

**CONTRACT DOCUMENTS
AND
SPECIFICATIONS
FOR**

**PROJECT NO. 144101, TMUA-W 14-82
AND MS-635 ARTERIAL STREET WIDENING –
SOUTH YALE AVENUE FROM EAST 81ST ST
SOUTH TO EAST 91ST ST SOUTH**

ATTENDANCE AT PRE-BID CONFERENCE IS MANDATORY

PREPARED BY:
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Jared Podolny



**CITY OF
Tulsa**
A New Kind of Energy™

**PAUL D. ZACHARY, P.E., DIRECTOR
ENGINEERING SERVICES DEPARTMENT**

Account Numbers: 144101.Streets.5453104.4053122-541106;
5618.2031F00001 StrmSewer.Flood.56183122-541101; 193310008Z.WaterDist.74003122.541101

Engineering Services Department
2317 South Jackson Avenue
Tulsa, Oklahoma 74107
(918) 596-9565

CONTRACT DOCUMENTS

PROJECT NO. 144101, TMUA-W 14-82, AND MS-635
ARTERIAL STREET WIDENING – SOUTH YALE AVENUE FROM
EAST 81ST ST SOUTH TO EAST 91ST ST SOUTH

ENGINEERING SERVICES DEPARTMENT

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**NOTICE TO BIDDERS
SEALED BIDS FOR
PROJECT NO. 144101, TMUA-W 14-82, and MS-635**

Notice is hereby given that pursuant to an order by the Mayor of the City of Tulsa, Oklahoma, sealed bids will be received in Room 260 of the Office of the City Clerk, City of Tulsa, 175 E. 2nd Street, Tulsa, Oklahoma 74103 until **8:30 a.m. the 29th day of January, 2021** for furnishing all tools, materials and labor and performing the work necessary to be done in the construction of the following:

**PROJECT NO. 144101, TMUA-W 14-82, AND MS-635
ARTERIAL STREET WIDENING – SOUTH YALE
AVENUE FROM EAST 81ST ST SOUTH TO EAST 91ST
ST SOUTH**

The entire cost of the improvement shall be paid from
Account No. 144101.Streets.5453104.4053122-541106;
5618.2031F00001.StrmSewer.Flood.56183122-541101;
193310008Z.WaterDist.74003122.541101

A **MANDATORY** Pre-Bid Conference is scheduled for **Tuesday, January 12, 2020 at 9:30 a.m.** and will be held through video conferencing with Microsoft Teams, invitation presented on the City of Tulsa's website at this link:

<https://www.cityoftulsa.org/government/departments/engineering-services/construction-bids/>

144101, TMUA-W 14-82, and MS-635 ARTERIAL STREET WIDENING-SOUTH YALE AVENUE FROM EAST 81ST ST SOUTH TO EAST 91ST ST SOUTH

Attendance at the Pre-Bid Conference is MANDATORY. Bids will not be received from contractors who did not attend the Pre-Bid Conference.

Bids will be accepted by the City Clerk from the holders of valid pre-qualifications certificates from the City of Tulsa in one or more of the following classifications: **A, C, or D**

Drawings, specifications and contract documents for construction of said public improvements of the said project have been adopted by the Mayor of said City. Copies of same may be obtained at the Office of the Director of Engineering Services at the City of Tulsa Engineering Services, 2317 South Jackson, Room 103, North Building, for a non-refundable fee in the amount of **\$50.00** made payable to the City of Tulsa by check or money order.

Contract requirements shall include compliance as required by law pertaining to the practice of non-discrimination in employment.

The overall aspirational Small Business Enterprise utilization goal for this project is **ten (10)** percent.

Attention is called to Resolution No. 18145 of August 23, 1988, requiring bidders to commit to the goal of employing on the project at least fifty percent bona fide residents of the City of Tulsa and/or MSA in each employment classification.

Attention is called to Resolution 7404 of November 8, 2006, requiring bidders, their subcontractors and their lower-tier subcontractors to hire only citizens of the United States.

The City of Tulsa itself is exempt from the payment of any sales or use taxes, and pursuant to Title 68 O.S. Section 1356(10), direct vendors to the City are also exempt from those taxes. A bidder may exclude from his bid appropriate sales taxes, which he will not have to pay while acting for and on behalf of the City of Tulsa.

A Certified or Cashier's Check or Bidders Surety Bond, in the sum of 5% of the amount of the bid will be required from each bidder to be retained as liquidated damages in the event the successful bidder fails, neglects or refuses to enter into said contract for the construction of said public improvements for said project and furnish the necessary bonds within thirty days from and after the date the award is made.

The bidder to whom a contract is awarded will be required to furnish public liability and workmen's compensation insurance; Performance, Statutory, and Maintenance bonds acceptable to the City of Tulsa, in conformity with the requirements of the proposed contract documents. The Performance, Statutory, and Maintenance bonds shall be for one hundred percent (100%) of the contract price.

All bids will be opened and considered by the Bid Committee of said City at a meeting of said Committee to be held in the City Council Room of City Hall in said City at **9:00 a.m. on the 29th day of January 2021.**

Dated at Tulsa, Oklahoma, this 4th day of December 2020.
(SEAL) Christina Chappell
City Clerk

INSTRUCTIONS TO BIDDERS

B-1. BIDS

Each bid Proposal shall be completed electronically on the electronic media provided, then printed, signed and submitted along with the electronic media and the complete bound copy of the contract documents. In the event of a discrepancy between the pricing on the electronic media and hard copy of a Proposal, the hard copy pricing will govern. If electronic media is not provided and the bid Proposal is manual, the bid Proposal shall be submitted in ink. The written words shall govern over the figures if there is a difference between the two. No alterations, additions, or erasures shall be made on the Proposal. Erroneous entries shall be lined out, initialed by the bidder, and the correct entry inserted. The unit price bid must cover all expense for furnishing the labor, materials, tools, equipment, and apparatus of every description to construct, erect, and furnish all work required by and in conformance with the Drawings and Specifications.

Each bid shall be enclosed in a sealed envelope addressed to the City of Tulsa, 175 E. 2nd Street, Room 260, City Hall, Tulsa, Oklahoma, identified on the outside with the words:

**PROJECT NO. 144101, TMUA-W 14-82, AND MS-635 ARTERIAL STREET
WIDENING – SOUTH YALE AVENUE FROM EAST 81ST ST SOUTH TO EAST
91ST ST SOUTH**

Pre-qualification Certificate Number _____.

And shall be filed with the City Clerk in Room 260, City Hall.

All addenda to the contract documents, properly signed by the bidder, shall accompany the bid when submitted.

B-2. BID SECURITY

Each bid shall be accompanied by a cashier's check, a certified check, or bidder's bond, in the amount of five percent (5%) of the total amount bid.

The bid security shall be made payable, without condition, to the City of Tulsa, Oklahoma. The bid security may be retained by and shall be forfeited to the City as liquidated damages if the bid is accepted, a contract based thereon is awarded, and the bidder fails to enter into a contract in the form prescribed, with legally responsible sureties, within thirty (30) days after such award is made by the City.

B-3 RETURN OF BID SECURITY

The bid security of each unsuccessful bidder will be returned when his bid is rejected. The bid security of the bidder to whom the contract is awarded will be

returned when he executes a contract and files satisfactory bonds. The bid security of the second lowest responsible bidder may be retained for a period of time not to exceed sixty (60) days pending the execution of the contract and bonds by the successful bidder.

B-4 WITHDRAWAL OF BIDS

No bidder may withdraw his bid for sixty (60) days after the date and hour set for the opening. A bidder may withdraw his bid any time prior to expiration of the period during which bids may be submitted by making a written request signed in the same manner and by the same person who signed the Proposal.

B-5 REJECTION OF BIDS

Bids received more than ninety-six (96) hours before the time set for opening bids, excluding Saturdays, Sundays, and holidays, as well as bids received after the time set for opening bids, will not be considered and will be returned unopened.

The City of Tulsa reserves the right to reject any and all bids when such rejection is in the best interest of the City of Tulsa. All bids are received subject to this stipulation and the City reserves the right to decide which bidder shall be deemed lowest responsible bidder.

A violation of any of the following provisions by the bidder shall be sufficient reason for rejecting his bid, or shall make any contract between the City of Tulsa and the Contractor that is based on his bid, null and void: divulging the information in said bid before the bids have been opened; submission of a bid which is incomplete, unbalanced, obscure, incorrect, or which has conditional clauses, additions, or irregularities of any kind not in the original proposal form, or which is not in compliance with the Instruction to Bidders and published Notice to Bidders, or which is made in collusion with another bidder. The City shall have the right to waive any immaterial defects or irregularities in any bid received.

B-6 DISQUALIFICATION OF BIDDERS

No contract will be awarded to any person or persons, firm, partnership, company, or corporation which is in arrears to the City upon any debt of contract, or in default as surety or otherwise upon any obligation to the City.

B-7 SIGNATURE OF BIDDERS

Each bid shall be properly signed with the full name of the company or individual submitting the bid, the bidder's address, and the name and title of all persons signing printed below their signature lines. Bids by partnerships shall be signed with the partnership name followed by the signature and title of one of the partners. Bids by corporations shall be signed with the name of the corporation followed by the signature and title of the president, vice president, chairman, or vice chairman of the Board of Directors with attestation by the corporate secretary or assistant corporate secretary. **Resolution must be dated no more**

than 30 days prior to date of signature of the contract/ bond etc. Bids by joint ventures shall be signed by each participant in the joint venture. Bids by limited liability companies shall be signed with the name of the limited liability company followed by the signature and title of the Manager or Managing Member. Bid by limited partnerships shall be signed with the name of the limited partnership followed by the signature of the general partner. Note: The signature requirements listed above are for Oklahoma entities; entities organized in other states must follow the law of the state in which they are organized.

A bid by a person who affixes to his signature the word "President", "Manager", "General Partner", "Agent", or other title, without disclosing the name of the company for which he is signing, may be held to be the bid of the individual signing.

B-8 INTERPRETATION OF CONTRACT DOCUMENTS

If any person who contemplates submitting a bid is in doubt as to the true meaning of any part of the drawing, specifications, or other proposed contract documents, he may submit to the Engineer a written request for interpretation thereof. The person submitting the request shall be responsible for its prompt delivery. Interpretation of the proposed contract documents will be made only by addendum. A copy of each addendum will be mailed or delivered to each person obtaining a set of contract documents from the Engineer. The City will not be responsible for any other explanations or interpretations of the proposed contract documents.

B-9 LOCAL CONDITIONS AFFECTING WORK

Each bidder shall visit the site of the work and shall completely inform himself relative to construction hazards and procedure, labor, and all other conditions and factors, local and otherwise, which would affect prosecution and completion of the work and its cost. Such considerations shall include the arrangement and condition of existing structures and facilities, the procedure necessary for maintenance of uninterrupted operation of existing structures and facilities, the availability and cost for labor, and facilities for transportation, handling, and storage of materials and equipment. All such factors shall be properly investigated and considered in the preparation of the bid. There will be no subsequent financial adjustment for lack of such prior information.

B-10 TIME OF COMPLETION

The time of completion is an essential part of the contract and it will be necessary for each bidder to satisfy the City of his ability to complete the work within the allowable time set forth in the Bid Form. In this connection, attention is directed to the provisions of the General Conditions and Special Conditions relative to delays, extension of time, and liquidated damages.

B-11 QUALIFICATION OF BIDDERS

No bid will be received and filed by the City Clerk of the City of Tulsa unless the person submitting the bid has been pre-qualified as provided by ordinance, and is the holder of a current certificate of Pre-qualification in force and effect on the date such bid is to be submitted and filed.

B-12 TAXES AND PERMITS

Attention is directed to the requirements of the General Conditions regarding payment of taxes and obtaining permits. Contractor shall comply with all zoning ordinances of the City, as provided in the Tulsa Zoning Code, Title 42 Tulsa Revised Ordinances and conform with all zoning requirements established by the Tulsa Metropolitan Area Planning Commission and the Board of Adjustment. Contractor can call the Indian Nations Council of Governments (INCOG) at (918) 584-7526, to determine if any zoning requirements must be met.

B-13 OKLAHOMA LEGAL REQUIREMENTS

The Contractor must comply with the Oklahoma Scaffolding Law, 40 Oklahoma Statutes, Sections 174 - 177, which cover erection and use of scaffolds, hoists, cranes, stays, ladders, supports, or other mechanical contrivances.

In accordance with Oklahoma Statutes, Title 68, Section 1701-1707, before commencing any work pursuant to this contract, any nonresident contractor shall give written notice by certified mail, return receipt requested, to the Oklahoma Tax Commission, the Oklahoma Employment Security Commission, the Workers Compensation Court, and the county assessor of each county in which work will be performed. The notices shall comply with the requirements set forth in said statute.

B-14 BONDS

The bidder to whom a contract is awarded will be required to furnish bonds as follows:

- a. Performance Bond – A Performance Bond to the City in an amount equal to one hundred percent (100%) of the Contract price.
- b. Statutory Bond – A Statutory Bond to the State of Oklahoma in an amount equal to one hundred percent (100%) of the contract price.
- c. Maintenance Bond – A Maintenance Bond to the City in an amount equal to one hundred percent (100%) of the contract price.

The bonds shall be executed on the forms included in the contract documents by a surety company authorized to do business in the State of Oklahoma and acceptable as Surety to the City of Tulsa.

Accompanying the bonds shall be a "Power-of-Attorney" authorizing the attorney-in-fact to bind the Surety Company and certified to include the dates of the bonds.

B-15 BOUND COPY OF CONTRACT DOCUMENTS

The Bid Form or other pages shall not be removed from the bound copy of contract documents. The copy of contract documents filed with each bid shall be complete and shall include all items in the Table of Contents and all addenda.

B-16 EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS

Each bidder agrees to comply with the terms of Title 5, Chapter 1, Section 111, of the Tulsa Revised Ordinances relating to Non-Discrimination.

B-17 BASIS FOR AWARD OF CONTRACT

The basis for award of a contract shall be the total base bid submitted by the lowest responsible bidder unless otherwise directed in the form of proposal. The City of Tulsa reserves the right to withhold the awarding of a contract for a reasonable period of time from the date of opening of bids. The awarding of a contract upon a successful bid shall give the bidder no right or action or claim against the City of Tulsa upon such contract until the same shall have been reduced to writing and duly signed by the contracting parties. The award of a contract will not be completed until the contract is duly executed and the necessary bonds and insurance approved.

B-18 TIME FOR AWARDING OF CONTRACT

The awarding of a contract to the lowest responsible bidder will be made within thirty (30) days after the opening of bids unless the City of Tulsa by formal recorded action and for good cause shown, provides for a reasonable extension to that period, which extension period shall not in any event exceed fifteen (15) days where only state or local funds are involved, or not to exceed ninety (90) days on any award of contract for the construction of public improvements where funds are utilized which are furnished by an agency of the federal government.

B-19 SAFETY AND HEALTH REGULATIONS

Bidders should note that they are subject to "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926 and that compliance, review and enforcement are the responsibility of the U.S. Department of Labor.

The Contractor is fully responsible for the safety of the work site and is expected to train their employees in all applicable safety issues. This should include but not be limited to: trench safety, confined space entry, head protection, etc. In accordance with construction contracts with the City, Authority, Board, or Commission, all applicable Labor and OSHA safety regulations must be followed.

Work sites must be monitored by the Contractor and safety provisions enforced. Contractors are asked to ensure that all employees are properly informed and trained in construction, work site safety.

B-20 VENDORS AND SUBCONTRACTOR IDENTIFICATION

Where Vendor and Subcontractor Identification Questionnaires are included in the bid documents, each bidder shall submit the Questionnaire directly to the Engineer no later than 5:00 p.m. on the first working day following the bid opening. Failure to submit the questionnaire may render the bid unresponsive and not eligible for award. The award of the Contract will be subject to the acceptability of the vendors and subcontractors listed. If an award is made, the vendors and subcontractors listed on the questionnaire shall be used on the project. No changes in the vendor and subcontractor list will be permitted unless prior consent is obtained from the Engineer.

B-21 U.S. ENVIRONMENTAL PROTECTION AGENCY NPDES REQUIREMENTS FOR STORMWATER DISCHARGES

The bidder's attention is directed to U.S. Environmental Protection Agency (EPA) NPDES requirements for stormwater discharges. The Contractor shall be responsible for filing a Notice of Intent and development and implementation of a Stormwater Pollution Prevention Plan (PPP).

B-22 AMERICANS WITH DISABILITIES ACT

The Contractor shall take the necessary actions to ensure its facilities are in compliance with the requirements of the Americans with Disabilities Act (ADA). It is understood that the program of the Contractor is not a program or activity of the City of Tulsa. The Contractor agrees that its program or activity will comply with the requirements of the ADA. Any costs of such compliance will be the responsibility of the Contractor. Under no circumstances will the Contractor conduct any activity, which it deems non-compliant with the ADA.

RESOLUTION NO. 18145

A RESOLUTION REQUIRING THE INCLUSION IN PLANS AND SPECIFICATIONS FOR PUBLIC IMPROVEMENT CONTRACTS OF PROVISIONS PROVIDING FOR THE EMPLOYMENT OF BONA FIDE RESIDENTS OF THE CITY OF TULSA; AND/OR THE MSA; ALSO PROVIDING THAT AT LEAST OF FIFTY PERCENT (50%) OF EACH CLASS OF EMPLOYEES USED ON A PROJECT BE BONA FIDE RESIDENTS OF THE CITY OF TULSA AND/OR THE MSA; THAT THE DIRECTOR OF THE DEPARTMENT OF HUMAN RIGHTS IS CHARGED WITH ENSURING THAT ALL BIDS FOR PUBLIC CONSTRUCTION CONTRACTS COMPLY WITH THIS RESOLUTION; AND DECLARING AN EMERGENCY.

WHEREAS, City of Tulsa, Oklahoma, desires to achieve a goal of full employment.

WHEREAS, it is necessary for the protection of the health, safety and welfare of all residents of the City of Tulsa, Oklahoma, to accomplish this goal.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COMMISSIONERS OF THE CITY OF TULSA, OKLAHOMA:

SECTION 1. The City of Tulsa is committed to the policy of achieving full employment of its citizens by encouraging the employment of bona fide Tulsa and MSA residents in public improvement contracts.

SECTION 2. Definitions. The definitions of certain terms used in this resolution are as follows:

a. "Bidding Documents" or "Bid" means the bid notice, plans and specifications, bidding form, bidding instructions, special provisions and all other written instruments prepared by or on behalf of an awarding public agency for use by prospective bidders on a public construction contract.

b. (i) "Bona Fide Residents" shall include only those persons who are either registered to vote in the City of Tulsa or who have resided within the city limits for at least six months, or who have purchased a permanent residence within the city limits or who have leased a residence for at least a six month term. Residency may be further determined by a valid Oklahoma driver's license, a current Oklahoma license tag, and a valid Oklahoma automobile inspection sticker. (ii) Bona fide residents of MSA shall include only those persons who are registered to vote in outlying MSA areas or who have resided within the outlying MSA area for at least six months, or who have purchased a permanent residence within the outlying MSA areas or who have leased a residence for at least a six month term. Residency may be further determined by a valid Oklahoma driver's license, a current Oklahoma license tag, and a valid Oklahoma automobile inspection sticker.

c. "Public Construction Contract" or "Contract" means any contract exceeding Seven Thousand Five Hundred Dollars (\$7,500.00) in amount, awarded by the City of Tulsa for the purpose of making any public improvements or constructing any public building or making repairs to the same.

d. "Public Improvement" means any beneficial or valuable change or addition, betterment, enhancement or amelioration of or upon any real property, or interest therein, belonging to the City of Tulsa, intended to enhance its value, beauty or utility or to adapt it to new or further purposes. The term does not include the direct purchase of materials, equipment or supplies by the City of Tulsa.

CITY OF TULSA
FILED

AUG 23 1988

AM
Office of City Auditor
By _____

- e. "MSA". All of the land areas composed of Creek County, Osage County, Rogers County, Tulsa County and Wagoner County.

SECTION 3. Residency Requirements of Contractor's Employees. Every employee and/or agent of the City of Tulsa, Oklahoma, charged or involved with the preparation of plans and specifications for any public improvement funded in whole or in part with funds of the City of Tulsa, is hereby charged to include in said plans and specifications the following provisions which shall be binding upon the successful bidders:

- a. Each bid shall be accompanied by a sworn statement that the bidder is committed to the goal of employing at least 50% bona fide residents of the City of Tulsa and/or the MSA in each classification as determined by the Oklahoma Commissioner of Labor.
- b. The successful bidder will be responsible for having like requirements placed upon any subcontractor.
- c. The successful bidder will submit to the Director or his designated representative of the Department of Human Rights any compliance reports involving the bidder and its subcontractors required by Title 31, Chapter 1, Section 9, of the Tulsa Revised Ordinances. The reports shall include information about the residence of each employee in each laboring and trade class applicable to any City project.

SECTION 4. Unresponsive Bids. The failure to submit the documents required by Section 3 shall render a bid unresponsive. Said documents must be submitted prior to the opening of the bids. The Director of the Department of Human Rights Section of City Development is charged with ensuring that all bids comply with Section 3 prior to the bid opening date.

SECTION 5. Duty of Employees and/or Agents of the City of Tulsa. Any employee and/or agent of the City of Tulsa who fails to include the goals for residency requirements found in Section 3 in the plans and specifications for any public improvement may be subject to disciplinary action, including dismissal.

SECTION 6. Severability. The invalidity of any section, subsection, provision or clause or portion of this chapter, or the invalidity of the application thereof to any person or circumstance shall not affect the validity of the remainder of this chapter or the validity of its application to other persons or circumstances.

SECTION 7. Effect Date. This resolution shall take effect as of July 1, 1988.

SECTION 8. Emergency Clause. That an emergency exists for the preservation of the public peace, health and safety, by reason whereof this resolution shall take effect immediately upon its passage, approval and publication.

PASSED, with the emergency clause ruled upon separately and approved this 23rd day of August, 1988.

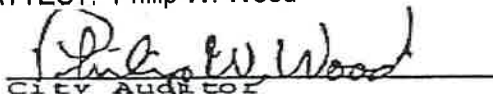
APPROVED, this 23rd day of August, 1988.

Rodger Randle

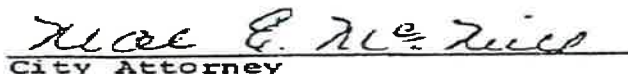


Mayor

ATTEST: Philip W. Wood


City Auditor

APPROVED: Neal E. McNeil


City Attorney

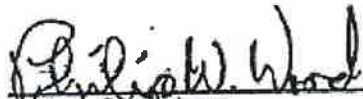
PASSED, with the emergency clause ruled upon separately and approved this 23 day of August, 1988.

- APPROVED, this 23 day of August, 1988.



Mayor

ATTEST:



City Auditor

APPROVED:



City Attorney

CITY OF YOLLA
FILED

AUG 23 1988

A.M. P.M.
Office Of City Auditor
By _____

CITY OF TULSA, OKLAHOMA

SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS

BID OPENING AND AWARD SYSTEM

01.23.18

POLICY STATEMENT

The City of Tulsa (hereinafter City) is committed to implementing the City of Tulsa Small Business Enterprise (SBE) Program of the City of Tulsa, hereinafter referred to as SBE Program. The stated objectives of the programs are:

- To ensure the employment of SBE(s) in the award and administration of City agreements and contracts;
- To create a level playing field on which SBE firms can compete fairly for City contracts;
- To ensure that only firms that fully meet the eligibility standards are permitted to participate as SBE participants;
- To help remove barriers to participation in City contracts;
- To assist in the development of SBE firms so that they may graduate from the SBE Program and ultimately compete successfully in the marketplace.

GOALS BY BUSINESS CATEGORY – SBE

There are seven (7) Business Categories for the City of Tulsa: Construction Contractors (Prime and Subcontractor), Architecture / Engineering (Consultant and Subconsultant), Professional Services, Other Services, and Goods and Supplies. A general description of each category follows:

Construction

- General building contractors engaged primarily in the construction of commercial buildings.
- Heavy construction such as airport runways, bridges, plants, grading and drainage, roadways, and other municipal infrastructure.
- Light maintenance construction services such as carpentry work; electrical work; installation of carpeting; air-conditioning repair, maintenance, and installation; plumbing; and renovation.
- Other related services such as water and sewer lines and maintenance, asbestos abatement, drainage, dredging, grading, hauling, landscaping (for large construction projects such as boulevards and highways), paving, roofing, and toxic waste clean-up.

