to be smooth and free of bumps and depression. Surface to be flush with adjoining grass areas if any. Place top elevation of sod approximately 1/2 inch below adjoining edging, paving and curbs. Grade planting surface as necessary to accomplish above.
- 6) On slopes 4 inches per foot and steeper, 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.
- 7) Water sodded areas deeply immediately after installation.
- 8) After sod and soil have dried sufficiently, roll sodded areas to insure good bond between sod and soil and to remove minor depressions and irregularities.

832.3.4 WARRANTY

- 1) Sodded areas to be vigorously growing at time of final acceptance or if installation occurs during dormancy warranty to extend through first month of following growing season. At conclusion of initial warranty period replace dead or unhealthy sod.
- 2) For a period of one year commencing upon the Date of Substantial Completion, resod or reseed bare areas until complete coverage is achieved. Repairs to be completed as specified in the Maintenance requirements below.

832.3.5 MAINTENANCE

- 1) Maintain sod until Final Acceptance by the City, or for additional time period as indicated in the Pay Quantity items for the project.
- 2) Mow grass at regular intervals to maintain at a maximum height of 3 inches for Fescue and 2-1/2 inches for Bermuda grass. Do not cut more than 1/3 of grass blade at any one mowing.
- 3) Neatly trim edges and hand clip where necessary.
- 4) Immediately remove clippings after mowing and trimming.
- 5) Water sufficiently to insure establishment and maintain vigorous appearance. For a period of one week following Fescue sod installation, each area shall be watered four times daily with spray mist.
- 6) Roll and/or topdress surface as needed to remove minor depressions or irregularities.
- 7) Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- 8) Immediately replace sod in areas which show deterioration or bare spots. Any areas that have had topsoil washed away shall be filled to match specified grade with topsoil before resodding.
- 9) Protect sodded areas with warning signs during maintenance period.
- 10) Apply approved fertilizer at rate to provide 1-1/2 pounds of actual Nitrogen per 1000 square feet every 25 days during growing season.
- 11) For the purpose of establishing an acceptable standard, no bare areas will be permitted.

832.4 PAYMENT

832.4.1 METHOD OF MEASUREMENT

- 1) The Engineer will review Pay Applications submitted by the Contractor and shall approve payment based on the square foot quantity of each type of solid sod that is properly and completely installed according to the drawings, including placing and maintaining.

832.4.2 BASIS OF PAYMENT

- 1) Payment will be made for each Tree, and each Shrub at the contract unit price per specified pay unit:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
BERMUDA SOD	PER SQ. FT.
FESCUE SOD	PER SQ.FT.

DIVISION VIII

STREETSCAPE SPECIFICATIONS

PART 830 STRUCTURAL SOIL

830.1 GENERAL

830.1.1 SUMMARY

- 1) The work of this section consists of all Structural Soil work and related items as indicated on the drawings or as specified herein and includes, but is not limited to, the following:

CU-Soil™ is a proprietary material patented by Cornell University (US Patent #5,849,069) and marketed under the registered trademark, CU-Structural Soil®. Only licensed companies are authorized to produce this material, meeting the specifications described in this text. For a list of licensed CU-Soil™ producers, call AMEREQ, INC. at 800-832-8788.

830.1.2 RELATED WORK

- 1) Section 831 – Trees, Shrubs and Ground Cover
- 2) Section 840 – Underground Sprinkler System

830.1.3 QUALITY ASSURANCE

- 1) Qualifications of installing contractor: The work of this section should be performed by a contracting firm which has a minimum of five years experience. Proof of this experience shall be submitted as per paragraph, SAMPLES and SUBMITTALS, of this section.

830.1.4 SUBMITTALS

- 1) At least 30 days prior to ordering materials, the installing contractor shall submit to the Engineer representative samples, certificates, manufacturer's literature and test results for materials specified below. No materials shall be ordered until the required samples, certificates, manufacturer's literature, producer's current license and test results have been reviewed and approved by the Engineer. The Engineer reserves the right to reject any material that does not meet CU-Structural Soil® specifications. Delivered materials shall closely match the approved samples.
- 2) Submit soil test analysis reports for sample of clay loam from an independent soil-testing laboratory. The testing laboratory for particle size and chemical analysis may include a public agricultural extension service agency.

- A) Submit a mechanical analysis of the clay loam sample and particle size analysis including the following gradient of mineral content:

<u>USDA Designation</u>	<u>Size in mm</u>
Gravel	+2 mm
Sand	0.05 – 2 mm
Silt	0.002-0.05 mm
Clay	minus 0.002 mm

- 3) Sieve analysis shall be performed and compared to USDA Soil Classification System.
- 4) Sieve analysis shall be done by a combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D422 after destruction of organic matter by hydrogen peroxide.
- 5) Submit a chemical analysis, performed in accordance with current AOAC Standards, including the following:
- A) pH and buffer pH.
 - B) Percent organic matter as determined by the loss of ignition of oven dried samples. Test samples shall be oven dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.
 - C) Analysis for nutrient levels by parts per million.
 - D) Soluble salt by electrical conductivity of a 1:2 soil/water sample measured in Millimho per cm.
 - E) Cation Exchange Capacity (CEC).
 - F) Carbon/Nitrogen Ratio.
- 6) At the Engineer's discretion, the sample of CU-Structural Soil® may be tested for the following:
- A) Compaction in accordance with ASTM D698/AASHTO T99 without removing oversize aggregate
 - B) California Bearing Ratio in accordance with ASTM D1883- soaked CBR shall equal or exceed a value of 50
 - C) Measured dry-weight percentage of stone in the mixture
 - D) The approved CU-Structural Soil® sample shall be the standard.
 - E) Any deviation from the specified crushed stone and clay loam specifications shall be approved by Amereq, Inc.

830.1.5 DELIVERY, STORAGE AND HANDLING

- 1) Delivered CU-Structural Soil® shall be at or near optimum compaction moisture content as determined by AASHTO T 99 (ASTM D 698) and should not be placed in frozen, wet or muddy sites.
- 2) Protect CU-Structural Soil® from exposure to excess water and from erosion at all times. Do not store CU-Soil™ unprotected. Do not allow excess water to enter site prior to compaction. If water is introduced into the CU-Soil™ after grading, allow water to drain to optimum compaction moisture content.
- 3) CU-Structural Soil® shall be amended to produce a consist pH within the range of 6.0 to 7.0.

830.1.6 EXAMINATION OF CONDITIONS

- 1) All areas to receive CU-Structural Soil® shall be inspected by the installing contractor before starting work and all defects such as incorrect grading, compaction, and inadequate drainage shall be reported to the Engineer prior to beginning this work.

830.2 PRODUCTS

830.2.1 MATERIALS

1) CU-STRUCTURAL SOIL®

- A) A uniformly blended urban tree mixture of crushed stone, clay loam and Gelscape® Hydrogel Tackifier, as produced by an Amereq-licensed company, mixed in the following proportion:

<u>Material</u>	<u>Unit of Weight</u>
specified crushed stone	100 units dry weight
specified clay loam	20 - 25 units (to achieve minimum CBR of 50)
Gelscape® Hydrogel Tackifier ASTM D698/AASHTO T-99	0.035 units dry weight moisture optimum moisture

830.3 EXECUTION

830.3.1 CU-SOIL™ MIXING AND QUALITY CONTROL TESTING

- 1) All CU-Structural Soil® mixing shall be performed at the licensed producer's yard using appropriate soil measuring, mixing and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. No mixing of CU-Structural Soil® at the project site shall be permitted.

- 2) Maintain adequate moisture content during the mixing process. Soils and mix components shall easily shred and break down without clumping. Soil clods shall easily break down into a fine crumbly texture. Soils shall not be overly wet or dry. The licensed producer shall measure and monitor the amount of soil moisture at the mixing site periodically during the mixing process.
- 3) Raw materials shall be mixed off-site, only at the licensed producer's facility, on a flat asphalt or concrete paved surface to avoid soil contamination.
- 4) Should the independent laboratory test results of the clay loam reveal a need to amend it, to meet specifications, the amending materials should be added to the clay loam following the rates and recommendations provided by Amereq.