Architecture and Engineering

- Licensed Architect
- Landscape Architect
- Professional Engineer
- Professional Land Surveyor
- Construction observation
- Other professional design / construction related services

CITY OF TULSA, OKLAHOMA

SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS

BID OPENING AND AWARD SYSTEM

Professional Services

- Financial Services
- Legal services
- Medical services
- Educational services
- Real Estate services
- Planning services.
- Other professional services

Other Services

- Janitorial and maintenance services
- Uniformed guard services
- Computer services
- Certain job shop services
- Graphics, photographic services
- Landscaping
- Other non-technical professional services

Good and Supplies

- Office goods
- Medical supplies
- Miscellaneous building materials
- Computers

The goals are to reflect resource availability and capability. The City of Tulsa's goal is to mitigate and close the disparity between the availability/capability versus actual utilization of SBE firms in Creek, Okmulgee, Osage, Pawnee, Rogers, Tulsa, and Wagoner counties in Oklahoma.

The City enters various agreements and contracts with the private sector for services, goods and supplies, and construction activities. The agreements or contracts may have a specific or primary deliverable associated with one of the Business Categories. However, supplementary efforts may exist to fulfill the agreement or contract. Therefore, the table below is provided to show goals for all Business Categories. Good faith efforts shall first be focused on the Business Category or Categories that relate directly to the deliverables. Additional good faith efforts shall be in supplementary efforts from other categories to assist in meeting the overall project goal.

The project goals will be monitored and periodically adjusted to address the disparity between the available / capable / willing SBE firms versus actual utilization of SBE firms. The **overall project goal is 10%.**

SBE firms identified for utilization in an agreement or contract must be paid from the proceeds from that agreement or contract.

**CITY OF TULSA, OKLAHOMA
SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS
BID OPENING AND AWARD SYSTEM**

<i>Business Category</i>	<i>SBE Goal (%)</i>
Construction (Prime Contractors)	10
Construction (Subcontractors)	10
Architecture / Engineering (Consultant)	10
Architecture / Engineering (Subconsultant)	10
Professional Services	10
Other Services	10
Goods and Supplies	10

BIDDER'S ACTIONS

When the City has established SBE contract goals (hereinafter referred to as "goals"), the City will award a contract only to a bidder who makes good faith efforts to meet the goals. The following summary outlines the procedures

Summary:

- 1. RECORD OF SOLICITATION FOR SBE form:**
These forms **MUST** be submitted with the bid documents. These documents establish the initial good faith, outreach efforts. In the event the bidder submitted the lowest bid, the SBE firms identified on these forms submitted with the bid are the only SBE firms that will be considered for establishing the bidder's projected utilization percentages for consideration of the award of bid.
- 2. LETTER OF INTENT TO CONTRACT WITH SBE form:**
The bidder that submits the apparent lowest bid will be notified by City staff no later than the Monday following bid opening. The apparent low bidder **MUST** submit these forms and the associated attachments by close of business on Thursday following bid opening. Only SBE firms documented on the **RECORD(s) OF SOLICITATION FOR SBE** forms submitted with the bid will be considered for establishing the bidder's projected utilization percentages for consideration of the award of bid. If Letters of Intent are not submitted, the projected utilization will be 0% and the apparent lowest bidder is subject to being deemed non-responsive.
- 3. ADMINISTRATIVE RECONSIDERATION:**
If the City determines that a bidder failed to meet the requirements above, City staff will contact the bidder by phone to define the issue and clarify any miscommunications and/or inadvertent actions. If issue was not due to miscommunication and/or inadvertent actions, the bidder will be notified per the Administrative Reconsideration process defined below. If the apparent low bidder is deemed non-responsive, City staff will notify the next lowest bidder to submit their **LETTERS OF INTENT TO CONTRACT WITH SBE** by close of business of the 6th day following notification or may exercise its right to reject any and all bids.

**CITY OF TULSA, OKLAHOMA
SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS
BID OPENING AND AWARD SYSTEM**

4. CITY OF TULSA SBE UTILIZATION form:

This form is completed by the contractor (successful bidder) and submitted as part of the contract to perform the project. This form documents the “projected” utilization for the project. At the end of the project, this form is submitted with the final pay request documenting the “actual” utilization. The “actual” utilization must meet or exceed the “projected” utilization. Any change in the “projected” utilization must be documented, submitted to the City on the CHANGE REQUEST FOR SBE PARTICIPATION form, and approved by the City. Approval of the change must occur at the time of the change. If the change is a reduction and not submitted and approved per the instructions, the amount will be deducted from the contractor’s final pay request.

5. CHANGE REQUEST FOR SBE PARTICIPATION form:

This form documents any change to the “projected” utilization for the project. Change in utilization includes reduction, substitution, and/or increase. Utilization shall be checked with the submission of partial pay requests, but not longer than 30 day intervals throughout the project. The contractor’s acknowledgement that they have verified changes in his/her utilization is required as part of partial pay request documents. Reductions in utilization not approved prior to the final pay request will result in pay reduction to the contractor. If, at the completion of the project, the contractor has failed to meet the SBE contract goals, does not have an approved change request, and has not demonstrated good faith efforts to meet the contract goal, the contractor will be assessed liquidated damages for the difference between the contract goal and the actual SBE participation achieved.

Record of Solicitation

All bidders shall, **with the submissions of their bids**, show their RECORD(s) OF SOLICITATION FOR SBE that demonstrates the good faith outreach effort to meet or exceed the SBE goals established for the project.

If bidders cannot meet the established SBE goals, the bidders shall document and submit with their bid proposal, justification stating why they could not meet the established SBE goals. To demonstrate good faith efforts to meet the SBE goals, the bidders shall document their efforts to obtain SBE participation. City will review and determine that the information is complete, accurate and adequately documents the bidder’s good faith efforts before committing to the award of the contract to the bidder. In the event that the City awards a contract to a bidder who cannot meet the established SBE goals, the findings of the City’s review shall be in written form and shall be incorporated into and become part of the contract documents.

If the bidder to whom City proposes to award the contract is able to demonstrate good faith efforts, City may accept the bidder’s proposed goal. Acceptance by the City of the bidder’s proposed goal does not release the bidder from its contractual obligation to continue to make efforts throughout the duration of the project to utilize SBE firms on the project.

All bidders shall submit with their bid the completed and signed RECORD OF SOLICITATION FOR SBE form.

CITY OF TULSA, OKLAHOMA

SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS: BID OPENING AND AWARD SYSTEM

Letter of Intent

The bidder must submit to the Engineering Contract Coordinator written confirmation from the SBE firms on the form LETTER OF INTENT TO CONTRACT WITH SBE that it is participating in the contract as provided in the contractor's bid commitment. This may be submitted with the bid, but not later than the City's close of business of the Thursday following the bid opening. The signed forms will define the contractor's final proposed utilization and will be the basis of a final evaluation. If inadequate utilization is proposed, the bid shall be considered non-responsive.

The SBE firms submitted on the LETTER OF INTENT TO CONTRACT WITH SBE forms shall be considered binding and changes of committed SBE firms may only be made after the contract is fully executed, and may only be changed through the submission, review and approval of form CHANGE REQUEST FOR SBE PARTICIPATION.

Failure to make the written assurance (City form LETTER OF INTENT TO CONTRACT WITH SBE), which includes the names of the SBE firms to be used, the work they will perform, and the price for the work, or failure to demonstrate good faith efforts that is deemed acceptable to the City to meet or exceed the SBE goals, shall render a bid non-responsive.

It is the contractor's responsibility to submit the information necessary for the City to ascertain compliance with the good faith efforts requirement. Extra cost involved in finding and utilizing SBE firms shall not be deemed adequate reason for the bidder's failure to meet the project SBE goals unless such costs are grossly excessive.

In instances where a successful bidder's SBE commitment exceeds the actual SBE contract goals, the submitted goals of the bidder become the contractual obligation.

In instances where a successful bidder's SBE commitment is below the SBE contract goals, the submitted utilization goals become the contractual obligation.

Good Faith Efforts

The steps taken by the bidder to obtain SBE participation shall be documented in writing and shall include, but are not limited to, the following good faith efforts:

A. Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) in the interest of all certified SBE firms capable to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the SBE firms to respond to the solicitation. The bidder must determine with certainty if the SBE firms are interested by taking appropriate steps to follow-up on the initial solicitation.

B. Selecting portions of the work to be performed by SBE firms in order to increase the likelihood that the SBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate SBE participation, even when the contractor might otherwise prefer to perform these work items with its own forces.

CITY OF TULSA, OKLAHOMA
SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS
BID OPENING AND AWARD SYSTEM

C. Providing interested SBE firms with adequate information about the plans, specifications and requirements of the contract in a timely manner to assist them in responding to a solicitation.

D. Negotiating in good faith with interested SBE firms:

(1) It is the bidder's responsibility to make a portion of the work available to SBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available SBE subcontractors and suppliers, to facilitate SBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of SBE firms that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for SBE firms to perform the work. RECORD OF SOLICITATION FOR SBE form will be submitted.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including available SBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using SBE firms is not sufficient justification for a bidder's failure to meet the contract SBE goals, as long as such costs are reasonable. Also, the ability or desire of a contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Contractors are not, however, required to accept higher quotes from SBE firms to fulfill the SBE contract requirements if the price difference is excessive or unreasonable. Documentation of quotes shall be submitted to the City with the bid as part of the bidder's record of solicitation.

E. Thoroughly analyzing the capabilities of SBE firms before determining a firm's qualification for a project. The following shall not be legitimate causes for the rejection or non-solicitation of SBE quotes in the efforts of the contractor to meet the project goal: (1) the subcontractor's standing, unrelated to job performance, within the industry; (2) membership in specific groups or organizations; or, (3) association with certain political and/or social organizations.

Administrative Reconsideration

If City determines that a bidder fails to meet the requirements stated above, the bidder will be provided an opportunity for administrative reconsideration. City staff will contact the bidder by phone to define the issue and clarify any miscommunications or inadvertent actions. If issue was not due to miscommunication and/or inadvertent actions, the following process will be followed:

1. The bidder will be notified by fax/email within ten working days following the bid opening.
2. The bidder will have 2 working days from time of notification to schedule a meeting for the purpose of administrative reconsideration with a City of Tulsa Attorney. Reconsideration meetings will generally be held within 7 days of notification of a bidder being determined non-responsive.

CITY OF TULSA, OKLAHOMA SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS BID OPENING AND AWARD SYSTEM

As part of this administrative reconsideration, the bidder will have the opportunity to meet in person with a City of Tulsa Attorney to present arguments concerning whether it met the goal or made adequate good faith efforts to do so. Submittal of additional information documenting solicitation, which was due with the original bid submission, will not be accepted or considered.

3. The decision on reconsideration will be made by a City of Tulsa Attorney who did not take part in the original determination that the bidder failed to meet the goal or make adequate good faith efforts to do so.
4. No awards will be made until all administrative reconsiderations as outlined herein are complete. A City of Tulsa Attorney will provide a written decision on reconsideration to the bidder. This decision will explain the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. The determination is copied to the Contract Administrator, City Engineer, and the Director of Human Rights.

CONTRACTOR ACTIONS AFTER AWARD OF THE CONTRACT:

Counting SBE Participation Toward the Goal

When a SBE participates in a contract, only the value of the work actually performed by the SBE is counted toward the contract goal.

The entire amount of that portion of a contract that is performed by the SBE firm's own forces is counted, including the cost of supplies and materials obtained by the SBE for the work on the contract, including supplies purchased or equipment leased by the SBE (except supplies and equipment the SBE purchases or leases from their Prime Contractor).

When a SBE performs as a participant in a joint venture, the portion of the total dollar value of the contract equal to the clearly defined portion of the work that the SBE performs with its own forces may be counted toward the goal.

Only expenditures to a SBE contractor who performs a commercially useful function may be counted toward a SBE goal.

Commercially Useful Function

A SBE performs a commercially useful function when it is responsible for the execution of the work of its contract and is carrying out its responsibilities by actually performing, managing and supervising the work involved. The SBE must be responsible, with respect to materials and supplies used on the

CITY OF TULSA, OKLAHOMA

SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS

BID OPENING AND AWARD SYSTEM

contract, for negotiating price, determining quality and quantity, ordering the material, and installing (where applicable) and paying for the material itself.

To determine whether a SBE is performing a commercially useful function, City will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid is commensurate with the work it is actually performing and the SBE credit claimed, and other relevant factors.

A SBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction through which funds are passed in order to obtain the appearance of SBE participation. In determining whether a SBE is acting as a pass-through, City will examine similar transactions, particularly those in which SBE firms do not participate.

Manufacturers and Material Suppliers

If the materials or supplies are obtained from a certified SBE manufacturer, 100 percent of the cost of the materials or supplies will be counted toward the SBE goals. A manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials required under the contract as described by the specifications.

If the materials or supplies are purchased from a certified SBE regular dealer, 100 percent of the cost of the materials or supplies will be counted toward the SBE goals. A regular dealer is a firm that owns, operates or maintains a store, warehouse, or other establishment in which the materials, supplies, articles, or equipment described by the specification and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

To be a regular dealer, the firm must be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating or maintaining a place of business as provided for in the above paragraph if the person both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment shall be by a long-term lease agreement and not on an ad-hoc or contract-by-contract basis.

In order for a firm to qualify as a SBE supplier of metal and/or concrete pipe, the firm must also fabricate the pipe. Metal or concrete pipe is specialty pipe which is project specific and is inspected during the manufacturing process. This arrangement provides for no warehousing of metal or concrete pipe and essentially requires the manufacturer to be the supplier. Merely ordering pipe from the fabricator and in turn selling it to contractors is not consistent with normal industry practice. Contractors normally purchase pipe directly from the manufacturer, thus eliminating the middleman. Supplying metal or concrete pipe is viewed as brokering and is considered inconsistent with SBE program requirements.

Change Request for SBE Participation

CITY OF TULSA, OKLAHOMA SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS BID OPENING AND AWARD SYSTEM

Substitution or replacement of a SBE firms will only be permitted or allowed after award and execution of the City contract.

A contractor may not terminate for convenience a SBE listed in their contract (or an approved substitute SBE firm) and then perform the work of the terminated subcontract with its own forces or those of an affiliate, without City's prior written consent.

When a SBE is terminated, or fails to complete the work of the contract for any reason, the contractor must make good faith efforts to find another SBE to substitute for the original SBE. These good faith efforts shall be directed at finding another SBE to perform at least the same amount of work (not necessarily the same work) under the contract as the SBE that was terminated, to the extent needed to meet the SBE goals established in the contract.

When the contractor obtains a substitute SBE, the contractor shall provide the Engineering Contract Coordinator with copies of the CHANGE REQUEST FOR SBE PARTICIPATION form and supporting documentation.

If the contractor is unable to replace the SBE with another SBE, then the contractor must provide City with evidence in writing that they have made a good faith effort. The contractor must submit to the Engineering Contract Coordinator a CHANGE REQUEST FOR SBE PARTICIPATION form along with documentation to support they have made a good faith effort. City may adjust the goal as appropriate.

In the case where a contractor cannot meet the SBE goals of a contract, he or she should request a change of that portion of the SBE goal, which cannot be met. The request will be subject to the following:

- A written request for change will be initiated by the contractor at the time he or she reasonably knows that despite good faith efforts the contract goal cannot be achieved. The request will be included on the CHANGE REQUEST FOR SBE PARTICIPATION form and will contain written document all good faith efforts made to meet the goal as well as the reason for the change.
- The request for change, CHANGE REQUEST FOR SBE PARTICIPATION form, will be submitted for review to the Engineering Contract Coordinator. The City will make the decision on the approval or denial of the change request and inform the contractor.
- If, at the completion of the project, the contractor has failed to meet the SBE contract goals, does not have an approved change request, and has not demonstrated good faith efforts to meet the contract goal, the contractor will be assessed liquidated damages for the difference between the contract goal and the actual SBE participation achieved. The City shall deduct the liquidated damages from the final payment. In the event insufficient earnings remain for the reduction of liquidated damages, the City may claim against the contractor's bond, suspend the contractor under performance suspension, withhold further proposals, suspend prequalification and/or other remedies available under the law.

CITY OF TULSA, OKLAHOMA

SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS

BID OPENING AND AWARD SYSTEM

- In those instances when the goal is not met due to a change in quantity, which occurs through no fault of the contractor, but due to City and/or changed site conditions, a change request will be recommended by Field Engineering at the time the change becomes known, but not later than the next progressive payment application from the contractor which covers the work identified for the SBE firm. The change request will include the statement of quantity change(s). The contractor shall endeavor, with good faith efforts, to mitigate underruns by utilizing other SBE firms.

Change in utilization includes reduction, substitution, and/or increase. Utilization shall be checked with the submission of each partial pay request, but not longer than 30 day intervals throughout the project. The contractor's acknowledgement that they have verified changes in his/her utilization is required as part of partial pay request documents. Reductions in utilization not approved prior to the final pay request, will result in pay reduction to the contractor.

If a contractor fails to comply with this section, appropriate administrative remedies may be taken including, but not limited to:

- No additional progressive payments may be processed
- Refusal to issue proposals
- Liquidated damages
- Suspension of work on the project
- Suspension of prequalification
- Termination of the contract

Prompt Payments

To ensure that contractors' obligations under City contracts are met, the contractor shall endeavor to pay all subcontractors for satisfactory performance of their contracts no later than fifteen (15) calendar days after receipt of each progressive payment from City. The contractor must further endeavor to make prompt release of retainage held to the SBE within thirty days after the work is satisfactorily completed, whether the contractor's work is complete or not. The term "satisfactorily completed" is defined as when; 1) City finds the work completed in accordance with the Plans and Specifications; 2) any required paperwork, including material certification, payrolls, etc., have been received and approved by City; 3) Field Engineering has determined the final quantities on the subcontractor's portion of the work; and 4) Contractor has received progressive payments from City which includes subcontractors' work.

In an effort to accelerate payments to subcontractors, the City may pay the Contractor for acceptable material stockpiled or delivered to the project, at other approved or designated locations, or at a plant site required for Contractor's operations as approved by the City. This is governed by Oklahoma Department of Transportation Standard Specifications for Highway Construction 2009 or latest edition.

Contractor shall endeavor to include invoices from SBE for materials on hand, partially completed work, or complete work on the earliest partial payment request submitted to the City. It is incumbent on the SBE to submit invoices to the Contractor in a timely manner.

CITY OF TULSA, OKLAHOMA SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS BID OPENING AND AWARD SYSTEM

Failure to comply with the prompt payment and return of retainage provisions of the contract may result in sanctions under the contract, as listed below:

- Refusal to issue proposals
- Liquidated damages
- Suspension of work on the project
- No additional progressive payments may be processed
- Suspension of prequalification

Any delay or postponement of payment among the parties may take place only for good cause, with City written approval. The explanation from the contractor must be made in writing to the City.

Record Keeping Requirements

The contractor shall keep such records as are necessary to determine compliance with the SBE contract obligations. The records kept by the contractor will indicate:

1. The name(s) of SBE firms or other subcontractors, the type of work being performed, and payment for work, services and business.
2. Documentation of correspondence, verbal contracts, telephone calls, etc., to obtain services of SBE firms on the project.

Upon request, the contractor shall submit all subcontracts, purchase orders, contracts, agreements, and financial transactions, including canceled checks, executed with SBE firms with the reference to records referred to in this provision, in such form, manner, content prescribed by City.

The contractor should list all SBE firms in the contract and summarize total amounts paid to SBE firms and the project goal amount for each SBE firm.

Reciprocity

The City will grant reciprocity of membership in the SBE program to certified Oklahoma Department of Transportation Disadvantaged Business Enterprises which are located in the Tulsa Metropolitan Statistical Area.

(Must be submitted with Bid)

**CITY OF TULSA
BIDDER'S AFFIDAVIT FOR
SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION GOALS**

STATE OF)
) ss:
COUNTY OF)

_____, of lawful age, being first duly sworn, says that s(he) is the agent authorized by the bidder to submit the attached bid. Affiant further states that the bidder agrees to fully comply with the City of Tulsa's Resolution requiring that a good faith effort be made to utilize small business enterprises as subcontractors.

Affiant further states that s(he) will document on pages SBE-2BID, -3BID, -4BID, and -5BID for public record, his/her good faith efforts in solicitation.

Affiant further states that s(he) is responsible for having like requirements placed upon any subcontractor of said bidder.

Affiant further states that s(he) has read and agrees to the current CITY OF TULSA, OKLAHOMA SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION INSTRUCTIONS FOR BID OPENING AND AWARD SYSTEMS.

BIDDER (Company Name)

SIGNED

TITLE

SUBSCRIBED and SWORN to before me this _____ day of _____, 20_____.

NOTARY PUBLIC

MY COMMISSION EXPIRES:

SBE-1BID



RECORD OF SOLICITATION FOR SMALL BUSINESS ENTERPRISE (SBE)
(MUST BE SUBMITTED WITH BID)

- Project Name:	
- Project Number:	
- Prime Contractor:	
- Prime Contractor Representative:	
Consultants, Subcontractors, Service, Regular Dealers, Material Suppliers, & Fabricators:	
- Contact Date(s):	
- Name of Company:	
- Address (Street, City, County, State):	
- City of Tulsa SBE: <input type="checkbox"/> Yes <input type="checkbox"/> No	
- City of Tulsa SBE Certificate Number:	
- Other SBE Certificate Number(s):	
- Company Contact Person:	
- Phone No.:	Email:
- Description of Work:	
- Contract Documents provided to and/or reviewed by Company: <input type="checkbox"/> Yes <input type="checkbox"/> No	
- Will City of Tulsa SBE be utilized? <input type="checkbox"/> Yes <input type="checkbox"/> No	
- If Yes, Estimated Agreement Amount: \$	
- If No, description of reasons why agreement could not be reached for City of Tulsa SBE to perform work:	



**CITY OF
Tulsa**
A New Kind of Energy.

LETTER OF INTENT
TO CONTRACT WITH SMALL BUSINESS ENTERPRISE (SBE)
(Must be submitted by close of business on Thursday following bid opening)

Engineering Services Department, Attn: Contract Administration
CITY OF TULSA
2317 South Jackson, N-103
Tulsa, Oklahoma 74107
Ph.: 918.596.9637
Fax: 918.596.1299

Project Name: _____
Project Number: _____
Submittal Date: _____

Prime Contractor

HEREBY, intends to subcontract items of work generally described as

to:

SMALL BUSINESS ENTERPRISE

Total amount of participation by City of Tulsa SBE: \$ _____
(City of Tulsa SBE, quote must be attached)

City of Tulsa SBE: ☐ Yes ☐ No

City of Tulsa SBE Certificate Number: _____

Other SBE Certificate Number(s): _____

SMALL BUSINESS ENTERPRISE

Signature: _____

Title: _____

Date: _____

PRIME CONTRACTOR

Signature: _____

Title: _____

Date: _____

Signatures of Authorized representatives of the Prime Contractor and the City of Tulsa SBE firm above represent the written commitment by the Prime Contractor to subcontract with the City of Tulsa SBE firm and a written commitment by the City of Tulsa SBE firm to subcontract for work as described in the attached quote.

This form, along with the City of Tulsa SBE firm's quote must be submitted to the City with the executed Contract documents. If this form is not received, the proposed utilization will NOT be counted as part of the Prime Contractor's agreement. This may cause the agreement to be considered non-compliant and be rejected by the City of Tulsa.

SBE – 3BID



CHANGE REQUEST
FOR SMALL BUSINESS ENTERPRISE (SBE) PARTICIPATION

Project Name: _____

Project Number: _____

Prime Contractor: _____

CHANGE: From / To (fill in both sides)
FROM:

OR

ADD: To (fill in this side only)
TO:

Name: _____

Name: _____

City of Tulsa SBE: ☐ Yes ☐ No

City of Tulsa SBE: ☐ Yes ☐ No

City of Tulsa SBE Certificate Number: _____

City of Tulsa SBE Certificate Number: _____

Other SBE Certificate Number(s): _____

Other SBE Certificate Number(s): _____

Change in service to be performed: _____

Change in amount of participation by City of Tulsa SBE: \$ _____

Reason for Change: _____

NOTE: Attach a copy of the Letter of Intent for the original City of Tulsa SBE and a new Letter of Intent for the proposed City of Tulsa SBE.

PRIME CONTRACTOR

SBE SUBCONTRACTOR

Signature: _____

Signature: _____

Date: _____

Date: _____

Title: _____

Title: _____

Approved / Disapproved: _____ Date: _____

Engineering Services, Manager
(Planning, Design, or Field)

Approved / Disapproved: _____ Date: _____

Engineering Services / Contract Admin.

Distribution: Mayor's Office of Economic Development
Engineering Services Department Division (Planning, Design, or Field)



CITY OF TULSA
SMALL BUSINESS ENTERPRISE (SBE) UTILIZATION

Project No.	Contractor	
Project Name		

Name	Business Category	Projected Dollars	Actual Dollars

Projected Contract % Actual Contract % Total

PROJECTED: **ACTUAL (Update and Submit with Final Payment):**

Contractor Representative _____ Contractor Representative _____

Date _____ Date _____

NOTE: REFER TO UTILIZATION INSTRUCTIONS

SBE – 5BID

(Must be submitted at time of Bid)
CITY OF TULSA
RESOLUTION NO. 7404
AFFIDAVIT OF COMPLIANCE

_____, of lawful age, being first duly sworn, states that
s(he) is the authorized agent of the Company set forth below.

Affiant further states that the Company, in compliance with City of Tulsa Resolution No. 7404, shall not hire or knowingly allow any of its subcontractors or lower tier subcontractors to hire anyone who is not a United States citizen or legal immigrant or anyone who does not have legal status as a temporary worker to perform work on any project which is the subject of a contract between the Company and the City of Tulsa.

Affiant further states that the Company shall not fail to comply with and shall not knowingly allow any of its subcontractors or lower tier subcontractors to fail to comply with all applicable laws including, but not limited to, labor, employment and taxation laws, in the performance of any work on any project which is the subject of a contract between the Company and the City of Tulsa.

Affiant further states that the Company shall make available to the City of Tulsa, at the City's request, sufficient information and/or affirmations to allow the City to confirm Company's compliance with Resolution No. 7404 relating to the performance of any contract between the Company and the City of Tulsa.

Company: _____

Signed: _____

Title

SUBSCRIBED and SWORN to before me, this ____ day of _____, 20__.

NOTARY PUBLIC

MY COMMISSION EXPIRES:

COMMISSION NO.:

Resolution No. 7404
RAC-1

(Must be submitted at time of Bid)
CITY OF TULSA
50% RESIDENT RESOLUTION
AFFIDAVIT FOR BID

STATE OF)
) ss:
COUNTY OF)

_____, of lawful age, being first duly sworn, states that s(he) is the agent authorized by the bidder to submit the attached bid. Affiant further states that the bidder, in compliance with City of Tulsa Resolution No. 18145, is committed to the goal of employing at least 50% bona fide residents of the City of Tulsa and/or the Metropolitan Statistical Area (composed of Creek, Okmulgee, Osage, Pawnee, Rogers, Tulsa, and Wagoner counties).

Affiant further states that bidder is responsible for having like requirements placed upon any of its subcontractors.

BIDDER (Company Name)

SIGNED

Title

SUBSCRIBED and SWORN to before me this ____ day of _____, 20__.

NOTARY PUBLIC

MY COMISSION EXPIRES:

COMMISSION NO.:

(Must be submitted at time of bid)
NON-COLLUSION AFFIDAVIT

STATE OF _____)
) ss:
COUNTY OF _____)

_____, of lawful age, being first duly sworn, says that:

1. I am the duly authorized agent of the bidder submitting the competitive bid associated with this sworn statement for the purpose of certifying facts pertaining to the existence of collusion among bidders and between bidders and municipal officers or employees, as well as facts pertaining to the giving or offering of things of value to governmental personnel in return for special consideration in the letting of any contract pursuant to the bid;
2. I am fully aware of the facts and circumstances surrounding the making of the bid and have been personally and directly involved in the proceedings leading to the submission of such bid;
3. Neither the bidder nor anyone subject to the bidder's direction or control has been a party:
 - a. to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding;
 - b. to any collusion with any municipal official or employee as to quantity, quality or price in the prospective contract, or as to any other terms of such prospective contract; nor
 - c. in any discussions between bidders and any municipal official concerning exchange of money or other things of value for special consideration in the letting of a contract.
4. If awarded the contract, neither the bidder nor anyone subject to the bidder's direction or control has paid, given or donated or agreed to pay, give or donate to any officer or employee of the City of Tulsa or of any public trust where the City of Tulsa is a beneficiary, any money or other thing of value, either directly or indirectly, in procuring the contract for which the bid is submitted.

BIDDER (Company Name)

Signed

Title

SUBSCRIBED and SWORN to before me this _____ day of _____, 20____.

NOTARY PUBLIC

MY COMMISSION EXPIRES:

_____, _____
COMMISSION NO.:

(Must be submitted at time of bid)
BUSINESS RELATIONSHIP AFFIDAVIT

STATE OF)
) ss:
 COUNTY OF)

_____, of lawful age, being first duly sworn, says that s(he) is the agent authorized by the bidder to submit the attached bid. Affiant further states that the nature of any partnership, joint venture or other business relationship presently in effect or which existed within one (1) year prior to the date of this statement with the architect, engineer, or other party to the project is as follows:

Affiant further states that any such business relationship presently in effect or which existed within one (1) year prior to the date of this statement between any officer or director of the bidding company and any officer or director of the architectural or engineering firm or other party to the project is as follows:

Affiant further states that the names of all persons having any such business relationships and the positions they hold with their respective companies or firms are as follows:

(If none of the business relationships herein above mentioned exist, affiant should so state.)

Signed: _____

 BIDDER (Company Name)

 Title:

SUBSCRIBED and SWORN to before me this _____ day of _____, 20____.

 NOTARY PUBLIC

MY COMMISSION EXPIRES: _____

COMMISSION NO.: _____

INTEREST AFFIDAVIT

STATE OF _____)
)ss.
COUNTY OF _____)

I, _____, of lawful age, being first duly sworn, state that I am the agent authorized by Contractor, Engineer, Architect or provider of professional service [“Services Provider”] to submit the attached Agreement. Affiant further states that no officer or employee of the City of Tulsa either directly or indirectly owns a five percent (5%) interest or more in the Services Provider’s business or such a percentage that constitutes a controlling interest. Affiant further states that the following officers and/or employees of the City of Tulsa own an interest in the Services Provider’s business which is less than a controlling interest, either direct or indirect.

By _____
Signature

Title _____

Subscribed and sworn to before me this ____ day of _____, 20__.

Notary Public

My Commission Expires: _____

Notary Commission Number: _____

County & State Where Notarized: _____

The Affidavit must be signed by an authorized agent and notarized.

ELECTRONIC BID PROPOSAL INSTRUCTIONS - EXCEL SPREADSHEET
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

Please read the following instructions carefully.

1. After opening this file re-save it as your company's name.
2. Open the BID FORM Sheet from the tabs below.
3. Input the unit price of the appropriate pay item in the cells highlighted in blue.
4. Review all data input and check calculations to ensure accuracy of Bid.
5. Print 1 hardcopy of the "PROPOSAL" tab, BID FORM and the "SIGNATURE PAGE" tab.
6. Complete and sign the "Signature Page" document.
6. Submit hardcopy and electronic disk with Contract Documents and Specifications for Bid opening date.

AGREEMENT FOR USING ELECTRONIC BID PROPOSAL

By and Between: Benham, (ENGINEER) and RECIPIENT. The enclosed electronic media is provided pursuant to your request and is for your limited use in connection with your submittal of Bid Proposal for Project No. 144101 | TMUA-W 14-82 | MS-635. In no event shall the information be used for any other purpose or be released to third parties without the written consent of the ENGINEER. In the event of a discrepancy between the hard copy and this electronic media at delivery or in the future, the hard copy shall govern. ENGINEER hereby disclaims any and all liability for the consequences from use of the electronic media and makes no warranty or guarantee of accuracy. RECIPIENT shall assume full responsibility for the uses and consequences of the electronic media. It is agreed that ENGINEER has and retains ownership of the electronic media. ENGINEER does not warrant or guarantee that the electronic data is compatible with RECIPIENT'S computer hardware or software, and ENGINEER'S responsibility for the electronic media is limited to replacement of defective media for a period of thirty (30) days after delivery to RECIPIENT. !!! By opening and using this FILE, You AGREE to these TERMS AND CONDITIONS!!!

**PROPOSAL
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. PROJECT NO. 144101 | TMUA-W 14-82 | MS-635**

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 hereto attached and other documents referred to therein: to complete said work within **670**, 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 Engineer as set forth in the Contract.

Basis of Award

THE BID PROPOSAL INCLUDES A ROADWAY BASE BID, TWO STORMWATER PIPE MATERIAL OPTIONS, RETAINING WALLS, LANDSCAPING, TRAFFIC CONTROL, WATERLINE AND SANITARY SEWER. IT SHOULD BE NOTED THAT THE LOWEST RESPONSIBLE TOTAL BID SHALL BE DETERMINED BY THE ROADWAY BASE BID , LOWEST STORMWATER PIPE MATERIAL OPTION, RETAINING WALLS, LANDSCAPING, TRAFFIC CONTROL, WATERLINE AND SANITARY SEWER. ANY PROPOSAL SUBMITTED WITH THE STORMWATER PIPE MATERIAL OPTION INCOMPLETE SHALL BE CONSIDERED NON-RESPONSIVE. THE CITY OF TULSA RESERVES THE RIGHT TO SELECT EITHER OF THE STORMWATER PIPE OPTIONS IF THE COSTS ARE THE SAME.

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

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
ROADWAY - BASE BID						
1	201(A)	CLEARING AND GRUBBING	AC	9.33		\$0.00
2	202(A)	UNCLASSIFIED EXCAVATION	CY	93,785		\$0.00
3	202(D)	UNCLASSIFIED BORROW	CY	5,000		\$0.00
4	202(E)	SELECT BORROW	CY	1,203		\$0.00
5	205(A)	TYPE A-SALVAGED TOPSOIL	CY	2,970		\$0.00
6	220	SWPPP DOCUMENTATION AND MANAGEMENT	LSUM	1		\$0.00
7	221(C)	TEMPORARY SILT FENCE	LF	5,518		\$0.00
8	221(D)	TEMPORARY SEDIMENT FILTER	EA	52		\$0.00
9	221(F)	TEMPORARY SILT DIKE	LF	168		\$0.00
10	230(A)	SOLID SLAB SODDING	SY	17,680		\$0.00
11	303(A)	AGGREGATE BASE TYPE TYPE A	CY	16,908		\$0.00
12	310(B)	SUBGRADE METHOD B	SY	45,905		\$0.00
13	325	SEPARATOR FABRIC	SY	52,389		\$0.00
14	411(B)	SUPERPAVE, TYPE S3 (PG 64-22 OK)	TON	416		\$0.00
15	411(C)	SUPERPAVE, TYPE S4 (PG 64-22 OK) INSOLUBLE	TON	344		\$0.00
16	414(B)	DOWEL JOINTED P.C.C. PAVT. (PLACEMENT)	SY	34,979		\$0.00
17	414(G)	P.C. CONC. PAVEMENT	CY	8,748		\$0.00
18	509(A)	CLASS AA CONCRETE	CY	109		\$0.00
19	509(C)	CLASS A CONCRETE, SMALL STRUCTURES	CY	10		\$0.00
20	509(D)	CLASS C CONCRETE	CY	138		\$0.00
21	511(A)	REINFORCING STEEL	LB	18,357		\$0.00
22	601(C)	TYPE 1-A FILTER BLANKET	TON	5		\$0.00
23	609(B)	2'-2" COMB. CURB & GUTTER (8" BARRIER)	LF	9,045		\$0.00
24	609(B)	2'-2" COMB. CURB & GUTTER (8" BARRIER)	LF	6,254		\$0.00
25	610(A)	4" CONCRETE SIDEWALK	SY	5,090		\$0.00
26	610(A)	4" STAMPED CONCRETE SIDEWALK	SY	214		\$0.00
27	610(B)	6" CONCRETE DRIVEWAY	SY	2,089		\$0.00
28	610(C)	6" PATTERNED CONCRETE DIVIDING STRIP	SY	1,190		\$0.00
29	610(I)	TACTILE WARNING DEVICES	SF	240		\$0.00
30	611(A)	MANHOLE (4' DIAMETER), COMPLETE IN PLACE	EA	8		\$0.00
31	611(A)	MANHOLE (5' DIAMETER), COMPLETE IN PLACE	EA	26		\$0.00
32	611(A)	MANHOLE (6' DIAMETER), COMPLETE IN PLACE	EA	1		\$0.00
33	611(B)	ADDITIONAL DEPTH IN 4' MANHOLE (STORM SEWER)	VF	6		\$0.00
34	611(B)	ADDITIONAL DEPTH IN 5' MANHOLE (STORM SEWER)	VF	82		\$0.00
35	611(B)	ADDITIONAL DEPTH IN 6' MANHOLE (STORM SEWER)	VF	3		\$0.00
36	611(G)	INLET CI DESIGN 2(B), COMPLETE IN PLACE	EA	6		\$0.00
37	611(G)	INLET, TYPE RCI DES. 2 (B),COMPLETE IN PLACE	EA	2		\$0.00
38	611(G)	INLET CI DESIGN 2(D), COMPLETE IN PLACE	EA	1		\$0.00
39	611(G)	INLET CI DESIGN 4(STD), COMPLETE IN PLACE	EA	8		\$0.00
40	611(G)	INLET, TYPE RCI DES. 4 (STD),COMPLETE IN PLACE	EA	12		\$0.00
41	611(G)	INLET CI DESIGN 4(B), COMPLETE IN PLACE	EA	1		\$0.00
42	611(G)	INLET, TYPE RCI DES. 4 (B),COMPLETE IN PLACE	EA	1		\$0.00
43	611(G)	INLET CI DESIGN 4(D), COMPLETE IN PLACE	EA	1		\$0.00
44	611(G)	INLET W/ LRG. JCT. BOX, CI DES. 2(B), COMPLETE IN PLACE	EA	5		\$0.00
45	611(G)	INLET W/ LRG. JCT. BOX, CI DES. 2(D), COMPLETE IN PLACE	EA	1		\$0.00
46	611(G)	INLET W/ LRG. JCT. BOX, CI DES. 4(STD), COMPLETE IN PLACE	EA	3		\$0.00
47	611(G)	INLET (SMD-TYPE 2), COMPLETE IN PLACE	EA	11		\$0.00

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
48	611(H)	ADD'L DEPTH IN INLET CI DES. 2	VF	53		\$0.00
49	611(H)	ADD'L DEPTH IN INLET CI DES. 4	VF	49		\$0.00
50	611(H)	ADD'L DEPTH IN INLET W LJB, CI DES. 2	VF	16		\$0.00
51	611(H)	ADD'L DEPTH IN INLET W LJB, CI DES. 4	VF	6		\$0.00
52	611(H)	ADD'L DEPTH IN INLET (SMD-TYPE 2)	VF	16		\$0.00
53	612(A)	MANHOLE ADJUST TO GRADE (PUBLIC)	EA	1		\$0.00
54	612(C)	INLET ADJUSTED TO GRADE	EA	2		\$0.00
55	613(J)	EDGE DRAIN CONDUIT - PERFORATED	LF	9,444		\$0.00
56	613(K)	EDGE DRAIN OUTLET LATERAL - NONPERFORATED	LF	237		\$0.00
57	613(L)	15" PREFAB. CULVERT END SECTION, ROUND, COMPLETE IN PLACE	EA	1		\$0.00
58	613(L)	18" PREFAB. CULVERT END SECTION, ROUND, COMPLETE IN PLACE	EA	3		\$0.00
59	613(S)	STANDARD BEDDING MATERIAL, CLASS B	CY	643		\$0.00
60	613(V)	TRENCH EXCAVATION	CY	42		\$0.00
61	619(A)	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	LSUM	1		\$0.00
62	619(B)	REMOVAL OF HEADWALL	EA	11		\$0.00
63	619(B)	REMOVAL OF ASPHALT PAVEMENT	SY	24,417		\$0.00
64	619(B)	REMOVAL OF CONCRETE PAVEMENT	SY	893		\$0.00
65	619(B)	REMOVAL OF CURB & GUTTER	LF	2,409		\$0.00
66	619(B)	REMOVAL OF SIDEWALK	SY	381		\$0.00
67	619(B)	REMOVAL OF CONCRETE SLOPE PROTECTION	SY	888		\$0.00
68	619(B)	REMOVAL OF MANHOLES	EA	3		\$0.00
69	619(B)	REMOVAL OF DRAINAGE INLETS	EA	14		\$0.00
70	619(B)	REMOVAL OF RIPRAP	SY	263		\$0.00
71	619(B)	REMOVAL OF CONCRETE DITCH LINER	LF	1,098		\$0.00
72	619(B)	REMOVAL OF EXISTING PIPE	LF	1,993		\$0.00
73	619(B)	REMOVAL OF FENCE	LF	2,805		\$0.00
74	619(B)	REMOVAL OF WALL	LF	893		\$0.00
75	619(B)	REMOVAL OF GUARDRAIL	LF	1,779		\$0.00
76	619(B)/240(A)	REMOVAL OF TREE 6" TO 12" IN DIA.	EA	184		\$0.00
77	619(B)/240(A)	REMOVAL OF TREE 13" TO 18" IN DIA.	EA	65		\$0.00
78	619(B)/240(A)	REMOVAL OF TREE 19" TO 24" IN DIA.	EA	19		\$0.00
79	619(B)/240(A)	REMOVAL OF TREE 25" AND UP IN DIA.	EA	18		\$0.00

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
80	619(C)	SAWING PAVEMENT	LF	308		\$0.00
81	640(A)	FIELD OFFICE	EA	2		\$0.00
82	641	MOBILIZATION	EA	1		\$0.00
83	642	CONSTRUCTION STAKING	EA	1		\$0.00
84	856(A)	TRAFFIC STRIPE (MULTI-POLY.) (4" WIDE)	LF	14,509		\$0.00
85	856(B)	TRAFFIC STRIPE (MULTI-POLY.) (ARROWS)	EA	23		\$0.00
86	COT 332	CONDUIT OPEN CUT 6 INCH	LF	557		\$0.00
87	COT 608	GROUND SIGN	SF	93		\$0.00
88	COT 608	1-1/2" SIGN POST	LF	20		\$0.00
89	COT 608	1-3/4" SIGN POST	LF	100		\$0.00
90	COT 608	2" SIGN POST	LF	30		\$0.00
91	COT 625	REMOVAL OF TRAFFIC ITEMS	EA	55		\$0.00
92	SP-01	ANCHORED REINFORCED VEGETATION SYSTEM (ARVS) WITH B-1 ANCHORS	SY	6,161		\$0.00
93	SP-01	EROSION CONTROL BLANKET (ECB)	SY	6,161		\$0.00
94	SPECIAL	DECORATIVE DOWEL JOINTED P.C.C. PAVT. (PLACEMENT)	SY	415		\$0.00
95	SPECIAL	FENCE - CLF (6 FT HIGH, CLASS A)	LF	8		\$0.00
96	SPECIAL	FENCE - BRICK (6 FT HIGH)	LF	16		\$0.00
97	SPECIAL	FENCE - WOOD (4 FT HIGH)	LF	134		\$0.00
98	SPECIAL	FENCE - WOOD (6 FT HIGH)	LF	332		\$0.00
99	SPECIAL	FENCE - IRON ROD (4 FT HIGH)	LF	350		\$0.00
100	SPECIAL	FENCE - IRON WITH BRICK PILARS (6 FT HIGH)	LF	9		\$0.00
101	SPECIAL	STABILIZED CONSTRUCTION ENTRANCE	EA	4		\$0.00
102	SPECIAL	CURB RAMP	EA	30		\$0.00
103	SPECIAL	TEMPORARY FENCE	LF	3,575		\$0.00
104	SPECIAL	URBAN RIGHT OF WAY RESTORATION	EA	1		\$0.00
105	SPECIAL	QUICK SET FLOWABLE FILL	CY	123		\$0.00
106	SPECIAL	OWNER ALLOWANCE	ALLOW	1	\$150,000.00	\$150,000.00
107	SPECIAL	RELOCATION OF RIPRAP	SY	15		\$0.00
108	SPECIAL	PSO RELOCATION ALLOWANCE	ALLOW	1	\$10,000.00	\$10,000.00
ROADWAY - BASE BID - SUBTOTAL						\$160,000.00

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
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ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
STORMWATER PIPE - OPTION 1 (RCP)						
109	613(A)	15" REINFORCED CONCRETE PIPE (RCP), COMPLETE IN PLACE	LF	4		\$0.00
110	613(A)	18" REINFORCED CONCRETE PIPE (RCP), COMPLETE IN PLACE	LF	3,695		\$0.00
111	613(A)	24" REINFORCED CONCRETE PIPE (RCP), COMPLETE IN PLACE	LF	751		\$0.00
112	613(A)	30" REINFORCED CONCRETE PIPE (RCP), COMPLETE IN PLACE	LF	649		\$0.00
113	613(A)	36" REINFORCED CONCRETE PIPE (RCP), COMPLETE IN PLACE	LF	646		\$0.00
STORMWATER PIPE - OPTION 1 (RCP) - SUBTOTAL						\$0.00

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
STORMWATER PIPE - OPTION 2 (CPP)						
114	613(E) / COT 215	15" CORRUGATED POLYPROPYLENE PIPE (CPP), COMPLETE IN PLACE	LF	4		\$0.00
115	613(E) / COT 215	18" CORRUGATED POLYPROPYLENE PIPE (CPP), COMPLETE IN PLACE	LF	3,695		\$0.00
116	613(E) / COT 215	24" CORRUGATED POLYPROPYLENE PIPE (CPP), COMPLETE IN PLACE	LF	751		\$0.00
117	613(E) / COT 215	30" CORRUGATED POLYPROPYLENE PIPE (CPP), COMPLETE IN PLACE	LF	649		\$0.00
118	613(E) / COT 215	36" CORRUGATED POLYPROPYLENE PIPE (CPP), COMPLETE IN PLACE	LF	646		\$0.00
STORMWATER PIPE - OPTION 2 (CPP) - SUBTOTAL						\$0.00

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
RETAINING WALLS						
119	303(A)	AGGREGATE BASE TYPE A	CY	2,196		\$0.00
120	501(A)	STRUCTURAL EXCAVATION UNCLASSIFIED	CY	15,815		\$0.00
121	501(C)	SUBSTRUCTURE EXCAVATION ROCK	CY	1,217		\$0.00
122	501(F)	GRANULAR BACKFILL	CY	18,272		\$0.00
123	502	TEMPORARY EARTH RETAINAGE	LSUM	1		\$0.00
124	509	SPECIAL CONCRETE FINISH	SY	19,985		\$0.00
125	509(A)	CLASS AA CONCRETE	CY	4,754		\$0.00
126	509(B)	CLASS A CONCRETE	CY	5,711		\$0.00
127	511(A)	REINFORCING STEEL	LB	818,670		\$0.00
128	511(B)	EPOXY COATED REINFORCING STEEL	LB	961,630		\$0.00
129	516(A)	DRILLED SHAFTS 30" DIAMETER	LF	6,732		\$0.00
130	516(A)	DRILLED SHAFTS 36" DIAMETER	LF	5,492		\$0.00
131	516(A)	DRILLED SHAFTS 60" DIAMETER	LF	9,839		\$0.00
132	516(C)	(SP) CROSSHOLE SONIC LOGGING	EA	131		\$0.00
133	613(H)	6" PERFORATED PIPE UNDERDRAIN ROUND	LF	7,864		\$0.00
134	624	(PL) ORNAMENTAL FENCE	LF	87		\$0.00
135	SPECIAL	(PI) CLAY CAP	CY	2,203		\$0.00
136	SPECIAL	(SP) SHOTCRETE	SY	4,358		\$0.00
RETAINING WALLS - SUBTOTAL						\$0.00

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
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ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
TRAFFIC CONTROL						
137	857(C)	REMOVABLE PAVEMENT MARKING TAPE (4" WIDE)	LF	16,212		\$0.00
138	857(F)	PAVEMENT MARKING REMOVAL (TRAFFIC STRIPE)	LF	5,747		\$0.00
139	871(B)	(SP) CONST. ZONE IMPACT ATTENUATOR	SD	450		\$0.00
140	877(B)	DELIVER PORTABLE LONGITUDINAL BARRIER	LF	1,438		\$0.00
141	877(C)	RELOCATION OF PORT. LONGITUDINAL BARRIER	LF	1,325		\$0.00
142	880(A)	ARROW DISPLAY	SD	1,830		\$0.00
143	880(B)	SIGNS 0.00 TO 6.25 SF	SD	11,190		\$0.00
144	880(B)	SIGNS 6.26 TO 15.99 SF	SD	1,964		\$0.00
145	880(B)	SIGNS 16.00 AND UP	SD	13,754		\$0.00
146	880(C)	BARRICADES (TYPE III)	SD	26,988		\$0.00
147	880(E)	TYPE "A" WARNING LIGHT	SD	67,730		\$0.00
148	880(E)	TYPE "C" WARNING LIGHT	SD	102,150		\$0.00
149	880(F)	DRUMS	SD	119,350		\$0.00
150	880(G)	TUBE CHANNELIZERS	SD	51,210		\$0.00
151	880(I)	FLAGGER	FD	100		\$0.00
152	882(B)	REMOTE CONTROLLED CHANGEABLE MESSAGE SIGN	SD	4,020		\$0.00
153	COT STD 102	PROJECT SIGN (CITY OF TULSA)	EA	2		\$0.00
154	COT STD 326	SAFETY FENCE	LF	8,000		\$0.00
TRAFFIC CONTROL - SUBTOTAL						\$0.00