830.3.2 UNDERGROUND UTILITIES AND SUBSURFACE CONDITIONS

- 1) The installing contractor shall notify the Engineer of any subsurface conditions which will affect the contractor's ability to install the CU-Soil™.
- 2) The installing contractor shall locate and confirm the location of all underground utility lines and structures prior to the start of any excavation.
- 3) The installing contractor shall repair any underground utilities or foundations damaged during the progress of this work.

830.3.3 PREPARATION

- 1) Do not proceed with the installation of the CU-Structural Soil® material until all walls, curb footings and utility work in the area have been installed. For site elements dependent on CU-Structural Soil® for foundation support, postpone installation of such elements until immediately after the installation of CU-Structural Soil®.
- 2) Install subsurface drain lines as shown on the plan drawings prior to installation of CU-Structural Soil® material.
- 3) Excavate and compact the proposed subgrade to depths, slopes and widths as shown on the drawings. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not over excavate compacted subgrades of adjacent pavement or structures.
- 4) Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade and/or toward the subsurface drain lines as shown on the drawings.
- 5) Clear the excavation of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout silts or

other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Fill any over excavation with approved fill and compact to the required subgrade compaction.

- 6) Do not proceed with the installation of CU-Structural Soil® until all utility work in the area has been installed. All subsurface drainage systems shall be operational prior to installation of CU-Structural Soil®.
- 7) Protect adjacent walls, walks and utilities from damage. Use 1/2" plywood and/or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work.
 - A) Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.
 - B) Any damage to the paving or architectural work caused by the installing contractor shall be repaired, as directed by the Engineer.
- 8) Maintain all silt and sediment control devices required by applicable regulations. Provide adequate methods to assure that trucks and other equipment do not track soil from the site onto adjacent property and the public right of way.

830.3.4 WATER

- 1) The installing contractor shall be responsible to furnish his own supply of water (if needed) free of impurities, to the site.

830.3.5 INSTALLATION

- 1) Install CU-Structural Soil® in 6 inch lifts and compact each lift.
- 2) Compact all materials to at least 95% Proctor Density from a standard compaction curve AASHTO T 99 (ASTM D 698). No compaction shall occur when moisture content exceeds maximum as listed herein. Delay compaction if moisture content exceeds maximum allowable and protect CU-Structural Soil® during delays in compaction with plastic or plywood as directed by the Engineer.
- 3) Bring CU-Structural Soil® to finished grades as shown on the drawings. Immediately protect the CU-Structural Soil® from contamination by toxic materials, trash, debris, water containing cement, clay, silt or materials that will alter the particle size distribution of the mix with plastic or plywood as directed by the Engineer.
- 4) The Engineer may periodically check the material being delivered, prior to installation for color and texture consistency with the approved sample provided by the installing contractor as part of the submittal for CU-

Structural Soil®. If the Engineer determines that the delivered CU-Soil™ varies significantly from the approved samples, the Engineer shall contact the licensed producer.

- 5) Engineer shall ensure that the delivered structural soil was produced by the approved CU-Soil™ licensee by inspecting weight tickets showing source of material.
- 6) CU-Soil™ should not be stockpiled long-term. Any CU-Soil™ not installed immediately should be protected by a tarp or other waterproof covering.

830.3.6 FINE GRADING

- 1) After the initial placement and rough grading of the CU-Structural Soil® but prior to the start of fine grading, the installing contractor shall request review of the rough grading by the Engineer. The installing contractor shall set sufficient grade stakes for checking the finished grades.
- 2) Adjust the finish grades to meet field conditions as directed.
 - A) Provide smooth transitions between slopes of different gradients and direction. Fill all dips with CU-Soil™ and remove any bumps in the overall plane of the slope.
 1. The tolerance for dips and bumps in CU-Structural Soil® areas shall be a 3" deviation from the plane in 10'. All fine grading shall be inspected and approved by the Engineer prior to the installation of other items to be placed on the CU-Structural Soil®.

830.3.7 ACCEPTANCE STANDARDS

- 1) The Engineer will inspect the work upon the request of the installing contractor. Request for inspection shall be received by the Engineer at least 10 days before the anticipated date of inspection.