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
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ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
LANDSCAPING						
155	02950	3" CAL. TRIDENT MAPLE	EA	28		\$0.00
156	02950	3" CAL. MAIN STREET SHANTUNG MAPLE	EA	35		\$0.00
157	02950	1 GAL. KARL FOERSTER'S FEATHERREED GRASS	EA	318		\$0.00
158	02950	2" CAL. EASTERN WHITEBUD	EA	6		\$0.00
159	02950	2" CAL. OKLAHOMA REDBUD	EA	27		\$0.00
159A	02950	1 GAL. BLUE ZINGER SEDGE	EA	482		\$0.00
159B	02950	1 GAL. BIG BANG MERCURY RISING COREOPIS	EA	181		\$0.00
159C	02950	1 GAL. POWWOW WILD BERRY CONEFLOWER	EA	181		\$0.00
160	02950	3 GAL. BRAKELIGHTS RED YUCCA	EA	352		\$0.00
161	02950	1 GAL. ROYAL PURPLE LIRIOPE	EA	1,548		\$0.00
162	02950	1 GAL. COASTAL MUHLY GRASS	EA	352		\$0.00
163	02950	1 GAL. WALKER'S LOW CATMINT	EA	282		\$0.00
164	02950	3" CAL. GREEN GABLE BLACK GUM	EA	26		\$0.00
165	02950	1 GAL. LITTLE SPIRE RUSSIAN SAGE	EA	100		\$0.00
166	02950	3" CAL. CHINESE PISTACHE	EA	33		\$0.00
167	02950	45 GAL. LOBLOLLY PINE	EA	83		\$0.00
168	02950	1 GAL. LITTLE SUZY BLACK EYED SUSAN	EA	182		\$0.00
169	02950	3 GAL. ANTHONY WATERER SPIREA	EA	261		\$0.00
170	02950	1 GAL. PRAIRIE DROPSEED	EA	209		\$0.00
171	02950	3.5" CAL. SHAWNEE BRAVE BALD CYPRESS	EA	13		\$0.00
172	02950	LANDSCAPE BOULDERS	TON	50		\$0.00
173	02950	3 CF BAG CEDAR MULCH	EA	1,308		\$0.00
174	02950	3 CF BAG BACK TO NATURE COMPOST	EA	1,219		\$0.00
175	02950	3/16" BY 4" PRO-STEEL STEEL BED EDGING	LF	2,420		\$0.00
176	02950	3" DEPTH DECOMPOSED GRANITE-CIP	SF	9,755		\$0.00
177	32-8400	IRRIGATION-CIP	LS	1		\$0.00
LANDSCAPING - SUBTOTAL						\$0.00

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
178	COT 302	EXCAVATION AND BACKFILL, UNCLASSIFIED	CY	18,412		\$0.00
179	COT 303	MOBILIZATION	EA	1		\$0.00
180	COT 304	CONSTRUCTION STAKING	EA	1		\$0.00
181	COT 307	6 INCH DIP, CL51 POLYETHYLENE WRAPPED (RJ)	LF	307		\$0.00
182	COT 307	8 INCH DIP, CL51 POLYETHYLENE WRAPPED	LF	837		\$0.00
183	COT 307	8 INCH DIP, CL51 POLYETHYLENE WRAPPED (RJ)	LF	1,144		\$0.00
184	COT 307	12 INCH DIP, CL50 POLYETHYLENE WRAPPED	LF	1,258		\$0.00
185	COT 307	12 INCH DIP, CL50 POLYETHYLENE WRAPPED (RJ)	LF	783		\$0.00
186	COT 307	16 INCH DIP, CL50 POLYETHYLENE WRAPPED	LF	1,277		\$0.00
187	COT 307	16 INCH DIP, CL50 POLYETHYLENE WRAPPED (RJ)	LF	904		\$0.00
188	COT 312	8 INCH DUCTILE IRON 11-1/4 DEGREE BEND (RJ)	EA	8		\$0.00
189	COT 312	12 INCH DUCTILE IRON 11-1/4 DEGREE BEND (RJ)	EA	3		\$0.00
190	COT 312	16 INCH DUCTILE IRON 11-1/4 DEGREE BEND (RJ)	EA	4		\$0.00
191	COT 312	8 INCH DUCTILE IRON 22-1/2 DEGREE BEND (RJ)	EA	6		\$0.00
192	COT 312	12 INCH DUCTILE IRON 22-1/2 DEGREE BEND (RJ)	EA	2		\$0.00
193	COT 312	16 INCH DUCTILE IRON 22-1/2 DEGREE BEND (RJ)	EA	2		\$0.00
194	COT 312	6 INCH DUCTILE IRON 45 DEGREE BEND (RJ)	EA	3		\$0.00
195	COT 312	8 INCH DUCTILE IRON 45 DEGREE BEND (RJ)	EA	18		\$0.00
196	COT 312	12 INCH DUCTILE IRON 45 DEGREE BEND (RJ)	EA	4		\$0.00
197	COT 312	16 INCH DUCTILE IRON 45 DEGREE BEND (RJ)	EA	4		\$0.00
198	COT 312	8 INCH DUCTILE IRON 90 DEGREE BEND (RJ)	EA	3		\$0.00
199	COT 312	6 INCH X 6 INCH DUCTILE IRON TEE (RJ)	EA	3		\$0.00
200	COT 312	8 INCH X 8 INCH DUCTILE IRON TEE (RJ)	EA	1		\$0.00
201	COT 312	8 INCH X 6 INCH DUCTILE IRON TEE (RJ)	EA	2		\$0.00
202	COT 312	12 INCH X 8 INCH DUCTILE IRON TEE (RJ)	EA	2		\$0.00
203	COT 312	12 INCH X 6 INCH DUCTILE IRON TEE (RJ)	EA	4		\$0.00
204	COT 312	16 INCH X 8 INCH DUCTILE IRON TEE (RJ)	EA	3		\$0.00
205	COT 312	16 INCH X 6 INCH DUCTILE IRON TEE (RJ)	EA	2		\$0.00
206	COT 312	12 INCH X 8 INCH DUCTILE IRON CROSS (RJ)	EA	1		\$0.00

BID FORM
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
207	COT 312	6 INCH DUCTILE IRON SLEEVE (RJ)	EA	5		\$0.00
208	COT 312	8 INCH DUCTILE IRON SLEEVE (RJ)	EA	8		\$0.00
209	COT 312	12 INCH DUCTILE IRON SLEEVE (RJ)	EA	1		\$0.00
210	COT 312	16 INCH DUCTILE IRON SLEEVE (RJ)	EA	1		\$0.00
211	COT 312	16 INCH X 12 INCH DUCTILE IRON REDUCER (RJ)	EA	1		\$0.00
212	COT 315	3/4 INCH WATER SERVICE CONNECTION (LONG)	EA	1		\$0.00
213	COT 315	3/4 INCH WATER METER CAN, LID & RIM	EA	1		\$0.00
214	COT 315	1 INCH WATER SERVICE CONNECTION (SHORT)	EA	4		\$0.00
215	COT 315	1 INCH WATER SERVICE CONNECTION (LONG)	EA	1		\$0.00
216	COT 315	1 INCH WATER METER CAN, LID & RIM	EA	5		\$0.00
217	COT 315	1-1/2 INCH WATER SERVICE CONNECTION (LONG)	EA	2		\$0.00
218	COT 315	1-1/2 INCH WATER METER CAN, LID & RIM	EA	2		\$0.00
219	COT 315	2 INCH WATER SERVICE CONNECTION (LONG)	EA	2		\$0.00
220	COT 315	2 INCH WATER METER CAN, LID & RIM	EA	2		\$0.00
221	COT 317	6 INCH GATE VALVE (RJ)	EA	11		\$0.00
222	COT 317	8 INCH GATE VALVE (RJ)	EA	13		\$0.00
223	COT 317	12 INCH GATE VALVE (RJ)	EA	5		\$0.00
224	COT 317	16 INCH GATE VALVE (RJ)	EA	4		\$0.00
225	COT 317	12 INCH CHECK VALVE (RJ)	EA	1		\$0.00
226	COT 317	8 INCH TAPPING SLEEVE (RJ)	EA	1		\$0.00
227	COT 317	2 INCH COMB. AIR/VACUUM RELIEF VALVE & VAULT (COMPLETE IN PLACE)	EA	1		\$0.00
228	COT 317	6 INCH FIRE HYDRANT EXTENSION	EA	8		\$0.00
229	COT 317	3-WAY FIRE HYDRANT, INPLACE	EA	8		\$0.00
230	COT 318	VALVE BOX	EA	33		\$0.00
231	COT 318	VALVE BOX EXTENSION	VF	124		\$0.00
232	COT 322	18 INCH STEEL CONDUIT BORED	LF	272		\$0.00
233	COT 328	6-INCH BORE	LF	75		\$0.00
234	COT 328	8-INCH BORE	LF	197		\$0.00
235	COT 329	PAVEMENT, REMOVAL AND REPLACEMENT	SY	109		\$0.00
236	COT 329	SAW CUT	LF	342		\$0.00
237	SPECIAL	CONSTRUCTION AS-BUILT	EA	1		\$0.00
238	SPECIAL	OWNER ALLOWANCE	ALLOW	1	\$10,000.00	\$10,000.00
WATERLINE - SUBTOTAL						\$10,000.00

ITEM NUMBER	SPEC NO.	DESCRIPTION	UNIT	QUANTITY	DATA INPUT UNIT PRICE	TOTAL EACH ITEM
SANITARY SEWER						
239	COT 302	UNCLASSIFIED EXCAVATION AND BACKFILL	CY	150		\$0.00
240	COT 307	8" DIP PIPE, CLASS - 51	LF	95		\$0.00
241	COT 314	4' ID MANHOLE	EA	3		\$0.00
242	COT 314	ADD'L DEPTH IN 4' MANHOLE (SANITARY SEWER)	VF	25		\$0.00
SANITARY SEWER - SUBTOTAL						\$0.00

SUMMARY SHEET
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. PROJECT NO. 144101 | TMUA-W 14-82 | MS-636

ROADWAY - BASE BID	\$160,000.00
STORMWATER PIPE - OPTION 1 (RCP)	\$0.00
STORMWATER PIPE - OPTION 2 (CPP)	\$0.00
RETAINING WALLS	\$0.00
TRAFFIC CONTROL	\$0.00
LANDSCAPING	\$0.00
WATERLINE	\$10,000.00
SANITARY SEWER	\$0.00
TOTAL BID (Roadway Base Bid, Lowest Stormwater Pipe Option, Retaining Walls, Landscaping, Traffic Control, Waterline and Sanitary Sewer)	\$170,000.00

SIGNATURE PAGE
ARTERIAL STREET WIDENING
SOUTH YALE AVENUE, EAST 81ST STREET SOUTH TO EAST 91ST STREET SOUTH
PROJECT NO. PROJECT NO. 144101 | TMUA-W 14-82 | MS-635

TOTAL BID (Roadway Base Bid, Lowest Stormwater Pipe Option, Retaining Walls, Landscaping, Traffic Control, Waterline and Sanitary Sewer)

\$170,000.00

Figures

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

Dollars (\$ _____)

Figures

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 _____, 20__.

Respectfully submitted,

(Complete legal name of company)

(State of Organization)

By:

ATTEST:

Title:

Title: Corporate Secretary

(SEAL)

Address: _____

Telephone Number: _____

Fax Number: _____

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

This form is made available for example purposes only and is not intended to be legal advice nor intended to be relied upon in lieu of consultation with an attorney.

Certificate of Secretary

The undersigned _____ (Assistant) Secretary of _____, a _____ corporation, (the "Corporation") hereby certifies that the following is a true and correct copy of a Resolution duly adopted by the Board of Directors of the Corporation on the _____ day of _____, 20__.

RESOLVED, that _____ is authorized to execute and enter into bids, contracts, bonds, affidavits and any ancillary documents, on behalf of the Corporation.

The undersigned further certifies that this Resolution is in full ~~force~~ and ~~effect~~ as of the date of this Certificate and has not been amended, modified, revoked ~~or~~ rescinded.

IN WITNESS WHEREOF, I have executed this Certificate this ____ day of _____, 20__.

(Signature)

Printed Name

(Assistant) Secretary

[SAMPLE CONSENT OF MEMBERS]

[NAME OF COMPANY], LLC

Consent of Members

The undersigned, being all of the Members of [Name of Company], LLC, an Oklahoma Limited Liability Company, hereby authorize, consent to, approve and ratify the execution by _____ on behalf of [Name of Company], LLC of bid proposals, contracts, affidavits and related documents in connection with [Name of Project] of the City of Tulsa.

DATED, this _____ day of _____, 20____.

Name printed: _____

Name Printed: _____

[ADD ADDITIONAL LINES FOR ADDITIONAL MEMBERS]

Disclaimer Statement: This form is made available for example purposes only and is not intended to be legal advice nor intended to be relied upon in lieu of consultation with an attorney "

Date

Contractor

**RE: City of Tulsa Project No. 144101, TMUA-W 14-82, AND MS-635
ARTERIAL STREET WIDENING – SOUTH YALE AVENUE FROM EAST
81ST ST SOUTH TO EAST 91ST ST SOUTH**

TO WHOM IT MAY CONCERN:

Please be advised that the City of Tulsa, Oklahoma, a municipal corporation, has contracted for the construction of a public improvement project as referenced above, and that pursuant to Title 68 § Section 1356 (10), sales on tangible personal property or services to be wholly consumed in the performance of such projects are exempt from Oklahoma and City of Tulsa Sales Tax when:

“...Any person making purchases on behalf of such subdivision or agency of the state shall certify, in writing, on the copy of the invoice or sales ticket to be retained by the vendor that the purchases are made for and on behalf of such subdivision or agency of this state and set out the name of such public subdivision or agency.”

This letter of authorization expires.

A photostatic copy of this letter may be considered as the original.

CITY OF TULSA

Paul D. Zachary, P.E.
City Engineer

cc: Ryan McKaskle

HAS:AT:

STED-1

EXTENSION OF TIME REQUEST
(to be submitted with each partial payment application)

DATE: _____

CONTRACTOR: _____

ADDRESS: _____

CONTRACT NO.: _____

PROJECT NO.: _____

DESCRIPTION: _____

ARE THERE ANY CHANGES TO YOUR SBE UTILIZATION? _____ YES _____ NO

IF YES, GIVE REASON AND ATTACH CHANGE REQUEST FORM (SBE-4): _____

EXTENSION OF CONTRACT TIME REQUIRED: _____ YES _____ NO

TOTAL OF EXTENSION TIME REQUESTED: _____

IF YES GIVE REASON: _____

SIGNATURE - CONTRACTOR

CONSULTING ENGINEER OR DEPARTMENT OF PUBLIC WORKS STAFF RECOMMENDATIONS

APPROVED: _____

REJECTED: _____

REASON: _____

SIGNATURE

DATE

ACTION WILL BE TAKEN WITHIN 30 DAYS FROM RECEIPT OF REQUEST

ETR-1

CONTRACT FOR CONSTRUCTION OF PUBLIC IMPROVEMENTS TULSA, OKLAHOMA

THIS CONTRACT made and entered into the ____ day of _____, 2020, by and between ____ an (list state) _____ (Corporation or Limited Liability Company) of _____, Oklahoma, hereinafter called the "CONTRACTOR", and the CITY OF TULSA - TULSA, OKLAHOMA, a Municipal Corporation, herein called the "CITY."

WITNESSETH:

WHEREAS, the City has caused to be prepared the necessary Drawings, Specifications, and other Contract Documents for the public improvements herein described, and has invited bids for the construction thereof in accordance with the terms of this Contract, all of which is hereby designated as:

PROJECT NO. 144101, TMUA-W 14-82, AND MS-635 ARTERIAL STREET WIDENING – SOUTH YALE AVENUE FROM EAST 81ST ST SOUTH TO EAST 91ST ST SOUTH

WHEREAS, the Contractor, in response to the Advertisement, has submitted to the City, in the manner and at the time specified, a sealed bid in accordance with the terms of this Contract; and,

WHEREAS, the City, in the manner prescribed by law, has publicly opened, examined, and canvassed the bids submitted, and has determined the above named Contractor to be the lowest responsible bidder for the work and has duly awarded to the said Contractor therefore, for the sum or sums named in the Contractor's bid, a copy of the Bid Form being attached to and made a part of this Contract;

NOW, THEREFORE, in consideration of the compensation to be paid to the Contractor and of the mutual agreements and covenants herein contained, the parties to this Contract have agreed and hereby agree, as follows:

ARTICLE I. That the Contractor shall (a) furnish all tools, equipment, supplies, superintendent, transportation, and other construction accessories, services, and facilities; (b) furnish all materials, supplies, and equipment specified and required to be incorporated in and form a permanent part of the completed work; (c) provide and perform all necessary labor; and (d) in a good, substantial, and workmanlike manner and in accordance with the requirements, stipulations, provisions, and conditions of the Contract as defined in the attached General Provisions, sometimes referred to as General Conditions in the Contract Documents, said documents forming the Contract and being as fully a part thereof as if repeated verbatim herein, perform, execute, construct, and complete all work included in and covered by the City's official award of this Contract to the said Contractor, such award being based on the acceptance by the City of the Contractor's bid, or part thereof, as follows:

**PROJECT NO. 144101, TMUA-W 14-82, AND MS-635 ARTERIAL STREET
WIDENING – SOUTH YALE AVENUE FROM EAST 81ST ST SOUTH TO EAST 91ST
ST SOUTH**

ARTICLE II. That the City shall pay to the Contractor for performance of the work embraced in this Contract, and the Contractor will accept as full compensation therefor, the sum (subject to adjustment as provided by the Contract) of _____ AND /100 Dollars (\$_____) for all work covered by and included in the Contract award and designated in the foregoing Article I; payments therefore to be made in cash or its equivalent, in the manner provided in the General Provisions.

ARTICLE III. That the Contractor shall start work within ten (10) days following the date stipulated in a written order from the City to proceed with the work to be performed hereunder, and shall complete the work within the number of consecutive calendar days after the authorized starting date, as stipulated below:

All Work Completed: 670 calendar days

ARTICLE IV. The sworn, notarized statement below shall be signed and notarized before this Contract will become effective.

ARTICLE V. Prior to submitting a final payment request, the Contractor shall furnish a lien waiver certifying that all subcontractors and suppliers have been paid.

IN WITNESS WHEREOF, the parties have hereto set their hands and seals,

this _____ day of _____, 2020.

CITY OF TULSA, OKLAHOMA
a municipal corporation

By: _____

ATTEST: (SEAL)

Mayor

Date: _____

City Clerk

Date: _____

APPROVED:

APPROVED:

City Attorney

Date: _____

City Engineer

Date: _____

CONTRACTOR

By: _____

Printed Name _____

Title

Date: _____

Title

Date: _____

ATTEST:

Corporate Secretary

(SEAL)

AFFIDAVIT

STATE OF _____)
)ss
COUNTY OF _____)

_____, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by the Contractor to submit the above Contract to the CITY OF TULSA, Tulsa, Oklahoma.

Signature

Subscribed and sworn to before me this _____ day of _____, 2020

NOTARY PUBLIC

My Commission Expires:

_____, _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we, the undersigned,
 _____, (hereinafter called the Contractor"),
 duly authorized by law to do business as a construction contractor in the State of
 Oklahoma, and _____
 (hereinafter called the "Surety"), a corporation organized under the laws of the
 State of _____, and authorized to transact business in the State of
 Oklahoma, as Surety, are hereby held and firmly bound unto the City of Tulsa,
 Tulsa, Oklahoma (hereinafter called the "City"), in the penal sum of

 Dollars (full amount of the Contract), (\$ _____) lawful money of the
 United States, for the payment of which, well and truly to be made unto the said
 City, we bind ourselves, our heirs, executors, administrators, successors, and
 assigns, jointly and severally, firmly by these presents, as follows:

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH THAT,
 WHEREAS, the Contractor has on the _____ day of _____,
 entered into a written contract with the City of Tulsa, Tulsa, Oklahoma, for
 furnishing all materials, labor, tools, equipment, and transportation necessary for:

PROJECT NO. 144101, TMUA-W 14-82, AND MS-635
ARTERIAL STREET WIDENING – SOUTH YALE AVENUE FROM EAST 81ST
ST SOUTH TO EAST 91ST ST SOUTH

NOW, THEREFORE, if said Contractor shall well and truly perform and complete
 said project in accordance with said Contract, Advertisement for Bids, General
 Conditions, Instructions to Bidders, Bid Form, Plans and Specifications, and
 related documents, shall comply with all the requirements of the laws of the State
 of Oklahoma; shall pay as they become due all just claims for work or labor
 performed and materials furnished in connection with said contract, and shall
 defend, indemnify and save harmless said City against any and all liens,
 encumbrances, damages, claims, demands, expenses, costs and charges of
 every kind, including patent infringement claims except as otherwise provided in
 said specifications and other contract documents, arising out of or in relation to the
 performance of said work and the provisions of said Contract, then these presents
 shall be void; otherwise, they shall remain in full force and effect.

This obligation is made for the use of said City and also for the use and benefit of
 all persons who may perform work or labor, or furnish any material in the
 execution of said Contract, and may be sued on thereby in the name of the City.

The Surety, for value received, hereby stipulates and agrees that no change,
 extension of time, alteration or addition to the terms of the Contract, or to the work
 to be performed thereunder, or the specifications accompanying same, shall in
 any way affect its obligation on this bond; and it does hereby waive notice of any
 such change, extension of time, alteration or addition of the terms of the Contract,
 or to the work or to the specifications.

06/13/06

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its duly authorized officers, and the said Surety has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its attorney-in-fact, duly authorized so to do, the day and year first above written.

CONTRACTOR (Principal)

BY:

ATTEST: (S E A L)

Date: _____ Title: _____

Date: _____ Attorney In Fact ** _____
Date: _____ Surety (S E A L)

**This date shall match the notarized certificate on the Power-of-Attorney

(Accompany this Bond with Power Of Attorney)

APPROVED AS TO FORM:

Date: _____
City Attorney

Date: _____
City Clerk

STATUTORY BOND

WHEREAS, the undersigned _____
has entered into a certain contract dated the _____ day of _____, _____, designated
as **Project No. Project No. 144101, TMUA-W 14-82, AND MS-635**, for the
construction of certain public improvements Consisting of **ARTERIAL STREET**
WIDENING – SOUTH YALE AVENUE FROM EAST 81ST ST SOUTH TO EAST
91ST ST SOUTH to be situated and constructed on and through the property described in
said Contract, including all of the work mentioned and described in said Contract, and to
be performed by the undersigned strictly and punctually in accordance with the terms,
conditions, drawings and specifications thereof, on file in the office of the office of the
City Clerk.

NOW, THEREFORE, KNOW ALL MEN BY THESE PRESENTS: That
_____, as Principal, and _____
_____, a Corporation organized under the laws of the State
of _____, and authorized to transact business in the State of Oklahoma, as
Surety, are held and firmly bound unto the State of Oklahoma in the penal sum of _____

Dollars (Full Amount of Contract) (\$_____), lawful money of the United States, for
the payment of which sum well and truly to be made, we bind ourselves, our successors, and
assigns, jointly and severally firmly by these presents.

NOW, THEREFORE, if the said Principal shall fail or neglect to pay all indebtedness incurred
by Principal or sub-contractors of said principal who perform work in the performance of such
contract, for labor and materials and repairs to and parts for equipment used and consumed in
the performance of said contract within thirty (30) days after the same becomes due and
payable, the person, firm or corporation entitled thereto may sue and recover on this bond the
amount so due and unpaid.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time,
alteration, or addition to the terms of the contract or to the work to be performed thereunder,
or the specifications accompanying the same, shall in any way affect its obligation on this
bond, and it does hereby waive notice of any such change, extension of time, alteration, or
addition to the terms of the contract or to the specifications.

5/30/06

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its duly authorized officers, and the said Surety has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its attorney-in-fact, duly authorized so to do, the day and year first above written.

CONTRACTOR (Principal)

BY:

ATTEST: (S E A L)

Date: _____ Title: _____

Date: _____ Title: _____

Date: _____ Attorney-In-Fact **

Date: _____ Surety (S E A L)

**This date shall match the date of the notarized certificate on the Power-of- Attorney.

(Accompany this Bond with Power-Of-Attorney)

APPROVED AS TO FORM:

Date: _____
City Attorney

Date: _____
City Clerk

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____, as Principal, and _____, a corporation organized under the laws of the State _____ of and authorized to transact business in the State of Oklahoma, as Surety, are held and firmly bound unto the City of Tulsa in the Penal sum of _____

Dollars (full amount of Contract) (\$ _____) in lawful money of the United States of America for the payment of which, well and truly to be made, we bind ourselves and each of us, our heirs executors, administrators, trustees, successors, and assigns, jointly and severally, firmly by these presents.

The condition of this obligation is such that:

WHEREAS, said Principal entered into a written contract with the City of Tulsa, Oklahoma dated _____, _____, for

Project No. 144101, TMUA-W 14-82, AND MS-635 ARTERIAL STREET WIDENING - SOUTH YALE AVENUE FROM EAST 81ST ST SOUTH TO EAST 91ST ST SOUTH

all in compliance with the drawings and specifications therefore, made a part of said Contract and on file in the office of the City Clerk, Tulsa, Oklahoma.

NOW, THEREFORE, if said Principal shall pay or cause to be paid to the City of Tulsa, Oklahoma, all damage, loss, and expense which may result by reason of defective materials and/or workmanship in connection with said work, occurring within a period of one (1) year for all projects, from and after acceptance of said project by the City of Tulsa, Oklahoma; and if Principal shall pay or cause to be paid all labor and materials, including the prime contractor and all subcontractors; and if principal shall save and hold the City of Tulsa, Oklahoma, harmless from all damages, loss, and expense occasioned by or resulting from any failure whatsoever of said Principal, then this obligation shall be null and void, otherwise to be and remain in full force and effect.

It is further expressly agreed and understood by the parties hereto that no changes or alterations in said Contract and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the sureties, or any of them, from the obligation of this Bond.

06/13/06

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its duly authorized officers, and the said Surety has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its attorney-in-fact, duly authorized so to do, the day and year first above written.

CONTRACTOR (Principal)

BY:

ATTEST: (S E A L)

Date: _____
Title:

Date: _____
Title:

Date: _____
Attorney-In-Fact

**

Date: _____
Surety (S E A L)

** This date shall match the date of the notarized certificate on the Power of Attorney

(Accompany this Bond with Power-Of-Attorney)

APPROVED AS TO FORM:

Date: _____
City Attorney

Date: _____
City Clerk

AFFIDAVIT OF CLAIMANT

STATE OF _____

COUNTY OF _____

The undersigned, of lawful age, being first duly sworn, on oath says that this contract is true and correct. Affiant further states that the work, services or materials will be completed or supplied in accordance with the contract, plans, specifications, orders or requests furnished the affiant. Affiant further states that (s)he has made no payment directly or indirectly of money or any other thing of value to any elected official, officer or employee of the City of Tulsa or any public trust of which the City is a beneficiary to obtain or procure the contract or purchase order.

By: _____
Signature

Name: _____

Company: _____

Title: _____

Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My Commission Expires: _____

Notary Commission Number: _____

GENERAL PROVISIONS AND SPECIFICATIONS

(Published in the Tulsa World,
January 30, 2015.)
Ordinance No. 23427

AN ORDINANCE AMENDING TITLE 11, TULSA REVISED ORDINANCES ENTITLED "PUBLIC WORKS DEPARTMENT" BY AMENDING CHAPTER 10 ENTITLED "STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION," AMENDING SECTION 1001, TO REVISE STANDARD SPECIFICATIONS SET FORTH IN PARTS 411.04.N AND 414.04.R; AND PROVIDING FOR SEVERABILITY; AND PROVIDING FOR REPEAL OF CONFLICTING ORDINANCES.

BE IT ORDAINED BY THE CITY OF TULSA:

Section I. That Title 11, Chapter 10, Tulsa Revised Ordinances, be and the same is hereby amended and shall read as follows:

"CHAPTER 10. STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION

Section 1000. Adoption of State Standard Specifications.

Section 1001. Additions, Revisions, Deletions and Exceptions

SECTION 1000. ADOPTION OF STATE STANDARD SPECIFICATIONS.

Those certain documents, three (3) copies of which have been filed in the Office of the City Clerk of the City of Tulsa, being marked and designated as Standard Specifications for Highway Construction, 2009 Edition, as published by the Oklahoma Department of Transportation, are hereby adopted as the standard specifications for public improvement projects for the City with the exceptions given in SECTION 1001.

SECTION 1001. ADDITIONS, REVISIONS, DELETIONS AND EXCEPTIONS.

1001.A. The following terms, listed as numbered in the 2009 Edition of the Standard Specifications for Highway Construction, are hereby revised for all sections of this chapter:

101.05. Definitions.

101.05.A. Acceptance Date. Delete

101.05.P. Bond. All references to the "Department" shall mean "City of Tulsa," a municipal corporation.

101.05.V. Commission. All references to the "Commission" shall mean "The City of Tulsa, Oklahoma, a municipal corporation acting by and through its duly authorized officers and agents."

101.05.Y. Contract. Replace definition with the following: "The written agreement between the City and the Contractor setting forth obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment."

The Contract includes the Notice to Bidders, Proposal, Contract Form, all Contract Bonds, Specifications, Special Specifications, Special Provisions, all Plans, Work Orders and Change Orders that are required to complete the construction of the work in an acceptable manner, including authorized extensions.

101.05.AG. Department. Replace definition with the following: "Engineering Services Department of the City of Tulsa, Oklahoma."

101.05.AI. Director. Replace definition with the following: "The Director of the Engineering Services Department of the City of Tulsa."

101.05.AL. Engineer. Replace definition with the following: "The City Engineer of the City of Tulsa or his designee."

101.05.AT. Holiday. Replace definition with the following: "Those days declared to be holidays for regular Civil Service employees of the City of Tulsa."

101.05.AV. Inspector. Replace definition with the following: "The City of Tulsa's Engineering Services Department authorized representative assigned to make inspections of the work."

101.05.AX. Letter of Credit. All references to the "State" shall mean "The City of Tulsa, Oklahoma, a municipal corporation acting by and through its duly authorized officers and agents."

101.05.BF. Materials Division. Replace definition with the following: "The Director of the Engineering Services Department of the City of Tulsa."

101.05.BG. Materials Engineer. Replace definition with the following: "The City Engineer of the City of Tulsa or his designee".

101.05.BZ. Resident Engineer. Replace definition with "The direct representative of the Engineering Services Department of the City of Tulsa for the oversight of construction projects with authority for oversight of all aspects of the construction project."

101.05.CC. Right-of-Way. Replace definition with the following: "Right-of-Way or ROW shall mean the surface, the airspace above ground, and the area below the surface of any public street, highway, parkway, lane, path, alley, sidewalk, boulevard, drive, bridge, tunnel,

stormwater drainage system, easement, park, or similar property in which the City now or hereafter holds a property interest and/or a maintenance responsibility which, consistent with the purposes for which it was granted or dedicated, may be used to install, operate and maintain Facilities.

101.05.CH. State. All references to the "State" shall mean the "The City of Tulsa, Oklahoma, a municipal corporation acting by and through its duly authorized officers and agents."

101.05.CP. Supplemental Agreement. Delete

1001.B. City of Tulsa exceptions to the following provisions, listed as numbered in the 2009 Edition of the Standard Specifications for Highway Construction, are hereby described as follows:

102.01. Pre-Qualification. Replace section with "The City of Tulsa requires General / Prime Contractors to be Prequalified according to Title 11 Chapter 11 of the City of Tulsa Ordinances."

102.06. Examination of Plans, Specifications, Special Provisions, and the Work Site. Replace the fourth paragraph with, "If the City has boring logs and subsurface investigation results, bidders may contact the Contract Administrator at the following address during normal business hours:

City of Tulsa
Engineering Services Department
2317 S. Jackson Ave.
Tulsa, OK 74107"

102.10. Delivery of Proposal. Replace section with the following: "Each bid Proposal shall be completed electronically on the electronic media provided, then printed, signed and submitted along with the electronic media and the complete bound copy of the contract documents or as instructed in the Notice to Bidders. In the event of a discrepancy between the pricing on the electronic media and the hard copy of a Proposal, the hard copy pricing will govern. If an electronic media is not provided and the bid Proposal is manual, the bid Proposal shall be submitted in ink. The written words shall govern over the figures. Erroneous entries shall be lined out, initialed by the bidder, and the correct entry inserted. The unit price bid must cover all expense for furnishing the labor, materials, tools, equipment, and apparatus of every description to construct, erect, and furnish all work required by and in conformance with the Plans and Specifications.

Each bid shall be enclosed in a sealed envelope addressed to the:

City Clerk's Office
The City of Tulsa
One Technology Center
175 E. 2nd Street, Suite 260
Tulsa, Oklahoma 74103

or as otherwise instructed in the Notice to Bidders, and identified on the outside with the words:

PROJECT NO.

Pre-qualification Certificate Number _____

All addenda to the contract documents shall accompany the bid when submitted. Any bid turned in prior to 96 hours before opening is non-responsive."

102.13. Public Opening of Proposals. Replace section with the following: "Proposals shall be publicly opened and read on the date and at the hour and place set forth in the advertisement and Notice to Bidders in the manner established by the City."

102.16. Non-Collusive Bidding Certification. Replace ODOT form and replace with the form provided in the Bid Documents.

103.08. Approval of Contract. Replace section with the following: "The Contract shall not be binding upon the City until it has been executed and approved in the manner set forth in the Tulsa City Charter."

105.17.C. Final Acceptance. Replace definition with the following: "The date on which the Request for Action (RFA) for final payment has been signed by the Mayor of the City of Tulsa."

105.18. Claims for Adjustment. Delete section.

106.03. Samples, Tests and Cited Specifications. Insert the following after the second sentence: "FAST Guide shall mean current City of Tulsa testing guidance as shown in the Special Provisions."

106.04.D. Distribution of Certifications. Replace section with the following: "The Contractor shall submit certifications to the Engineer with another copy mailed to:

Construction Engineer
City of Tulsa
Engineering Services Department
2317 S. Jackson Ave.
Tulsa, OK 74107"

106.05. Plant Inspections. In this section, "Oklahoma City" shall mean "Tulsa."

106.11. Guarantees and Warranties. In this paragraph replace "six month" with "twelve month."

107.14. No Waiver of Legal Rights. Delete section.

107.19. Regulated Floodways. Add the sentence, "The Contractors shall also follow the requirements of Title 11A of the City ordinances."

107.20. Stormwater Management. Insert after the first sentence, "The Contractors shall also follow the requirements of Title 11A of the City ordinances."

108.02. Notice to Proceed and Preconstruction Conference. Modify the second paragraph to read: "After the Contractor and Resident Engineer hold a preconstruction conference, the Contractor shall receive a Notice to Proceed, before the start of construction."

108.07.B. Calendar Day Contract. Delete the second paragraph and replace with the following: "There are fifteen (15) working days in every month of the year."

108.08. Incentive/Disincentive for Early/Late Completion. Delete section.

108.09. Failure to Complete on Time. Delete Table 108:1.

109.04.B. Submitting a Claim. Delete Sections 1 through 4. Insert the following after the first paragraph: "Change Orders to be processed according to City policy."

109.06. Progress Payments. In the second paragraph delete language regarding "semi-monthly progressive estimates."

109.08. Final Payment. Delete last paragraph of the section and replace with the following: "Contractor shall submit final payment within 90 days of completion of job unless otherwise approved by the City."

109.10.A. Recoverable Costs. Delete section.

109.11. Payment to Subcontractors. Delete last paragraph of the section.

220.04.C. Contractor Responsibilities for SWPPP. Delete the first sentence of the second paragraph and replace with the following: "A Contractor Certification statement for subcontractors is "required."

401.04.A. Tolerances. Delete entire section and replace with the City of Tulsa Special Provision for Pavement and Bridge Deck Smoothness provided in the contract documents.

411.04.N. (2) Acceptance. Replace this section with the following: "ODOT pay factors for average lot density, asphalt cement content, and air voids shall not be used for this project. Failure to reach average lot density of 92% to 97%, asphalt cement content of +/- 0.40 of job mix formula, or air voids greater than 1.5 deviation from target will result in rejection of the work. In addition the thickness of the asphalt must be equal to or greater than what is specified."

414.02 Materials. Delete Fly Ash. Fly Ash is not allowed in any concrete mixture unless specifically specified in the Special Provisions / Plans.

414.03.B. Placing and Finishing Equipment. In the first paragraph add the sentence, "If paving is not performed by a slip form paver a hand vibrator shall be required."

414.04.R. Acceptance of Pavement. Replace this section with the following: "ODOT pay factors for strength and thickness shall not be used on this project. Failure to reach less than 300 psi of the target strength from the mix design will result in rejection of the work. In addition, the thickness of the Portland Cement Concrete Pavement must be equal to or greater than what is specified."

509.06. Basis of Payment. Delete pay factors for air content.

516.06. Basis of Payment. Delete the Obstructions pay item.

701.01.B. Cement Substitution. Delete Fly Ash. Fly Ash is not allowed in any concrete mixture unless specifically specified in the Special Provisions / Plans.

702.01. Fly Ash. Delete Fly Ash. Fly Ash is not allowed in any concrete mixture unless specifically specified in the Special Provisions / Plans.

801.02. Materials. Replace Department's Traffic Engineering Division Qualified Products List (QPL) with the City of Tulsa Traffic Engineering's Approved Products List (APL).

801.04.B. Bonding and Diagram. Delete and replace section with the following:

"Provide mechanically and electrically secure conduit, poles, and highway lighting cabinets to form a continuous system.

Provide No. 8 AWG copper wire for grounding traffic signal cabinet.

Provide at least No. 6 AWG THHN green stranded copper wire for bond and ground jumpers for all other equipment.

Provide at least No. 6 AWG THHN green stranded copper wire for ground poles, securely attached to the pole and the ground rod, as shown on Plans.

All identified neutrals shall be white."

802. Electrical Conduit. Delete section and refer to City of Tulsa Specification 602, Electrical Conduit.

803. Pull Boxes and Ground Boxes. Delete section and refer to City of Tulsa Specification 601, Pull Boxes.

804. Concrete Footings. Delete section and refer to City of Tulsa Specification 603, Signal Pole Footings.

805.01. Description. Delete section and replace with the following: "This work consists of the removal and delivery of traffic signal and highway lighting items, to the City of Tulsa Operations facility, which equipment shall remain the property of the City of Tulsa: Traffic signal poles, signal heads, pedestrian heads, backplates, controller cabinet assembly, cabinet guard, mast arm signs, astro-brackets, span wire equipment and any other traffic signal equipment removed except for the pull boxes, conduit and wire which shall become the property of the contractor. Work to include the removal of all footings below ground or as directed by the engineer. Footings shall become the property of the contractor."

805.04. Construction Methods. Replace the second paragraph with the following: "Do not damage traffic signal equipment during removal and storage. Remove all footings to below ground level or as directed by the engineer. Footings, pull boxes, conduit and wire shall become property of the contractor."

806. Poles and Mast Arms. Delete section and refer to City of Tulsa Specification 617, Poles and Mast Arms.

810. Power Supplies. Delete section and refer to City of Tulsa Specification 607, Power Supplies.

811. Electrical Conductors Highway Lighting. Delete section and refer to City of Tulsa specification 621, Electrical Conductors Highway Lighting.

825. Traffic Signal Controller Assembly. Delete section and refer to City of Tulsa specification 610, Traffic Signal Controller Assembly.

828. Vehicle Loop Detector and Loop Detector Wire. Delete section and refer to City of Tulsa specification 604, Detector Wire.

830. Pedestrian Push Button. Delete section and refer to City of Tulsa specification 613, Pedestrian Push Button.

831. Traffic Signal Heads. Delete section and refer to City of Tulsa specification 614, Traffic Signal Heads.

832. Optically Programmed Adjustable Traffic Signal Heads.
Delete section.

833. Traffic Signal Backplanes. Delete section.

834. Electrical Conductors for Traffic Signals. Delete section and refer to City of Tulsa specification 611, Electrical Conductors for Traffic Signals.

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Section 2. SEVERABILITY. *If any section, subsection, paragraph, subparagraph, sentence, clause or phrase of this Ordinance shall be declared invalid for any reason whatsoever, such decision shall not affect the remaining portions of this Ordinance, which shall remain in full force and effect, and to this end the provisions of this Ordinance are hereby declared to be severable.*

ADOPTED by the Council: JAN 14 2016

Date



Chairman of the Council

OFFICE OF THE MAYOR

Received by the Mayor: _____ at _____
Date Time

Dewey F. Bartlett, Jr.

By: _____
Secretary

APPROVED by the Mayor of the City of Tulsa, Oklahoma: JAN 22 2016
Date

at _____
Time


Mayor





APPROVED:

City Attorney

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SPECIFICATIONS

- A. Oklahoma Department of Transportation Standard Specifications for Highway Construction, 2009 Edition, shall be used on this project including Section 100-General Provisions, as modified by Ordinance No. 23427
- B. City of Tulsa, Engineering Services Department Construction Specifications – October 2013 are incorporated herein as if fully set forth and are on file, including all revisions posted on internet prior to bid opening, with the Engineering Services Department, Engineering Design Division, 2317 S. Jackson Ave. Tulsa, Oklahoma or access on the internet at:
<http://www.cityoftulsa.org/government/departments/engineering-services/specification-checklists-and-details>

**SPECIAL
PROVISIONS**

**SPECIAL PROVISION
SUPPLEMENTAL CONTRACT REQUIREMENTS
PROJECT NO. 144101, TMUA-W 14-82, AND MS-635
ARTERIAL STREET WIDENING – SOUTH YALE AVENUE FROM
EAST 81ST ST SOUTH TO EAST 91ST ST SOUTH**

1. Successful Contractor shall return fully executed contract documents (including bonds and insurance) to the City of Tulsa, Contract Administration Section, Room N-103, 2317 South Jackson Avenue within two (2) weeks after bid opening.
2. If the successful Contractor can provide proper bonds and insurance and the contract is executed, the Pre-Construction Conference for this project will be held within eight (8) weeks after bid opening.

SPECIAL PROVISIONS

INSURANCE REQUIREMENTS

In reference to Ordinance No. 23427 Adoption of State Specification for Highway Construction, Section 107.12 shall be modified as follows:

The CONTRACTOR (and any subcontractors) shall carry and keep in force during this Contract, policies of insurance issued by an insurer authorized to transact business in Oklahoma in minimum amounts as set forth below or as required by the laws of the State of Oklahoma. The CONTRACTOR shall also furnish an Owner's Protective Policy in the same amounts naming the City of Tulsa as the assured, issued by the same insurance company as the CONTRACTOR'S liability coverage and indemnifying the City of Tulsa against any and all actions, claims, judgments or demands arising from injuries of any kind and character sustained by any person or persons because of work performed by the CONTRACTOR.

General Liability Insurance with a bodily injury and property damage combined single limit of not less than \$1,000,000.00 for each occurrence.

Employer's Liability and Workmen's Compensation in the amounts as required by law.

The CONTRACTOR shall provide proof of such coverage:

- (a) By providing Certificate(s) of Insurance prior to the execution of this contract; and
- (b) By submitting updated Certificate(s) of Insurance with each and every subsequent request for payment. The Certificate(s) should show that the policies are current and should be dated within 30 days of payment request.

The CONTRACTOR shall not cause any required insurance policy to be cancelled or permit it to lapse. If the CONTRACTOR cancels, allows to lapse, fails to renew or in any way fails to keep any required insurance policy in effect, the City will suspend all progress and/or final payments for the project until the required insurance is obtained. Further, a CONTRACTOR who fails to keep required insurance policies in effect may be deemed by the City to be in breach of contract, ineligible to bid on future projects, and/or ineligible to engage in any new contracts.

The Contractor shall execute and furnish a Statutory Bond for the protection of laborers, mechanics, and material men in a sum equal to one hundred percent (100%) of the contract price.

The Contractor shall execute and furnish a Performance Bond in a sum equal to one hundred percent (100%) of the contract price.

The Contractor shall execute and furnish a Maintenance Bond in a sum equal to one hundred percent (100%) of the contract price.

Prior to doing blasting, the Contractor shall furnish a Certificate of Insurance, which shall certify that any damage caused by blasting is within the coverage of the Contractor's liability insurance to the full limits thereof.

All bonds and insurance must be executed by a company licensed to do business in the State of Oklahoma and must be acceptable to the City.

SPECIAL PROVISIONS GENERAL

1. Work Days: All work to be completed within **670 calendar days** for the Base Bid.
2. No work shall be done between the hours of 7:00 p.m. and 7:00 a.m., nor on Saturday, Sunday, or legal holidays without the prior written approval or permission of the Engineer in each case, except such work as may be necessary for the proper care, maintenance, and protection or work already done, or of equipment, or in the case of an emergency.
3. Traffic Control: All work shall be done in cooperation with the City to establish, install, maintain and operate complete, adequate and safe traffic control during the entire construction period. Barricades, signs, lights, flags and all other traffic control devices shall meet the requirements and specifications of the Standard Drawings entitled "Typical Applications of Traffic Control Devices", and shall be approved by the Traffic Engineer of the City of Tulsa. Two-way traffic shall be maintained at all times, unless otherwise approved by the Engineer. All contractors shall contact the City of Tulsa Traffic Engineering Section before removing or replacing traffic devices, detector loops and street signs. A traffic plan must be submitted for any temporary street closure at least 2 working days prior to planned closing.
4. Contractor shall provide an acceptable 10' straightedge for this Project. All transverse joints shall be straight edged and approved by the Engineer. Surface elevations will meet ODOT 401.04 and all other contract requirements.
5. The Engineer may do quality assurance testing in addition to that performed by the Contractor. The Engineer or a testing laboratory designated by the Engineer will do any testing for quality assurance. The City will pay all costs of quality assurance.
6. Full depth sawing of patches is required. This area to be removed shall be marked by the Contractor under the direction of the Engineer. The Contractor will provide personnel and equipment for marking of the patches as directed by the Engineer. Cost of full depth sawing shall be included in bid item for patching areas.
7. Areas to be patched shall be delineated in a straight-line geometric pattern. When completed, the patch shall be level and provide a smooth riding surface. Portland Cement Concrete patches will be protected from all traffic for a minimum period of 24 hours before removal of protective devices. No open excavations will be left overnight.
8. All asphalt patch work will require that asphalt rollers and an asphalt laydown machine be available for use on the job as directed by the Engineer.

9. Contractor will be required to employ the use of an Automatic Grade Referencing System. The equipment shall be capable of accurately and automatically establishing grades along each edge of the machine by referencing the existing pavement by means of a ski or joint matching shoe, or from an independent grade control. Minimum length of ski shall be 40'.
10. Prior to application of tack coat, the street shall be blown clean with compressed air to the satisfaction of the Engineer.
11. The tack coat must be uniformly distributed and adequately cured prior to beginning the overlay.
12. Contractor shall be responsible for cleanup and/or removal of any excessive overspray of any tack coat material to the satisfaction of the Engineer.
13. Debris from routing of cracks and cold milling shall be swept and vacuumed from the street to the satisfaction of the Engineer.
14. Contractor will be responsible for preparation and distribution of a written notice to residents within 48 hours of beginning milling and overlay operations. Costs associated with this requirement will be included in other items of work.
15. Contractor shall provide a continuous work effort towards total completion of the work in an area prior to moving to a different location.
16. All full depth asphalt patches will be made only after milling is complete, if milling is required, and prior to overlay.
17. No masonry structures shall be used in street right of way. Either precast or cast-in-place structures shall be used.
18. No lifting holes will be allowed in any reinforced concrete pipes or reinforced concrete boxes.
19. No fly ash is allowed to be used on this project.
20. The Contractor certifies that it and all of its Subcontractors to be used in the performance of the Contract are in compliance with 25 O.S. Sec. 1313 and participate in the Status Verification System. The Status Verification System is defined in 25 O. S. Sec. 1312 and includes but is not limited to the free Employee Verification Program (E-Verify) available at www.dhs.gov/E-Verify.
21. **Driveways.** Access to properties and businesses adjacent to the right of way must be provided and maintained at all times unless otherwise directed/approved by the Engineer. The Contractor will contact the business or property owner at least 5 days in advance of any driveway closure. Driveways and patches in front

of driveways, which are removed, shall not be left unusable overnight. If concrete cannot be placed the same day as removal, the Contractor shall furnish screening or other suitable aggregate material to maintain temporary access until concrete can be placed. The cost of placing and removing the material for temporary access shall be included in the pay item for Concrete Driveway (High Early Strength). **Failure to leave any driveway usable will subject the Contractor to a \$1000.00 per day fine for each and every calendar day that the driveway remains non-useable.** The only exception for a driveway to be non-useable is to allow for curing time for concrete. Cure time will not exceed 48 hours.

22. Driveways in excess of 18-feet in width shall be constructed in half-sections and access shall be maintained at all times.
23. Contractor shall prepare and present a schedule and plan for lane and driveway closures throughout the project. The Contractor shall include in the plan, driveway signage for local business access. Payment for signs will be included under the pay item "**Signage for Local Business Access**" and will be paid for by the square foot. Coordination with the City of Tulsa and local business operators shall be required before a driveway schedule and plan is approved.
24. Contractor shall coordinate with the City of Tulsa and local business operators to identify opportunities to perform weekend or "after business hours" construction on driveways to minimize impacts to the area.
25. Local and through traffic shall be maintained at all times through the project unless otherwise permitted by the Engineer. All public and private streets shall be accessible at all times. All detours, horizontal traffic movements, etc. are directly related to the sequence of work; therefore, the Contractor shall proceed with his construction operation in conformity with the details shown on the plans and as required by this special provision.
26. Traffic must be handled appropriately through the entire project during construction and it shall be the responsibility of the Contractor to provide for the safety and comfort of the traveling public at all times. The Contractor shall be required to give the traveling public at least **48 hours** advance notice of any lane and/or street closures.
27. The Contractor may propose/recommend modifications to the sequence of work for consideration by the Engineer. Any major recommended modification by the contractor shall include any changes to the various pay items, impact to traffic, and effect of overall project in time and cost, etc. The Contractor shall not

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proceed with any construction operations based on a revised phase/sequence until the Contractor obtains written approval from the Engineer.