830.3.8 CLEAN-UP

- 1) Upon completion of the CU-Structural Soil® installation operations, clean areas within the contract limits. Remove all excess fills, soils and mix stockpiles and legally dispose of all waste materials, trash and debris. Remove all tools and equipment and provide a clean, clear site. Sweep, do not wash, all paving and other exposed surfaces of dirt and mud until the paving has been installed over the CU-Structural Soil® material. Do no washing until finished materials covering CU-Structural Soil® material are in place.

830.4 PAYMENT

830.4.1 METHOD OF MEASUREMENT

- 1) The Engineer will review Pay Applications submitted by the Contractor and shall approve payment based on the quantity of structural soil that is properly and completely installed according to the drawings, including placing and compacting.

830.4.2 BASIS OF PAYMENT

- 1) Payment will be made for each Cubic Yard of installed Structural Soil at the contract unit price per specified pay unit:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
CU STRUCTURAL SOIL	PER CUBIC YARD

DIVISION VIII

STREETSCAPE SPECIFICATIONS

PART 820 STREETSCAPE AMENITIES

820.1 GENERAL

820.1.1 SUMMARY

1) Section includes:

A) Fabricate and install benches, trash receptacles, bollards, bike racks, tree wells, and parking lot screens in accordance with the requirements set forth in this section.

2) Additional work included in this section

A) Field measuring for weld plates, sleeves and insert locations.

B) Field measuring.

C) Anchors or inserts and footings.

D) Touch-up of powder coated materials.

820.1.2 REFERENCES

1) American Concrete Institute (ACI)

A) ACI 347 Recommended Practice for Concrete Formwork

2) American Society for Testing and Materials (ASTM)

A) A 53 Pipe, Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless.

B) A 123 Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.

C) A 269 Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

D) A 312 Specification for Seamless and Welded Austenitic Stainless Steel Pipe.

3) Powder Coating Properties (ASTM)

A) D523-89: 80-90 Gloss at 60°.

B) D3363-92a: Pencil hardness 2H

C) D2794-93: Dir / Rev Impact, Gardner, Up to 160 in/lbs

- D) D522-93a: Flexibility, Mandrel, ¼" dia., no fracture.
- 4) Americans With Disabilities Act Accessibility Guidelines (ADAAG), and Public Right of Ways Accessibility Guidelines (PROWAG)
- 5) Green Globes System
- 6) International Code Council (ICC)
 - A) International Building Code (IBC)
 - B) International Residential Code (IRC).
- 7) National Association of Architectural Metal Manufacturers (NAAMM) and National Ornamental and Miscellaneous Metals Association (NOMMA)
 - A) Metal Finishes Manual
- 8) National Association of Home Builders (NAHB)
 - A) Model Green Home Building Guidelines.
- 9) Institute of Building Sciences
 - A) Metric Guide for Federal Construction
 - B) U.S. Green Building Council
 - C) The Leadership in Energy and Environmental Design (LEED) Green Building Rating System™

820.1.3 QUALITY ASSURANCE

- 1) Fabricator Qualifications:
 - A) A firm experienced in manufacturing site furnishings similar to those required for this project and with a record of successful in-service performance.
 - B) Furnish references listing projects of similar size and scope.
- 2) Installer Qualifications
 - A) An experienced installer who has completed installation of bicycle parking racks, trash receptacles, and benches, similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.
- 3) Source Limitations:

A) Obtain each color, finish, shape, and type of furnishing from a single source with resources to provide components of consistent quality in appearance and physical properties.

4) Product Options:

A) Drawings indicate general size, shape and dimensional requirements of furnishings, but are not intended to limit specific site furnishings to one manufacturer unless specifically stated. Submitted products should meet the general design intent and appearance of the detailed product.

5) Regulatory Requirements

A) Components and installation are to be in accordance with state and local code authorities

6) Certifications

A) Furnish certification that all components and fittings are furnished by the same manufacturer or approved by the primary component manufacturer.

820.1.4 SUBMITTALS

1) Submit shop drawings and product data that:

A) Show sections and plans of site, dimensions and assembly of components.

B) Show all field connections

C) Provide setting diagrams for installation of anchors, location of pockets, and weld plates for attachment of rails to structure.

D) Indicate all required field measurements.

E) Submit six (6) sets of hard copies, and one digital copy of PDF and CAD files for approval.