28. Two lanes shall remain open to traffic, one in each direction, throughout all phases of construction, unless otherwise approved/directed by the Engineer. Left turn lanes shall remain open to traffic throughout all phases of construction, unless otherwise approved/directed by the Engineer. Transitions from pavement elevations through construction areas to access driveways or intersections shall be the Contractor's responsibility. Contractor shall maintain signs and markings on a continuous basis.

SPECIAL PROVISIONS
TIME FOR COMPLETION

1. The work shall commence within ten days from and after the date of a written work order from the City. The Contractor agrees that the work shall be prosecuted regularly, diligently and uninterruptedly at a uniform rate of progress so as to ensure completion within the number of days after the day on which the work order is issued. If the Contractor shall fail to complete all work within the time specified, then the Contractor agrees to pay the City, not as a penalty, but as liquidated damages for Breach of Contract, the Sum of **Two Thousand Five Hundred Dollars (\$2,500.00)** for each and every calendar day for failure to complete all work within the time specified. The said amount is fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the City would in such event sustain. It is expressly understood and agreed that the said time for completion of the work described herein is a reasonable time for the completion of same.
2. If the Contractor shall fail to complete reconstruction of a segment of roadway within **thirty (30)** days of beginning the reconstruction operation, then the Contractor agrees to pay the City, not as a penalty, but as liquidated damages for such breach of contract, the sum of **Two Thousand Five Hundred Dollars (\$2,500.00)** for each and every calendar day of failure to complete the work after the specified time. The said amount is fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the City would in such event sustain. This time constraint applies only to roadways to be reconstructed and includes all subsidiary work items required to complete the reconstruction. Subsidiary items not required to complete the reconstruction are not subject to this time constraint.
3. If the Contractor shall fail to complete overlaying of any separately milled segment of roadway within **twenty (20)** days of beginning the milling operation, then the Contractor agrees to pay the City, not as a penalty, but as liquidated damages for such breach of contract, the sum of **Two Thousand Five Hundred Dollars (\$2,500.00)** for each and every calendar day of failure to complete the work after the specified time. The said amount is fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the City would in such event sustain. The City will authorize when milling is to be done based on weather conditions. This time constraint applies only to segments to be milled and includes all subsidiary work items required to complete the overlay. Subsidiary items not required to complete the overlay are not subject to this time constraint.
4. The Contractor shall commence work within 24 hours of traffic control devices being established at the project location. If the Contractor shall fail to commence work within 24 hours of traffic control devices being established at the project

location, then the Contractor agrees to pay the City, not as a penalty, but as liquidated damages for such breach of contract, the sum of **One Thousand Dollars (\$1,000.00)** per lane for each day of failure to commence work after the specified time set forth. The amount is fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damage the City would in such event sustain.

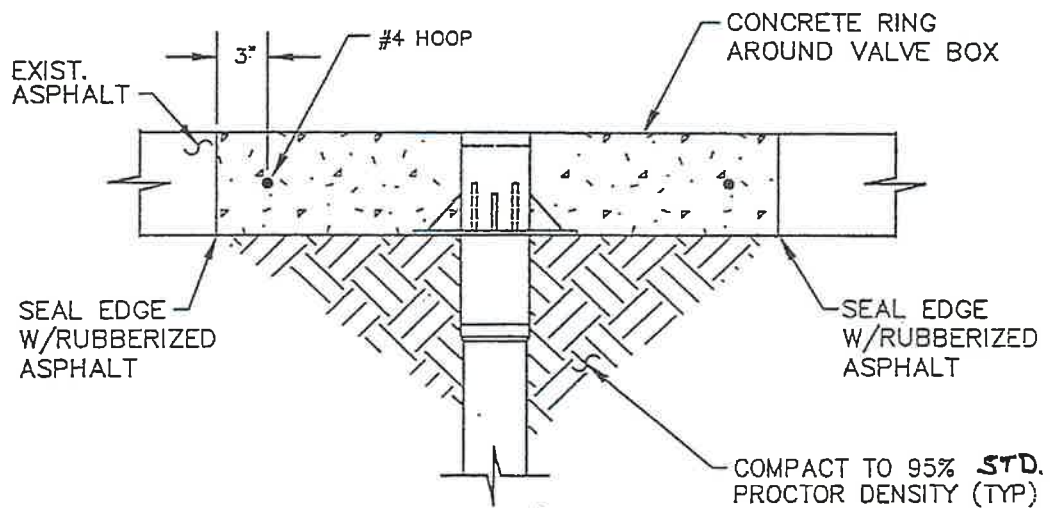
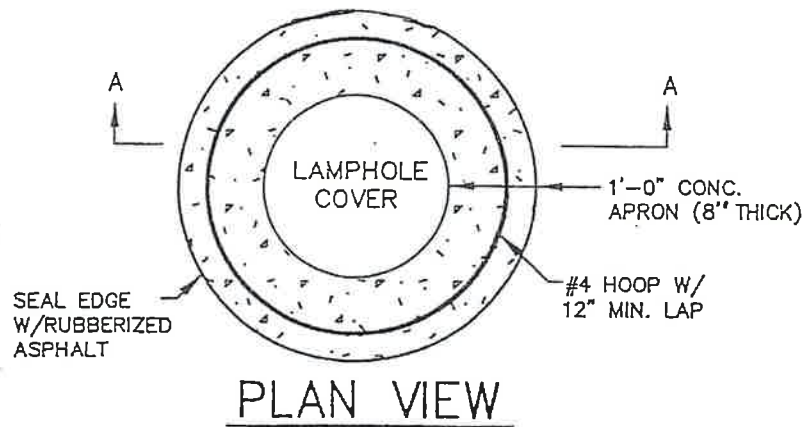
5. **Within 14 days** after Bid Opening and prior to Award of Bid the successful Contractor will be required to furnish the Engineer with a progress schedule, in a format approved by the Engineer, setting forth in detail the procedure he proposes to follow, and giving the dates on which he expects to start and to complete separate portions of the work. If at any time, in the opinion of the Engineer, proper progress is not being maintained, such changes shall be made in the schedule of operations, which will satisfy the Engineer that the work will be completed within the period stated in the Proposal. Monthly progress meetings will be conducted to maintain coordination between all project entities.
6. The Contractor will be required to provide a full-time, onsite English speaking superintendent for this Project for direct contact with City and coordination of subcontractors. A working foreman is not acceptable as a project superintendent. The superintendent shall be required to be present at the work site whenever the Contractor or subcontractors are performing work. The superintendent shall be a representative of the Contractor with the authority to make decision. If the Contractor shall fail to provide a non-working superintendent on a day when work is being performed, then the Contractor agrees to pay the City, not as a penalty, but as liquidated damages for such breach of contract, the sum of **One Thousand Dollars (\$1,000.00)** for each and every calendar day of failure to provide a non-working superintendent at the work site. The said amount is fixed and agreed upon because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the City would in such event sustain.
7. It is further agreed that time is of the essence of each and every portion of this Contract and the specifications wherein a definite and certain time is fixed for the performance of any act whatsoever; and where under the contract an allowance of additional time for completion of any work is made, the new time fixed by such extension shall be of the essence of this Contract.
8. Should the Contractor be delayed in the final completion of the work by any act or neglect of the City of Tulsa, or of any employees of either, or by strikes, injunctions, fire or other cause or causes outside of and beyond the control of the Contractor and which, in the opinion of the Engineer, could have been neither anticipated or avoided, then an extension of time sufficient to compensate for the delay as determined by the Engineer, shall be granted by the City, provided however, that the Contractor shall give the City and the Engineer notice in writing of the cause of the delay in each case on the Extension of Time Request Form enclosed in these documents, and agrees that any such claim shall be fully

compensated for by an extension of time to complete performance of the work included herein.

9. The Contractor shall submit the Extension of Time Request Form with each partial payment application. Failure to submit the Extension of Time Request with a partial payment application shall constitute a complete waiver of any claim for time extension for the period covered by the partial payment.
10. Extension of time may be granted for delays caused by unsuitable weather. Extension of time will not be granted for delays caused by ground condition, inadequate construction force, or the failure of the Contractor to place orders for equipment or materials a sufficient time in advance to ensure delivery when needed. Any extension of time by the City shall not release the Contractor and surety herein from the payment of liquidated damages for a period of time not included in the original contract or the time extension as herein provided.
11. Failure to complete project within specified time, as set forth in the Contract, may be grounds for disqualification for future consideration for contracts with the City of Tulsa.
12. Final Acceptance of the Project will be in strict accordance with ODOT Specification 105.17– Project Completion and Acceptance and ODOT Specification 104.10– Final Cleaning Up and defined as “The date on which the Request for Action (RFA) for final payment has been signed by the Mayor of the City of Tulsa.”
13. Contract Evaluation forms will be compiled by City staff upon completion of this Project to provide a record of the Contractor’s performance for use in subsequent projects.

SPECIAL PROVISIONS
FOR ADJUSTMENT OF ROADWAY UTILITIES

1. Contractor is to remove the rings and covers of manholes and water valves and the frames and grates of single grate drop inlets and double grate drop inlets. If these items are to be reused, the Contractor is to mark, store and protect these materials for later placement in the exact orientation existing at the beginning of the Project. After removal of these obstructions, the Contractor shall place over each hole 5/8" thick steel plate cut to the proper size as directed by the Engineer. After placement of steel plate, the hole shall be filled with compacted asphalt to the established street grade. It shall be the Contractor's responsibility to make the necessary measurements to ensure that all utilities can be easily located after overlay. After the overlay the Contractor shall raise the utilities to the new grade.
2. Manholes and inlet basins shall be raised or lowered as required by using a solid, continuous layer of bricks and mortar. The upper portion of manhole or basin shall be removed as required for correct raising or lowering adjustment. If existing basin or manhole walls are concrete, the Contractor may dowel apron into wall in lieu of removing the upper portion of wall. Dowels shall be #4, at 1' – 0" O.C. grade 60 steel.
3. All existing I-beams on double or triple grate frames shall be re-established under grates.
4. Where basins or manholes are covered for construction or other purposes, curbs shall be marked with green paint.
5. Silicone construction joint material per Public Works Standards shall be used where concrete aprons meet existing or new concrete pavement. Bituminous construction joint material per Public Works Standards shall be used where concrete aprons meet existing or new asphalt pavement.
6. The Contractor shall place a minimum ½" thick flexible gasket bitumastic sealant material in two concentric rings, along the inside and outside edge of the top of the manhole prior to reinstalling the frame. The gasket shall be E-Z STIK Butyl Rubber Sealant, PRO-STIK Performed Joint Sealant or equal. The material shall be able to withstand hydrogen sulfide and other corrosive gasses. After the frame has been set, a normal ½ coat of trowelable bitumastic joint sealant shall be applied to the entire outside circumference of the manhole. The sealant shall be applied from the top of the lower flange down a minimum of 6" below the frame connection. It shall then be wrapped with a 6 mil plastic to protect against damage from backfill. The trowelable material shall be Joint Mastic Sewer Joint Compound or equal. The cost of the material and labor associated with installing it shall be included in the price bid for manholes, adjust to grade.



LAMPHOLES IN ASPHALT
ADJUST TO GRADE

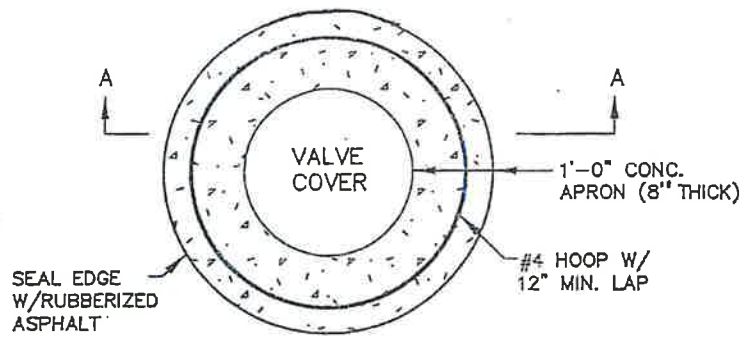
N.T.S.

ARU-2

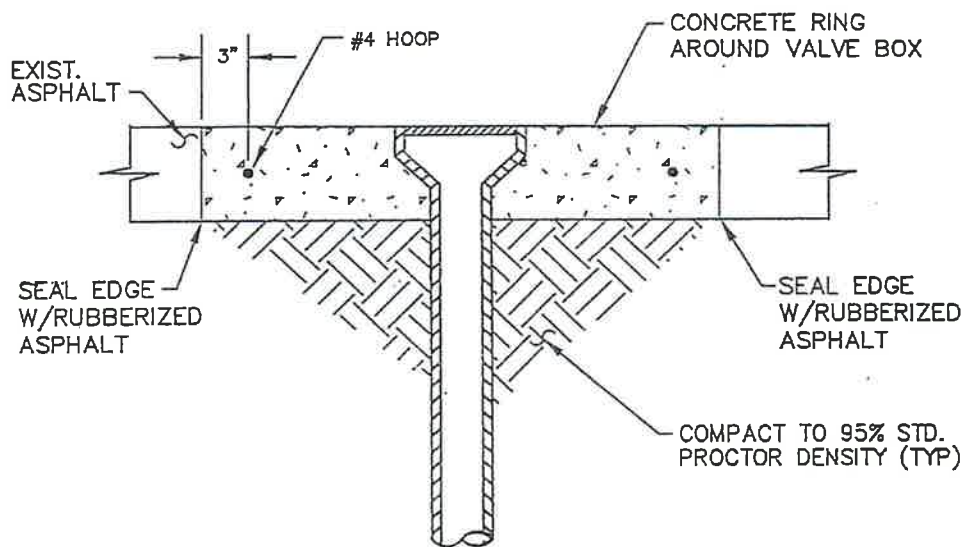
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PLAN VIEW



SECTION A

WATER VALVES TO GRADE
IN ASPHALT STREET

N.T.S.

3/30/05

ARU-3

ARU-3

SPECIAL PROVISIONS
FOR COLD MILLING BITUMINOUS PAVEMENT

1. Contractor will perform milling operation in accordance with ODOT Specifications as stated in Section 417.
2. Contractor will be required to perform the following as a minimum:
 - A. Milling of Asphalt Pavement per Specifications and Special Provision.
 - B. Provide all Traffic Control per Specifications and Special Provision.
 - C. Clean-up Milling Operation as directed by Engineer. This will include removal of unbonded asphalt overlays and sweeping.
3. All streets designated for milling shall be milled as shown on typical sections. If street is full depth Asphalt the depth of cut shall be as specified for each segment. If street is concrete with an Asphalt Overlay then all existing asphalt shall be removed. Boring logs are included as Appendix A. No payment will be made for any additional passes necessary to remove asphalt to the required cross section. Care should be exercised not to mill into the underlying concrete pavement. The Contractor will be responsible for damage to concrete caused by excessive milling.
4. The Contractor shall provide a power operated milling machine capable of planing a minimum depth of three inches in a single pass. The equipment shall be self-propelled with sufficient power, traction and stability to maintain accurate depth of cut and slope. The equipment shall be capable of accurately and automatically establishing profile grades along each edge of the machine by referencing the existing pavement by means of a ski, or matching shoe or from an independent grade control, and shall have an automatic system for controlling cross slope at a given rate. The machine shall be equipped with an integral loading means to remove the material being cut from the pavement surface and to discharge the cuttings into a truck, all in a single operation.
5. Milled material to remain the property of the contractor.
6. The Contractor shall provide butt joints as directed by the Engineer. Wherever the planned overlay of an asphalt street meets existing pavement, or at the end of a paving run, butt joints shall be provided to a depth matching the planned overlay thickness. The transition shall extend a minimum of 10 feet longitudinally from the joint for residential streets and a sufficient length to provide a smooth riding surface for arterial streets. Butt joints will not be paid for directly, but the cost shall be included in the price bid for milling.

7. Entrance and Exit Areas to projects:

After an entrance or exit area has been milled, the Contractor shall construct access ramps. These ramps shall be a minimum of 20' in length and shall be placed across full width of street. These ramps shall be maintained by Contractor and shall remain in place until lanes are closed for overlay. Ramps will be provided at driveways and non-arterial streets as needed to maintain a smooth transition for abutting properties during construction. Ramps will not be paid for directly, but the cost shall be included in the price bid for milling.

8. The existing pavement shall be uniformly milled to provide a uniform texture, true to line, grade and cross section; it shall have no deviations in excess of 3/16 inch in ten feet. Any portion of the planed surface not meeting this requirement shall be corrected in a manner approved by the Engineer.

SPECIAL PROVISIONS
FOR
CONTRACTOR'S QUALITY CONTROL

The units for this project will be those specified in the project plans.

643.01. DESCRIPTION.

Furnish Quality Control of materials and construction in accordance with the Standard Specifications, Plans and Special Provisions. This includes, but is not limited to preparing and following a Quality Control Plan. Obtain samples and perform tests for Quality Control, provide inspection, and exercise management control to produce materials and workmanship that conforms to contract requirements. Unless otherwise noted in the plans, all pavements and bridges (except culverts) will be subject to requirements of any or all of the Special Provisions which are included in this contract. City of Tulsa will provide Quality Assurance testing at their discretion.

643.02. MATERIALS.

Meet materials quality requirements.

643.03. EQUIPMENT.

Provide equipment at own expense, unless otherwise specified. All equipment and supplies shall conform with Standards and applicable Specifications. Certify the calibration of all equipment.

643.04. CONSTRUCTION.

- a) General. Provide quality of all construction covered in the contract.
- b) Quality Control Personnel Qualifications. All personnel directly involved in sampling and/or testing materials for either control or acceptance purposes shall be certified in the appropriate area(s) by the Oklahoma Highway Construction Materials Technician Certification Board. Manager certification for material sampling and testing is not required unless he or she is directly involved in sampling and/or testing materials.
- c) Contractor's Quality Control Plan. Submit a written Quality Control Plan at least one week prior to the pre-work conference. Include the following in the plan:
 1. Sources of principal materials including names of suppliers and locations.
 2. Names and resumes of key Quality Control personnel.
 3. Duties, responsibilities, and authorities (to suspend production, alter mixtures, etc.) granted to key Quality Control personnel.
 4. Description of testing laboratories, including qualifications, key equipment and locations.
 5. Description of start-up operations, including but not limited to:
 - a. Review of submittal requirements and all other Contract requirements with the performance of the work.
 - b. Examine the work area to ascertain that all preliminary work has been completed.
 - c. Verify all field dimensions and advise the Engineer of any discrepancies.
 6. Detailed testing schedule based on production.
 7. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification requiring the test, feature of work to be tested, and person responsible for each test.
 8. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.

- d) Sampling and Testing. Perform sampling and testing according to the accepted Quality Control plan using personnel certified in appropriate areas and laboratories approved by the Engineer. Keep laboratory facilities clean and maintain all equipment in proper working condition.
- e) Inspection. Provide inspection necessary to ensure compliance with applicable standards and specifications.
- f) Records. Maintain complete testing and inspection records and make them accessible to the Engineer.

- 1. Test Results. Maintain control charts that identify the project number, contract item, test number, each test parameter, the upper and/or lower specification limit applicable to each test parameter, and the test results. Use the control charts as part of the Quality Control system to document process variability, to identify production and equipment problems, to make necessary corrections, and to identify potential pay factor adjustments.

- i. Post control charts in an accessible location, keep them up to date, and make them available to the Engineer upon request. Make corrections to the process when problems are evident, including ceasing production if necessary.

- 2. Inspection Results. For each day of work, prepare an "Inspector's Daily Record of Construction Operations" on an approved form. Include the following certification signed by the person with overall responsibility for the inspection system:

- i. "It is hereby certified that the information contained in this record is accurate, and that all work documented herein complies with the requirements of the contract. Any exceptions to this certification are documented as a part of this record."

- 3. Submit the record and certification to the Engineer within two working days of the work being performed. If the record is incomplete, in error, or otherwise misleading, a copy of the record will be returned with corrections noted. When chronic errors or omissions occur, correct the procedures by which the records are produced.

- g) Use of Contractor Test Results for Acceptance Purposes. Abbreviated test procedures are allowed for Contractor use. The Quality Control Plan shall list all abbreviated test procedures, describe all deviations from standard procedures for each, and note their intended purpose. Test results from abbreviated procedures will not be used for any purpose by the City of Tulsa. It is the Engineer's discretion to use or not use any of the Contractor's test results for acceptance purposes.

- h) Changes. Submit, in writing, all proposed changes in key Quality Control personnel, equipment or procedures from those previously approved by the Engineer. Submit written changes at least one week prior to the proposed action.

643.05. METHOD OF MEASUREMENT.

Payment for Contractor's Quality Control will be measured on a lump sum basis.

643.06. BASIS OF PAYMENT.

Accepted Contractor's Quality Control measured for payment as prescribed above will be paid for at the Contract unit price for:

CONTRACTOR'S QUALITY CONTROLLUMP SUM

This payment will be full compensation for furnishing all materials, facilities, equipment, labor and incidentals to complete the work.

Subject to acceptable performance, payment for Contractor's Quality Control will be made in accordance with the following schedule:

- 25% on the next estimate after the Engineer's approval of the Contractor's Quality Control Plan and other required initial documentation
- plus 25% when 50% of the work subject to Quality Control requirements is complete
- plus 25% when 75% of the work subject to Quality Control requirements is complete
- plus 25% when all test results and records related to Quality Control work have been furnished to and accepted in writing by the Engineer

As stated above, this payment is based upon acceptable performance. Payment will be reduced for unacceptable portions of the Quality Control work. Serious deficiencies in Quality Control work may result in the project being shut down.

SPECIAL PROVISIONS
FOR COLD WEATHER CONCRETE CURING

Placement of asphalt on street cut repair sections of cold weather concrete or opening of street cut repair sections of cold weather concrete to traffic shall be allowed when the concrete achieves a compressive strength of 3,000 pounds per square inch (psi). Construction equipment loads shall not be applied to the concrete repair section until the 3,000 psi compressive strength is achieved.

SPECIAL PROVISIONS
FOR COLD WEATHER CONCRETE PLACEMENT

1. When early traffic placement on a repair is required, the following guidelines are provided as a minimum to assure required strength during cold weather. The Contractor is responsible for the protection and quality of concrete placed during all weather conditions. If circumstances occur which preclude following these guidelines, lower early strength may result in delays in opening areas to traffic as desired.
2. Ice, snow, and frost must be removed from the cut prior to placement of concrete. Concrete should not be placed on frozen subgrade. Removal of frozen subgrade will be paid as unclassified excavation.
3. Fresh concrete temperatures shall be a minimum of 65°F and a maximum of 90°F at time of placement. Hot mix water and preheated aggregate may be necessary to accomplish the minimum temperature during extremely cold weather. The minimum ambient temperature at time of placement should be at least 30°F.
4. Insulated blankets should be placed immediately when average daily temperatures are below 50°F or when minimum ambient temperatures are anticipated below 40°F during the curing period and left in place until opening to traffic. Insulated blankets shall be MA KA closed cell insulated blankets or approved equal. The insulated blankets shall have a minimum R-value of 2. Cost of insulated blankets shall be included in the price bid for the concrete where they are used.
5. Strict compliance with mix design slumps must be achieved to reach early strengths. "Drying out" of excessive slump mixes will not be allowed to reduce the slump.
6. All cold weather practices also apply to cementitious backfill material, except that blankets will not be required.

SPECIAL PROVISIONS
FOR CRACK SEALING OF AC STREETS
WITH RUBBERIZED ASPHALT

All cracks from ¼" wide to 1" wide shall be routed, blown and filled with rubberized asphalt by use of a melter-applicator as described in ASTM D3405 XI.I. If the manufacturer of the sealant has specifications that exceed those of ASTM D3405, then the manufacturer's specifications will be used.

Fill cracks to within 1/8 inch below pavement surface and blot any excess with approved material (no ridges).

Sealant material shall meet the requirements of ODOT 701.08 "Joint Fillers and Sealers" and meet or exceed ASTM D3405-78.

Asphalt crack seal will be measured by the linear feet of cracks that are sealed, excluding the areas that are patched.

The accepted quantities measured as provided above will be paid for at the Contract unit price as asphalt crack seal by the linear feet of cracks that are sealed, excluding the areas that are patched, which shall be full compensation for furnishing all materials, equipment, labor and incidentals to complete the work specified.

Approval of Joints: At the City of Tulsa's request, a representative of the sealant supplier will be on site at the beginning of the final cleaning and sealing of the joint to demonstrate to the Contractor and to Inspection the acceptable standard for installation of the sealant. No sealing shall commence until the manufacturer's representative has approved the joints. Failure of the sealant to bond to the joint/crack surfaces will be cause for rejection and repair shall be at the Contractor's expense.

Submittals: No work shall begin until the Contractor has submitted the following to the City as a minimum:

- A. Manufacturer's Material Specifications
- B. Manufacturer's Installation Specifications
- C. Manufacturer's Joint/Crack Dimension Specifications.

Concrete curb: Concrete curb and combined curb and gutter to be removed and replaced shall receive joints per ODOT Specification 609.04(e) and be sealed with silicone. Costs for joints and sealer to be included in the unit price bid for either concrete curb or combined curb and gutter.

All sawing necessary for sealing shall be included in the cost of the sealant where used.

SPECIAL PROVISIONS
FOR SPECIAL SPECIFICATION
OF HANDICAP RAMP

This work shall consist of the construction of concrete handicap ramps in reasonable close conformity with the location, lines and grades shown on the Standard Drawing for "Typical Curb Ramp" or established by the Engineer.

Materials and Methods of Construction shall meet ODOT specification 610.02 and 610.04 of the standard specifications.

The subgrade for ramps shall be compacted to a density of 90% standard density for depth of 6".

The minimum thickness of concrete on any portion of the ramp shall be 6" except in that portion of the ramp which extends over the pavement, which shall be 8".

The handicap ramp shall be flush where it meets the street. This will supersede the standard drawing.

The handicap ramps shall be installed according to City of Tulsa Standard Drawing No. 790—Standard Sidewalk Ramp.

Construction of handicap ramps will be measured by each ramp and shall be paid for at the contract unit price for:

HANDICAP RAMP

EA.

Which shall be full compensation for performing the work specified and the furnishing of all materials, labor, tools, equipment and incidental necessary to complete the work as specified. Aggregate base, truncated domes and pipe railing, if necessary, shall be paid for separately.

SPECIAL PROVISIONS
FOR SPECIAL SPECIFICATION
OF HIGH EARLY STRENGTH CONCRETE

DESCRIPTION

This work shall consist of furnishing and placing, High Early Strength Concrete.

MATERIALS

High Early Strength Concrete shall conform to Section 701, Portland Cement Concrete, of the Oklahoma Department of Transportation (ODOT) Standard Specification for Highway Construction, Current Edition, with the following modifications:

Air Content	-	5-7 percent
Maximum Water - Cement Ratio	-	0.41
Slump	-	1-3 inches

Batching shall measure the weights of each material required within a tolerance of one percent for cement and two percent for aggregates (account for moisture content). The quantity of water used shall be within plus or minus one percent of that required by the design. Water may be measured either by volume or by weight. All materials shall be used in strict accordance with the manufacturer's recommendations.

Submittals shall be delivered to the City of Tulsa at a date set by the Engineer. Submittals shall include the items outlined in ODOT Specification 701.03.

CONSTRUCTION METHODS

The concrete shall be mixed between 70 to 100 revolutions of the ready-mix truck. Mixing shall be in a mechanical mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the manufacturer's specified mixing period. There shall be no water in the mixing drum prior to adding the aggregates.

SPECIAL PROVISIONS
FOR HOT MIX ASPHALT

DESCRIPTION

This work shall consist of furnishing and placing Hot Mix Asphalt.

MATERIALS

Hot Mix Asphalt shall conform to Section 708, Plant Mix Bituminous Bases and Surfaces, of the Oklahoma Department of Transportation (ODOT) Standard Specification for Highway Construction, Current Edition, with the following modifications to Table 708:6

	S3	S4	S5
Asphalt Cement	5.0	6.0	6.0
% of mix mass			
(greater than or equal to)			

Submittals shall be delivered to the City of Tulsa at a date set by the Engineer. Submittals shall include the test results of the physical properties of the aggregate and asphalt cement as outlined in ODOT Specification 708.

SPECIAL PROVISIONS
FOR JOINT / CRACK SEAL OF PCC STREETS WITH SILICONE

All joints from ¼" wide to 1" wide shall be sawed, blown and filled with silicone in accordance with ODOT Specifications 419. All random cracks shall be cleaned by suitable tools (no routing), blown and filled with silicone that meets ODOT specification 701.08G.

Sealing

Instructions:

All aspects of the material application shall as a minimum meet the specifications of ODOT 701.08G. When material covered by that specification is used for maintenance or resealing of joints that have previously contained either similar or dissimilar sealing material, it is required that the joint be dry, cleaned thoroughly with a plow, wire brush, concrete saw, or other suitable tool or tools that are designed for the purpose of neatly cleaning pavement joints. Loose material shall be blown out. The sidewalls of the joint space to be sealed shall be thoroughly sandblasted, blown free of loose sand with high-pressure air and then sealed with sealant. If the manufacturer of the sealant has specifications that exceed those of ODOT 701.08G, then the manufacturer's specifications will be used.

Joint Shape

Requirements:

Specifications for the dimensions of joints and cracks shall be the same as those recommended by the sealant manufacturer.

Sealant Material:

The construction of concrete joint rehabilitation shall meet the requirements of ODOT 701.08. "Joint Fillers and Sealers", except that the sealant material for concrete joint/crack rehabilitation shall meet or exceed the requirements of ODOT 701.08G.

Method of

Measurement:

Concrete joint rehabilitation and concrete crack seal will be measured by the linear feet of joints/cracks that are sealed, excluding the areas that are patched.

Basis of Payment:

The accepted quantities measured as provided above will be paid for at the Contract unit price for Crack and Joint Sealer by the linear feet of joints/cracks that are sealed, excluding the areas that are patched, which shall be full compensation for furnishing all materials, equipment, labor and incidentals to complete the work specified. All sawing necessary for sealing shall be included in the cost of the sealant where used.

Approval of Joints: At the City of Tulsa's request, a representative of the sealant supplier will be on site at the beginning of the final cleaning and sealing of the joint to demonstrate to the Contractor and to Inspection the acceptable standard for installation of the sealant. No sealing shall commence until the manufacturer's representative has approved the joints. Failure of the sealant to bond to the joint/crack surfaces will be cause for rejection and repair shall be at the Contractor's expense.

Concrete Curb: Concrete curb and combined curb and gutter to be removed and replaced shall receive joints per ODOT specification 609.04(e) and be sealed with silicone. Costs for joints and sealer to be included in the unit price bid for concrete curb and gutter. The sealant for the curbs shall meet the requirements of ODOT 701.08F.

Submittals: No work shall begin until the Contractor has submitted the following to the City as a minimum:

- A. Manufacturer's Material Specifications
- B. Manufacturer's Installation Specifications
- C. Manufacturer's Joint/Crack Dimension Specifications
- D. A 3 Year History of Sealing Projects

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SPECIAL PROVISION
MINIMUM ASPHALT RETAINED STRENGTH

This Special Provision revises, amends, and where in conflict, supersedes applicable sections of the 2009 Oklahoma Department of Transportation Standard Specifications for Highway Construction, (ODOT).

The “% Retained Strength, min.” for asphalt as listed in ODOT Section 708 TABLE 6A “PROPERTIES OF LABORATORY MOLDED SPECIMENS” shall be 80%.

SPECIAL PROVISIONS
OWNER ALLOWANCE

The "Owner Allowance" may be used for various work and miscellaneous items not specifically identified in the Contract Documents with the following provisions:

- A. The allowance shall be used for cost of design and construction, including all materials, labor, equipment, profit and overhead, of work items not specifically identified in the Construction Documents, or included in original pay items bid for the contract.
- B. The allowance shall be utilized only at the discretion of the City of Tulsa. Any balance remaining at the completion of the Project will be retained by the City of Tulsa.
- C. The Contractor shall provide, to the City of Tulsa, a written request for the use of any allowance, including a schedule of values and associated backup information, including validity of need, materials, labor, equipment, and time required to perform the associated work.

Contractor shall proceed with the allowance work only after receiving written permission from the City of Tulsa. Proceeding with associated allowance work without written permission from the City of Tulsa will be at the Contractor's sole expense.

SPECIAL PROVISIONS
FOR PATCHING OF CONCRETE AND ASPHALT STREETS

The City of Tulsa Standards for street cut and repair shall be followed for materials and procedures except as modified here.

Patching

Instructions: Portland Cement concrete patches will be protected from all traffic for a period of 24 hours before removal of protective devices. Sawing of the patches is required. The area to be removed shall be marked by the Contractor under the direction of the Resident Inspector. The Contractor will provide personnel and equipment for making of patches as directed by Resident Inspector. When completed, the patch shall be level and provide a smooth riding surface. All asphalt patch work will require that asphalt rollers and an asphalt laydown machine be available for use on the job as directed by the engineer. The minimum size of any patch shall be 3' x 3'.

Testing of

Materials: The frequency of testing shall be as follows:

Subgrade Compaction: A minimum of one (1) density test of the subgrade shall be done per patch.

Concrete: Three cylinders shall be taken from every 50 cubic yards of concrete and tested for compressive strength.

Asphalt: Compaction and extraction tests shall be taken a minimum of every 50 tons of asphalt.

Weather

Limitations: The minimum temperature of the foundation course on which asphalt concrete may be laid shall be as shown in the following table:

Compacted Lift Thickness (inches)	Surface Temperature (minimum)
3 or more	40° F
1 ½ to 3	45° F
less than 1 ½	50° F

Asphalt

Materials: All asphaltic concrete used for this Project shall meet the specifications of ODOT Section 708. Under the paragraph, "Course Aggregates", the

following sentence shall be added: When tested for soundness, the number of cycles shall be five (5), the solution shall be Na₂ SO, the maximum loss shall be 10%.

Type I Patch

Subgrade

Replacement: Shall consist of the removal of subgrade material as measured from the bottom of the existing pavement. The removed subgrade material shall be replaced with separator fabric meeting the requirement of ODOT Section 325 and aggregate material meeting the requirement of ODOT Section 703.01 Type "A". The existing subgrade shall be compacted to 95% standard proctor density per AASHTO T-99 and the aggregate material shall be compacted to 98% modified proctor density per AASHTO T-180-86 Method as measured by the Nuclear Density Method. Compaction shall be done with a roller or vibratory hand tamper. Certain situations may require substitution of Quick-set Fill Concrete for aggregate material. Fill concrete specifications are shown on the Standards for Pavement Cut and Repair. Separator fabric shall be used at all full depth pavement patches where aggregate base is required, as directed by the Engineer. The fabric shall be cut or overlapped to fit the size of the patch. These items will be paid separately from the bid item for patching.

Type A Aggregate

Base: This material shall have the following gradation, which is ODOT Section 703-01 Type "A".

<u>Sieve (mm)</u>	<u>% Passing</u>
1 ½ in. (37.5)	100
¾ in. (19.0)	40 – 100
3/8 in. (9.5)	30 – 75
No. 4 (4.75)	25 – 60
No. 10 (2.00)	20 – 43
No. 40 (0.425)	8 – 26
No. 200 (0.075)	4 – 12

Type I Patch in PCC

Pavement: When the patch is made in PCC, the pavement shall be cut with a concrete saw full depth before removal of existing pavement. The area to be patched shall be delineated in a straight-line geometric pattern. Placement of the subgrade stabilization material shall be in accordance with the paragraph; "Type I Patch Subgrade Replacement". After

placement of the subgrade stabilization, the pavement shall be replaced with Class A High Early Strength concrete containing 4 to 6 percent air entrainment. The concrete shall have a maximum 3" slump. The concrete shall be placed in accordance with the detail in the drawings titled "Type I PCC Patch". The new concrete shall have a flat finish and match the grade of the adjacent pavement.

Existing joint patterns shall be reestablished and sealed as specified. The concrete shall be sprayed with curing compound and protected from traffic a minimum of 24 hours. Cold Joints around the perimeter of the patch shall be sawed and sealed with silicone in accordance with ODOT specification 701.08(E). All sawing, pavement removal, and sealing costs shall be included in the bid item for patching, H.E.S. concrete.

**Type I Patch
in Asphalt
Pavement:**

When the patch is made in asphalt, the pavement shall be cut with a concrete saw full depth before removal of existing pavement. The area to be patched shall be delineated in a straight-line geometric pattern. Placement of the subgrade stabilization material shall be in accordance with the paragraph; "Type I Patch Subgrade Replacement". After placement of the subgrade stabilization material, the pavement shall be replaced in accordance with the detail in the drawings titled "Type I AC Patch", a minimum of 8" or existing paving thickness, whichever is greater. All asphalt materials shall meet the specifications of ODOT 708 Plant Mix Bituminous Bases and Surface. The asphalt shall be placed and compacted in maximum 3" lifts. The edges of the patch shall be tacked prior to the placement of asphalt. The asphalt shall be compacted to 92% minimum density as determined by AASHTO T-209 Method. The patch shall be stringlined as required and all areas not matching the adjacent grade shall be immediately corrected. Cold joints around the perimeter of the patch shall be sawed and sealed with rubberized asphalt. All sawing, pavement removal, replacement, and sealing costs shall be included in the bid item for patching, AC.

**Type I
Patch in APC**

Pavements: Patching of PCC pavements with an asphalt overlay shall be performed as follows: Placement of the asphalt portion of the patch shall be in accordance with the paragraph "Type I Patch in Asphalt Pavements". Placement of the PCC portion of the patch shall be in accordance with the paragraph "Type I Patch in PCC Pavements". Placement of the subgrade stabilization material shall be in accordance with the paragraph "Type I Patch Subgrade Replacement". After placement of the subgrade stabilization material, the pavement shall be replaced in accordance with

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the detail in the drawings titled "Type I APC Patch". Payment will be made separately for each of the three materials: Type "S4" AC, H.E.S. PCC and Aggregate Base. Initial sawing, pavement removal and sealing costs shall be included in the bid items for patching as listed above. Additional sawing required to go from a Type "III" to a Type "I" patch shall be included in the bid items for H.E.S. PCC.

Type II Patch

In APC

Pavement: The asphalt overlay shall be removed prior to sawing through the PCC Pavement to determine if only the asphalt needs to be patched. Sawing of The asphalt is required, but should not penetrate the PCC pavement. If the PCC pavement needs to be replaced, a Type "I" APC patch shall be made.

Payment will be made for Type "S4" or Type "S5" AC only. If only the asphalt is removed, initial sawing, pavement removal, and sealing costs shall be included in the bid items for asphalt concrete.

**SPECIAL PROVISION
FOR
PAVEMENT AND BRIDGE DECK SMOOTHNESS
(ENGLISH)**

These Special Provisions amend and where in conflict, supersede applicable sections of ODOT's 2009 Standard Specifications for Highway Construction, English and Metric. Units of measurement are provided in the subsections in both English and Metric equivalents. The units for this provision will be those English equivalents.

These Special Provisions apply to all types of Portland cement and asphalt concrete pavements as well as bridge decks constructed as part of this contract or as specified on the Plans.

430.01. DESCRIPTION.

This section establishes procedures for determining acceptability as it relates to smoothness requirements of pavements and bridge decks. The equipment and testing applicable to this Section shall be provided and/or operated by the party or parties designated by the City.

430.03. EQUIPMENT AND PERSONNEL.

Smoothness measurement equipment to be used for control and for acceptance testing shall include either The California Profilograph or The Lightweight Profilometer as described below. Such equipment shall be certified by the Department.

- a) Profilograph. A California type profilograph produces a smoothness profilogram (or profile trace) of the surface tested. The equipment used shall be supported on multiple wheels having no common axle. The wheels shall be arranged in a staggered pattern such that no two wheels cross the same bump simultaneously. The profile is recorded from the vertical movement of a sensing wheel attached to the frame at the midpoint and is in reference to the mean elevation of the twelve points of contact with the road surface established by the support wheels.

The strip chart recorder shall be mounted on a lightweight frame 25 feet long. The relative smoothness/roughness of the pavement or bridge deck shall be measured by recording the vertical movement of a 6-inch or a larger diameter-sensing wheel attached to the midpoint of the frame.

The recorded graphical traces of the profile (termed the "profilogram") shall be on a scale of 1-inch equals 1 inch for the vertical motion of the sensing wheel. The profilogram shall be driven by the chart drive on a scale of 1 inch of chart paper equal to 25 feet of longitudinal movement of the profilograph.

- b) Lightweight Profilometer. The profilometer equipment shall be mounted on a lightweight, motorized vehicle such as an All-Terrain Vehicle (ATV), Golf Cart, or

other approved vehicle. The vehicle profilometer equipment, and operator shall be capable of running on "green" concrete without causing damage. The profilometer equipment shall include an onboard, precision accelerometer which measures movement of the light weight and a non-contact vertical distance sensor mounted on the vehicle. The vertical distance sensor may be either infrared or laser type. The profilometer shall be capable of making all of the measurements and providing the information required in 430.04(b) "Evaluation" of this special provision. Additionally, the profilometer shall measure the road profile in accordance with ASTM E950-98, Class I.

- c) Calibration. The profilograph or profilometer shall be calibrated within the following limits. Horizontal measurements shall be within ± 5 feet per 1,000 feet of distance tested. Vertical measurements shall be the same as those of the calibration blocks measured. A profilograph and profilometer Calibration Report shall be submitted to the Engineer each time the calibration is performed. The calibration shall be performed no more than one week prior to collection of smoothness data and repeated at the Engineer's direction at any time during the Project.
- d) Profilograph or profilometer Operator. The City shall provide a profilograph or profilometer operator, certified by the Oklahoma Highway Construction Materials Technical Certification Board to perform all profilograph or profilometer measurements as well as interpreting and analyzing produced profilograms at no cost to the Contractor.

430.04. CONSTRUCTION.

- a) Surface Testing. The Contractor shall provide traffic control as necessary for all smoothness measurements regardless of who provides and/or operates the equipment. The surface will be tested as soon as possible after completion of the work. For overlay projects when milling is not required, the surface will be tested immediately before construction and as soon as possible after completion of the work in order to determine the percent reduction in the profile index. Profilometer readings or profilograph traces are to be collected from 25 feet prior to the beginning point of a project, including any exception areas, and run continuously through all bridges and changes in the pavement types to a point 25 feet beyond the ending point of a project, including any exception areas.

Testing shall include all mainline paving and bridge decks. Smoothness deviations occurring at construction and expansion joints will be considered in calculations of profile index and in identification of bumps.

All objects and foreign material on the surface shall be removed by the Contractor prior to testing. Protective covers, if used, shall be removed prior to testing and will be properly replaced by the Contractor after testing. Testing for smoothness shall produce a final trace; a second trace shall be made on segments on which allowable surface corrections have been made.

The profilograph shall be propelled at a speed not to exceed 3 miles per hour. Data shall be gathered at lower speeds if the pavement or bridge deck is rough or profilograms are not being produced clearly.

The profilometer shall be operated at a constant speed as recommended by the manufacturer. The sequence of position of the pavement or bridge deck to be tested will be one pass per driving lane in the wheel path farthest from the edge of a pavement or bridge deck.

Additional profiles will be taken only to define the limits of an out-of-tolerance surface variation. The evaluations shall include graphical traces of the profiles and the disks from which they were derived. The testing and evaluation will be done by a trained and certified operator and the evaluation will be so certified. The City reserves the right to verify the testing and/or evaluation. In case of differences the City's results shall be considered final. If the Contractor's results are found to be significantly in error, the City may assess the cost of the verification efforts.

b) Evaluation.

1. *Profile Index.* Unless otherwise specified in Special Provision 431-3QA, a profile index shall be calculated from the profilogram for a pavement or bridge deck on 528 feet extents or entire lengths of bridges (including approach slabs) whichever is less. The index shall be calculated using a computerized profilogram reduction system. It is understood that stations reflected by automated profilogram interpretation systems are approximate and a further survey in the field may be required to establish bump locations. The index is calculated by summing the vertical deviations outside a 0.2-inch blanking band as indicated on the profile trace. The units of this measure (inches) will be converted into inches per mile. An extent is defined as the amount of pavement or bridge deck in a 528 feet or the entire bridge deck plus both approaches in length, whichever is less. When the quantity represented is less than a full extent in length, it will be combined with an adjacent extent or treated as a separate extent, at the option of the Contractor.
2. *Bumps.* Bumps will appear as high points on the profile trace and correspond to high points on the pavement or bridge deck surfaces. Unacceptable bumps are defined as those with vertical deviations in excess of 0.60 inch (without using a blanking band) in a 25-foot span.
3. The following will not be excluded from the smoothness requirements:
 - (a) Shoulders
 - (b) Ramps
 - (c) Turn Lanes

- (d) Acceleration, deceleration and climbing lanes less than 528 feet full width.
- (e) Pavement with horizontal centerline curves with radii of less than 1000 feet and the super elevation transitions of such curves.
- (f) In overlays only, areas in roadway within a 10 foot radius of existing inlets and utility covers. (This exception does not apply to full depth pavements.)
- (g) Short isolated pavement areas, which by normal industry practice would require handwork.

Examples include driveway blockouts, phased intersection work with variable cross slope, etc.

For the above exceptions, the profile index and adjustments calculations corrections specified in this Special Provision, will not apply. However, the requirements for mandatory correction of bumps as defined in this Special Provision and tolerances defined in subsection 401.04 of the Standard Specification for Highway construction will remain in effect.

- 4. *Special Evaluation Requirements.* Bridge approach slabs will be evaluated in accordance with bridge deck smoothness requirements. New pavements and overlays within 25 feet of bridges or their approach slabs, 25 feet of beginning and ending stations of the Project, or 25 feet of changes from portland cement concrete to asphalt concrete or vice versa will not be excluded from profile index calculation. However, the requirements for mandatory correction of bumps as defined in this Special Provision and tolerances defined in subsection 401.04 of the Standard Specification for Highway Construction will remain in effect.

- (c) **Surface Correction.** Unless otherwise permitted by the Engineer, in writing, all new pavements, overlaid pavements (with or without prior cold milling) and bridge deck surfaces having profile indices in excess of the acceptable limits of 13.0 in/mile for all streets and 27.0 in/mile for all bridges or having individual bumps with deviations in excess of 0.60 inch in a 25 foot span shall be corrected by the Contractor at no additional cost to the City. Such corrective actions shall NOT include any grinding of metal expansion joints, themselves, but may include grinding of concrete in the vicinity of the joints.

All corrective action, including the identification and correction of bumps, shall be in accordance with the requirements of the Standard Specifications and shall be subject to the approval of the Engineer. The surfaces of ground asphalt pavements shall be fog sealed. The surfaces of corrected areas shall be retextured to be similar to that of the adjacent sections of pavement or bridge deck and shall exhibit good workmanship and be neat in appearance. Cores for thickness determinations and measurement of cover of reinforcement steel will be taken subsequently to all corrective work.

SPECIAL PROVISIONS
FOR PAVING OPERATIONS

1. If the width of a street is such that it exceeds the paver's ability to pave one-half the street width another paver will be required and shall be operated so as to lay asphalt on at least one-half of the street width at a time.
2. The longitudinal joint shall run parallel to the approximate center of the street. Transverse joints shall be kept to a minimum. If it becomes necessary to stop the paving operation short of the end of the job then the two transverse joints shall be no farther apart than 6'.
3. If for any reason the Contractor is unable to pave one-half the width of the street with one paver, paving operations shall cease.
4. A paving plan, indicating sequence of paving passes, pass widths, pass thickness, and requested temporary street closures, will be submitted prior to paving.
5. Once paving begins the Contractor should have sufficient trucks available to deliver asphalt materials in a continuous operation.
6. Adequate transitions to side streets and driveways must be provided. In general, paving shall extend to the returns of all side streets. Special consideration should be given to preventing ponding in side street intersections.
7. The contractor shall provide butt joints as directed by the Engineer. Wherever the planned overlay of an existing street meets existing pavement, or at the end of a paving run, butt joints shall be provided to a depth matching the planned overlay thickness. The transition shall extend a minimum of 10 feet longitudinally from the joint to provide a smooth riding surface. Butt joints will not be paid for directly but the cost shall be included in the cost of the paving operations where they are used.
8. Contractor shall not drive empty or loaded trucks or equipment across newly paved areas for the construction period.
9. A leveling or "wedge" course may be required to establish the required cross-slope for the finished overlay. This item of work will be paid for separately under the bid item designated as Asphalt Concrete Type "S5" in tons.

SPECIAL PROVISIONS
PERMANENT TRAFFIC SIGNS

PART 608 - TRAFFIC SIGNS

608.1 GENERAL

- 608.1.1 This work shall consist of furnishing materials and installing traffic signs in accordance with these specifications and in reasonably close conformity with the location and dimensions shown on the Standards, Plans or established by the Engineer.
- 608.1.2 Signs shall be designed in accordance with the 2009 Manual on Uniform Traffic Control Devices (MUTCD) with revisions and the 2004 FHWA Standard Highway Signs (2012 Supplement to the 2009 MUTCD).
- 608.1.3 Street name sign proofs shall be submitted to the Traffic Engineer for review and approval prior to fabrication.