2) Indicate component details, materials, finishes, connection and joining methods, and the relationship to adjoining work.

3) Submit manufacturer's installation instructions.

4) Submit recommended methods for repairing damage to the powder coat, or other finishes of the site furnishings.

5) Substitutions:

- A) Any changes in specified material must meet requirements of the General Conditions "or equal" clause.
- B) Changes in architectural details to fabricator's standard procedures will be allowed when appearance and strength are not affected.
- 6) State any alternatives that affect the work and/or bid price of this section, such as a change in material or a change to contractor's standard details.

820.1.5 DELIVERY, STORAGE AND HANDLING

- 1) Deliver materials to the job site in good condition and properly protected against damage to finished surfaces.
- 2) Storage on site:
 - A) Store material in a location and in a manner to avoid damage. Stacking shall be done in a way, which will prevent bending.
 - B) Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.
 - C) Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

820.1.6 EXAMINATION OF CONDITIONS

- 1) Contractor should visit the site and be fully aware of the location and orientation of all site furnishings. Unless otherwise stated in the drawings, benches and trash receptacles may be mounted directly on existing concrete sidewalks. Below grade footings should be poured to allow the proposed paving to be placed with the correct finished grade, and at the proper thickness.

820.1.7 WARRANTY

- 1) Furnishings are to carry a minimum one-year manufacturer's limited warranty against defects in materials and workmanship. The one-year warranty shall be extended to cover the time period one-year from the date of final acceptance of the project.

820.2 PRODUCTS

820.2.1 ACCEPTABLE MANUFACTURERS

- 1) Bike Rack and components shall be equal to those manufactured or supplied by:

- A) Inverted U Bike Parking Rack: SiteScapes, Inc., P.O. Box 22326, Lincoln, NE 68542, 888.331.9464. www.sitescapeonline.com.
 - B) Dumor Bike Rack Model 83: Distributed by ACS Playground Adventures, 8501 Mantle Avenue, Oklahoma City, Oklahoma 73132. 405.721.3506. www.acsplay.com.
 - C) 'U' Bike Rack: Madrax, a division of Graber Manufacturing, Inc. 1080 Uniek Drive, Waunakee, WI 53597. 608.849.1080. www.madrax.com.
 - D) Loop Bikerail Kit Embedded; The Wagner Companies, P.O. Box 423; Butler, WI 53007. Phone: 888-243-6914. Fax: 414-214-0550. Web site: www.wagnercompanies.com. E-mail: info@mailwagner.com.
- 2) Benches shall be equal to those manufactured or supplied by:
- A) Dumor Bench Model 119: Distributed by ACS Playground Adventures, 8501 Mantle Avenue, Oklahoma City, Oklahoma 73132. 405.721.3506. www.acsplay.com.
 - B) Plaza Series, Model PL-5 Bench with Center Frame: FairWeather Site Furnishings, Port Orchard, Washington. 800.323.1798.
 - C) Victor Stanley CBF-12 Bench: Victor Stanley, P.O. Drawer 330, Dunkirk, MD 20754. 800.368.2573. www.victorstanley.com
- 3) Trash Receptacle shall be equal to those manufactured or supplied by:
- A) Dumor Trash Receptacle Model 119: Distributed by ACS Playground Adventures, 8501 Mantle
 - B) Litter Receptacle S-42: Victor Stanley, P.O. Drawer 330, Dunkirk, MD 20754. 800.368.2573. www.victorstanley.com
 - C) Model URT-FBS-36-F-P-LD-LF: Creative Pipe, Inc., P.O. Box 2458, Rancho Mirage, CA 92270-1087. 800.644.8467. www.creativepipe.com.
- 4) Bollards shall be equal to those manufactured or supplied by:
- A) Model B4-5 Bench with Center Frame: FairWeather Site Furnishings, Port Orchard, Washington. 800.323.1798.
 - B) Model matching details provided: Creative Pipe, Inc., P.O. Box 2458, Rancho Mirage, CA 92270-1087. 800.644.8467. www.creativepipe.com.
- 5) Tree Grates With Expandable Tree Openings shall be equal to those manufactured or supplied by:

- A) Model 8655 Tree Grate Set: East Jordan Ironworks, 270 Redwing Rd, Ardmore OK 73401, 580.389.5010, www.customersupport@ejco.com.
- B) Model 6018/20-1: Ironsmith, 41-701 Corporate Way #3, Palm Desert, CA 92260, 800.338.4766, www.ironsmith.cc
- C) Metropolitan Collection Tree Grate R-8707: Neenah Foundry, 2121 Brooks Avenue, Neenah, WI 54956, 800.558.5075, www.nfco.com

820.2.2 MATERIALS AND FINISHES

- 1) Steel:
 - A) Pipe: ASTM A 53
 - B) All steel to be powder coated in the factory.
 - C) Colors of all site furnishings to be approved in writing by the City of Tulsa prior to placing order.
- 2) Stainless Steel: Type 304
 - A) Pipe: ASTM A 269 and A 312

820.2.3 SITE FURNISHINGS

- 1) Material shall conform to and be finished in accordance with 2.2.
- 2) Bicycle Rack
 - A) Fabricate from powder coated steel 2" (2.375" OD).
 - B) Capacity: 2 bicycles.
 - C) Mount: Embedded.
 - D) Color: As approved by the City of Tulsa.
- 3) Benches, Trash Receptacles and Bollards
 - A) Fabricate from powder-coated steel.
 - B) Cast elements on benches to be either wrought iron or aluminum.
 - C) Color: As approved by the City of Tulsa.

820.2.4 FASTENERS

- 1) All mechanical fasteners used in the assembly shall be manufactured from stainless steel.
- 2) Cement: Hydraulic, ASTM C 595, factory prepared with accelerator.

820.2.5 FABRICATION

- 1) Cut material square and remove burrs from all exposed edges, with no chamfer.
- 2) Make exposed joints butt tight and flush.
- 3) For posts set in concrete, furnish matching sleeves or inserts not less than 5 inches long.
- 4) Verify dimensions on site prior to shop fabrication.

820.2.6 PROTECTIVE COATINGS

- 1) Following fabrication, site furnishings should be cleaned and treated with a corrosion preventative under-coating.
- 2) All furnishings are to be coated with a TGIC exterior rated powder in the color approved by the Architect and the City of Tulsa. All parts should be finished to an average of 8 to 10 mil thickness and fully cured to the manufacturer's specifications.

820.3 EXECUTION

820.3.1 EXAMINATION

- 1) Coordinate installation of footings and attachment bolts with the installation of paving.
- 2) Supply items to be cast in concrete, or embedded in masonry.

820.3.2 INSTALLATION

- 1) Install in accordance with shop drawings and manufacturer's instructions at locations indicated on the drawings.
- 2) Erect work square and level, and free from distortion or defects detrimental to appearance or performance.
- 3) Expansion joints shall be provided as needed to allow for thermal expansion or contraction.

820.3.3 REPAIR AND CLEANING

- 1) As installation is completed, wash thoroughly using clean water and soap; rinse with clean water.
- 2) Do not use acid solution, steel wool or other harsh abrasives.
- 3) If stain remains after washing, remove finish and restore in accordance with *NAAMM/NOMMA Metal Finishes Manual*.

- 4) Remove stained or otherwise defective work and replace with material that meets specification requirements.
- 5) Repair damaged finish as directed by City of Tulsa.
- 6) Replace defective or damaged components as directed by City of Tulsa.

820.3.4 PROTECTION

- 1) After work of this section is complete, contractor shall be responsible for protecting site furnishings from damage from subsequent construction activity on the site.

820.4 PAYMENT

820.4.1 METHOD OF MEASUREMENT

- 1) The City of Tulsa Inspector and the Project Architect or Engineer will review Pay Applications submitted by the Contractor and shall approve payment based on the quantity of site furnishings that are properly and completely installed including footings, attachment and touch-up.

820.4.2 BASIS OF PAYMENT

- 1) Payment will be made for each site furnishing pay item at the contract unit price per specified pay unit:

<u>PAY ITEM</u>	<u>PAY UNIT</u>
BIKE RACK	EACH
BENCH	EACH
TRASH RECEPTACLE	EACH
TREE GRATES	EACH
PARKING LOT SCREENING FENCE	PER LINEAL FOOT