608.2 MATERIALS

608.2.1 General

Signs shall be composed of aluminum metal sheeting overlaid with cut-out film and a reflective sheeting material. Mounting shall be with posts, hardware and brackets as specified.

608.2.2 Sheet Aluminum

Provide 0.080-ga sheet aluminum signs in accordance with ASTM B 209, alloy 6061-T6 or alloy 5052-H38 with mill finish. Use the dimensions, filleted corners, and hole sizes and locations as shown on the sign standards. Ensure panels are flat and straight within commercial tolerances. Treat sheet aluminum signs with a chromate type chemical conversion coating in accordance with ASTM B 449, Class II.

608.2.3 Reflective Sheeting

Post-Mounted Signs: Sheeting shall be High Intensity Prismatic meeting ASTM D4956 Type III / IV (3M 3930 or approved equal).

Mast-Arm Mounted Signs: Sheeting shall be Diamond Grade meeting ASTM D4956 Type XI (3M DG³ or approved equal).

All sheeting shall have a Class I adhesive backing.

608.2.4 Overlay

Electronic cuttable sign film designed for use with electronic sign plotters (3M ElectroCut Series 1170 Film, or approved equal).

608.2.5 Mounting Hardware

Bolts, nuts, washers, brackets, and all other hardware needed for mounting shall be suitable for long-term outdoor use

A) Bolts: 5/16" x 3", hex head

B) Nuts: flanged, self-locking, size as needed

C) Washers: 3/4" O.D., maximum

D) Brackets: for mast-arm mounting, use a prefabricated mounting system (Pelco Structural Astro-Brac® or approved equal). See COT Standard 616.

608.2.6 Posts

Sign posts shall be perforated square tube (Telespar® or approved equal). Signs shall be composed of new hot-rolled carbon sheet steel, structural quality, ASTM A 1101. Provide a finish that is in-line, hot-dip galvanized zinc coating in accordance with AASHTO M120, followed by a chromate conversion coating, and a clear organic exterior coating. Provide posts with 1/2-in. ($\pm 1/16$ -in.) diameter holes spaced 1-in. on center along the center of each of the four sides.

608.3 CONSTRUCTION METHODS

608.3.1 General

Construction methods shall involve fabrication and mounting of the sign to the appropriate type mount.

608.4 METHOD OF MEASUREMENT

608.4.1 Signs of the size and type specified will be measured by the square foot of area of the vertical front face with no deduction for rounded corners or bolt holes.

608.4.2 Posts of the size specified will be measured by the linear foot between the ends of the installed post.

608.5 BASIS OF PAYMENT

608.5.1 Accepted signs, measured as provided above, will be paid for at the contract unit price as follows:

608.5.2 SIGNS

GROUND SIGN SF
OVERHEAD SIGN SF

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

608.5.3 POSTS

1-1/2" SIGN POST LF
1-3/4" SIGN POST LF
2" SIGN POST LF

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

**SPECIAL PROVISIONS
FOR
PRICE ADJUSTMENT FOR ASPHALT BINDER**

These Special Provisions revise, amend, and where in conflict, supersede applicable sections of the 2009 Oklahoma Department of Transportation Standard Specifications for Highway Construction. Units of measurements are provided in the subsections in both English and metric equivalents. The units for this project shall be those specified in the project plans.

(add the following:)

109.12 PRICE ADJUSTMENT FOR ASPHALT BINDER.

A price adjustment clause is included in this contract to provide additional compensation to the Contractor or a credit to the City of Tulsa for fluctuations in asphalt binder process. This price adjustment is dependant upon a change in the average price of asphalt binder which results in an increase or decrease in the price of products utilized on this project.

- a) Payment will be made to the contractor for monthly fluctuation in the cost of asphalt binder used in performing the applicable items of Asphalt Concrete work as listed in the table below when the asphalt binder cost fluctuates by more then 3% from the base price defined below. Payments may be positive, negative, or nonexistent depending on the circumstances. Payments or deductions will only be calculated on that portion of the asphalt binder cost fluctuation that exceeds the 3% specified above. Payments or deductions for the asphalt binder cost adjustment will be included in the contractor's progressive estimates; and the payments or deduction authorized for each estimate will be based upon the algebraic difference between the quantities for applicable items of work.
- b) The Asphalt Binder Cost Adjustment (ACA) for the current estimate will be computed according to the following formula:

$$ACA = Q \times F \times D$$

Where

- | | | |
|-----|---|---|
| ACA | = | Asphalt binder cost adjustment, in dollars; |
| Q | = | The algebraic difference between the quantities for the applicable items on the current estimate and the quantities shown on the previous estimate, in tons of mix; |
| F | = | The Asphalt Binder Use Factor for the applicable items of work subject to this price adjustment, as listed in the following table, are: |

ITEM OF WORK	SPECIFICATION NUMBER	ASPHALT BINDER USE FACTOR PER UNIT (metric and U.S. Customary units)
Asphalt Concrete, Type S5	411	0.060 ton of binder per ton of mix
Asphalt Concrete, Type S4	411	0.060 ton of binder per ton of mix
Asphalt Concrete, Type S3	411	0.050 ton of binder per ton of mix

Note: When the units of measure in the contract for the Items of Work listed in the table do not correspond with the units shown in the table (i.e. Asphalt Concrete paid by the square yard, etc.), those Items will not be subject to the terms of this special provision or any asphalt binder price adjustment.

D = Allowable price differential, in dollars;

The allowable price differential, "D" for the current estimate will be computed according to the following formulas:

When the current price, P , is greater than the base price, $P_{(b)}$.

$D = P - [1.03 \times P_{(b)}]$, but not less than zero.

When the current price, P , is less than the base price, $P_{(b)}$.

$D = P - [0.97 \times P_{(b)}]$, but not greater than zero.

In either case, $P_{(b)}$ shall be the base asphalt binder price, in dollars per ton (mton), defined as the average of the minimum and maximum prices for performance-graded binder using the Selling Price of PG64-22 paving grade, F.O.B. manufacturer's terminal, as listed under "Midwest/Mid-Continent Market – Tulsa, Oklahoma/Southern Kansas area" as published in the last issue of Asphalt Weekly Monitor® furnished by Poten & Partners, Inc. for the month prior to the month in which the bids for the work were received.

In either case, P , shall be the current asphalt binder price, in dollars per ton (mton), as defined above for the base asphalt binder price. The publication used will be the last issue published in the month prior to the month in which the progressive estimate is generated.

- c) Items included in the contract that are listed in the table above are subject to the adjustment in accordance with this provision, regardless of any amount of overrun to the plan quantity. Any new items of work added to the contract by supplemental agreement that are listed in the table above, will be subject to the asphalt binder price adjustments in accordance with this provision. The base asphalt binder price, $P_{(b)}$, for any newly added eligible items will be the same $P_{(b)}$ as the eligible items in the contract and the new unit price established by supplemental agreement shall be determined accordingly.

SPECIAL PROVISIONS
REMOVAL OF CASTINGS

All water, sanitary sewer, and storm sewer manhole castings, lids, frames, curb hoods, grates, hydrants, valves, and other fittings removed as part of any construction project are property of the City of Tulsa. Contractor will not take ownership.

All storm sewer and sanitary sewer castings shall be salvaged and delivered by the contractor to the Underground Collections North Sewer Base Stockyard at 9319 East 42nd Street North. Contractor will coordinate the return of such items with the Stockyard personnel at 918-669-6130.

All hydrants, valves, and other fittings from abandoned water mains shall be salvaged and delivered by the contractor to the South Yard at 2317 South Jackson Avenue. Contractor will coordinate the return of such items with the South Yard personnel at 918-596-9401.

SPECIAL PROVISIONS
TACTILE MARKERS TRUNCATED DOMES

DESCRIPTION. This work shall consist of installing Truncated Domes.

MATERIAL. The Truncated Domes shall be pre-cast concrete pavers with a nominal thickness of 7/8 inch to 2 inches. They shall be constructed with a minimum of 4000 psi concrete. They shall be yellow in color and meet all ADA requirements for color contrast and dimensions.

CONSTRUCTION METHODS. The panels shall be installed according to the manufacturer's recommendations and in accordance with City of Tulsa Standard Drawing No. 790—Standard Sidewalk Ramp.

METHOD OF MEASUREMENT. The Truncated Domes will be measured by the square foot of panel area.

BASIS OF PAYMENT. Accepted panels, measured as provided above, will be paid for at the contract unit price as follows:

TRUNCATED DOMES

SQUARE FOOT

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

SPECIAL PROVISIONS
FOR TREE REMOVAL

DESCRIPTION. This work shall consist of removing trees where called for on the Plans and shall include cutting such trees, removing their stumps and roots, and properly disposing of the material.

CONSTRUCTION METHODS. Trees shall be removed and disposed of in a manner approved by the Engineer. All stumps and roots shall be removed to a depth of not less than 12 inches below the finished subgrade elevation.

METHOD OF MEASUREMENT. The size of trees will be determined by the average diameter of the tree trunk taken at a point measured four feet above the base of the tree at the ground line. The diameter will be measured to the nearest full inch.

BASIS OF PAYMENT. Trees to be removed under this item will be measured as provided above and will be paid for at the contract unit price per each tree in accordance with the following schedule of size:

(A)	REMOVING TREES 6-12 INCH IN DIAMETER	EA.
(B)	REMOVING TREES 13-18 INCH IN DIAMETER	EA.
(C)	REMOVING TREES 19-24 INCH IN DIAMETER	EA.
(D)	REMOVING TREES 25 INCH AND MORE IN DIAMETER	EA.

which shall be full compensation for furnishing all materials, equipment, labor and incidentals to complete the work as specified.

Removing trees less than 6 inches in diameter will be considered as incidental work and will not be paid for directly but the cost will be included in other items.

SPECIAL PROVISIONS
FOR SPECIAL SPECIFICATION
OF TYPE I MONUMENT PAYMENTS

Under this item, the Contractor shall furnish and place for the payment requested for each monument, all materials, labor, equipment, and incidentals necessary to complete the work as shown on the sketch on the following page. The brass marker shall be provided by the City. The 5/8 inch rebar shall be a minimum of 36 inches in length. The locations will be as ordered by the Engineer.

Materials will be in accordance with Section 626.02 of ODOT's Standard Specifications for Highway Construction, current addition, with Accelerated High Early Strength Concrete substituted for Portland Cement Concrete.

SPECIAL PROVISIONS

URBAN RIGHT OF WAY RESTORATION

DESCRIPTION:

The work under this item shall consist of restoring Rights-of-Way. Contractor shall be responsible for the removal and replacement of mailboxes, drains, traffic signs, and curb street address number, sprinkler system or any other improvement within the right of way that is not paid for in other items of work.

CONSTRUCTION REQUIREMENTS:

All existing improvements as called for in this special provision to be replaced or reconstructed shall be restored to substantially the same condition as existed prior to the construction. Contractor shall document by photographing all obstructions and improvements prior to the start of construction.

As the work progresses, all streets shall be thoroughly cleaned of all rubbish, excess earth, rock, and other debris resulting from such work. All clean-up operations at the location of such work shall be accomplished at the expense of the contractor and shall be completed to the satisfaction of the engineer.

IRRIGATION SYSTEMS

DESCRIPTION:

The work shall consist of repairing any irrigation systems inside or outside the street Right of Ways as a result of damages or adjustments needed during the course of the construction to the satisfaction of the engineer.

CONSTRUCTION REQUIREMENT:

Contractor shall repair irrigation systems using like materials and shall include all materials necessary for the proper installation and function of the system. Materials such as valves, controllers, pop up spray and rotary heads, risers, seals, backflow preventer and main line pipe damaged during the course of the construction shall be re installed to its original condition. Excavation, placement, testing, back filling and compacting shall be done as required by the city of Tulsa standard specifications.

STREET ADDRESS AT CURB

DESCRIPTION:

The street address of the building, structure or lot served by the reconstructed driveway shall be painted on the curb of the driveway. Location to be approved by the Engineer. The street address shall face traffic flow.

CONSTRUCTION REQUIREMENTS:

The Street Address to be painted shall conform to city specifications as to size and form, and the

02/08/16

quality of paint to be used, as determined by the City of Tulsa Public Works Department.

Street Address placed on the curb shall be done using a vinyl numbers stencils; letters shall be in black paint in figures of the size of three inches in height, and impressed upon a white background of the size of five by eleven inches. Standard stencil lettering with height, color and style shall be as approved by the engineer or in accordance with the most current City of Tulsa Standards.

MAILBOX REMOVAL AND RELOCATION

DESCRIPTION:

Contractor shall remove, reset and/or reconstruct any and all mailboxes within the street right of way.

CONSTRUCTION REQUIREMENTS:

The removal, resetting and/or reconstruction of mail boxes in street right of way shall be coordinated with the local postmaster as required. Mailboxes shall be located no closer than 1' behind the face of curb to face of box.

Where Special mailboxes such as Stone, masonry brick, or non standard mail boxes exist, contractor shall replace all mailboxes in like kind. The kind and quality of materials in which mailboxes shall be reconstructed shall be to the satisfaction of the property owner and approved by the engineer.

The replaced mailbox shall be capable of withstanding wind loading and lateral load associated with the delivery of the mail.

DRAINS

DESCRIPTION:

Contractor shall reestablish drains, roof drains, and other drainage through the curb.

CONSTRUCTION REQUIREMENTS:

Removal, replacement, salvage of drains in street right of way shall be done during road construction phase.

Contractor shall replace all drains in like kind. The kind and quality of materials in which drains shall be reconstructed shall be to the satisfaction of the property owner and approved by the engineer.

All re-established drains shall include a storm water curb opening as described in City of Tulsa Standard Drawing 758.

TRAFFIC SIGNS

DESCRIPTION:

Unless otherwise directed by the plans and specifications, this item shall consist of removing, storing, and resetting all existing traffic signs. Contractor shall remove, store, and reset all traffic signage as required for construction of this project.

CONSTRUCTION REQUIREMENTS:

Roadside signs shall be placed at locations shown on the plans or at existing locations and shall be installed in compliance with the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

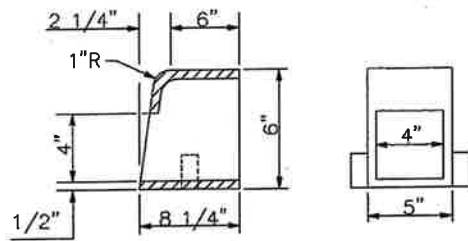
METHOD OF MEASUREMENT:

Irrigation Systems, Street Address at the Curb, Mailbox Removal and Relocation, Drains, and Traffic Signs will be measured by EACH for the project.

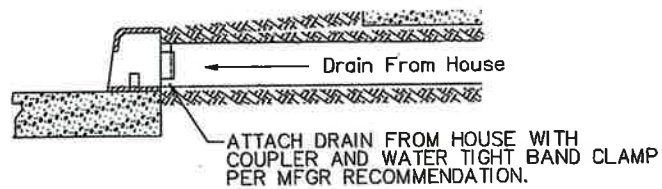
PAYMENT:

Special (C) Urban Right-Of Way Restoration (measured as provided above) will be paid for at the contract unit price by EACH. Such payment shall be full compensation for all equipment, tools, labor, and incidentals necessary to complete the work as specified.

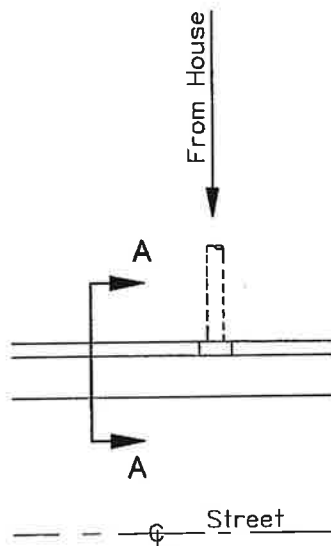
Special (C) Urban Right-Of-Way RestorationEACH



STORM WATER CURB OPENING



SECTION A-A

RESIDENTIAL CURB INLET

1. CONTRACTOR SHALL RECONNECT ANY SIDE DRAINS FROM ADJACENT PROPERTY THROUGH THE CURB.
2. INSTALL R-3262-3 SERIES HEAVY DUTY STORM WATER CURB OPENING BY NEENAH OR APPROVED EQUAL.
3. FIELD VERIFY SIZE AND LOCATION PRIOR TO PAVING OPERATIONS.
4. CONTRACTOR SHALL CAST INLETS IN PLACE DURING CURB PRODUCTION "CUT IN" NOT ACCEPTED.

RESIDENTIAL STORM WATER CURB OPENING

CITY OF TULSA, OKLAHOMA
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION

DRAWN BY: J.A.B.

APPROVED

CHECKED BY:

DATE: OCT. 2011

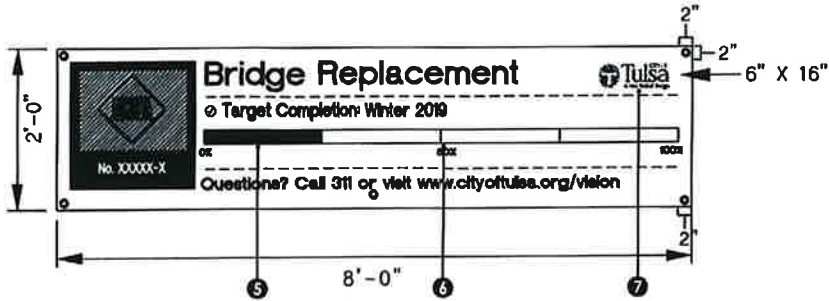
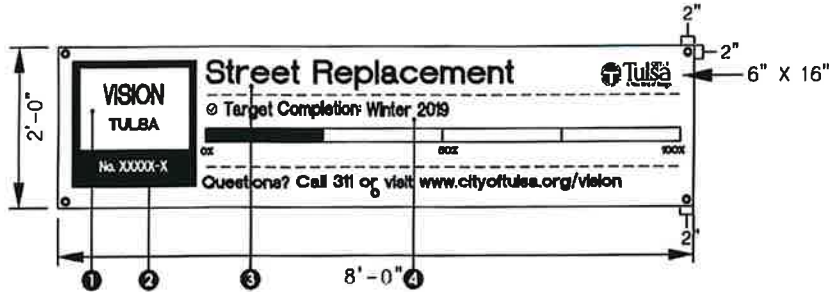
NOT TO SCALE

STANDARD NO. 758

SPECIAL PROVISION
FOR UTILITY RELOCATIONS
AND DESIGN ISSUES

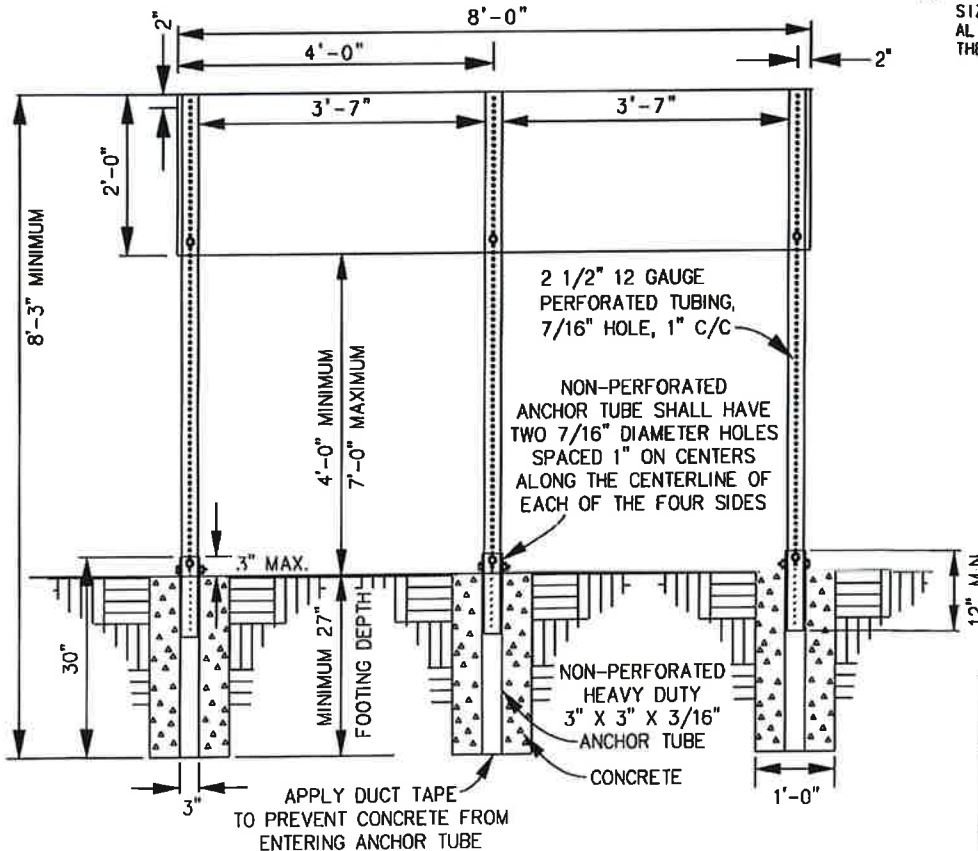
It is the intent of this specification to provide no more than seventy-five **(75)** calendar days due to delays caused by required utility relocations and required design clarifications. Should the Contractor be delayed in the final completion of work by any utility relocation or design issue, additional days as determined by the Engineer shall be granted by the City. However, the Contractor shall give the Engineer notice in writing of the cause of the delay in each case on the Extension of Time Request Form enclosed in these documents, and agrees that any claim shall be fully compensated for by the provisions of this specification to complete performance of the work. An adjustment will not be made to the contract time bid for incentive purposes.

Any time granted for utility relocations or design issues up to seventy-five **(75)** calendar days will be in addition to the number of days shown in the proposal for computation of disincentive and liquidated damages.



NOTE:

1. CAPITAL PROGRAM LOGO
 - VISION TULSA
 - IMPROVE OUT TULSA
2. PROJECT NUMBER
 - FONT: HELVETICA BOLD
 - SIZE: 2.5 INCHES
 - ALIGNMENT: CENTER
 - COLOR: WHITE
3. GENERAL PROJECT TITLE
 - FONT: HELVETICA BOLD
 - SIZE: 4.72 INCHES
 - ALIGNMENT: LEFT
 - COLOR: CITY BLUE
 - GENERALIZED
 - STREET REPLACEMENT
 - STREET REHABILITATION
 - STREET WIDENING
 - STREET RESURFACING
 - BRIDGE REPLACEMENT
 - BRIDGE REHABILITATION
4. TARGET COMPLETION
 - FONT: HELVETICA REGULAR AND BOLD
 - SIZE: 2.5 INCHES
 - ALIGNMENT: LEFT
 - COLOR: CITY BLUE AND BLACK
5. PROJECT PROGRESS BAR
 - SIZE: 2" TALL X 66" WIDE
 - COLOR: GREEN
 - MATERIAL: 2" GREEN, INDUSTRIAL DUCT TAPE CUT AT 1/4 SEGMENTS SHOULD BE USED TO INDICATE PROJECT PROGRESS/ADVANCEMENTS IN THE PROGRESS BAR. PAINT SHOULD ONLY BE USED IN THE EVENT THAT TAPE IS NOT AVAILABLE OR UNABLE TO REMAIN AFFIXED OVER A LONGER CONSTRUCTION PERIOD.
6. CONTACT INFORMATION
 - OPTIONS: 311 AND CORRESPONDING URL
 - FONT: HELVETICA REGULAR AND BOLD
 - SIZE: 2.5 INCHES
 - ALIGNMENT: LEFT
 - COLOR: CITY BLUE AND BLACK
7. CITY OF TULSA LOGO
 - SIZE: 10" WIDE
 - ALIGNMENT: OUTER RIGHT MARGIN EDGE AND TO THE BASELINE OF THE GENERAL PROJECT TITLE.



ASSEMBLY OF PLYWOOD SIGN

PROJECT SIGN	
CITY OF TULSA, OKLAHOMA ENGINEERING SERVICES DEPARTMENT	
DRAWN BY:	APPROVED
CHECKED BY:	
DATE: AUGUST 2017	
NOT TO SCALE	STANDARD NO. 102

SPECIAL PROVISION SP-01

ANCHORED REINFORCED VEGETATION SYSTEM

1.1 MATERIALS

A. Anchored Reinforced Vegetation System (ARVS)

1. Engineered armoring system consisting of High Performance Turf Reinforcement Mat (HPTRM) and earth percussion anchors. The HPTRM shall consist of non-degradable Trilobal polypropylene synthetic fibers, monofilaments, mesh and other elements, processed in to a three dimensional matrix. The HPTRM shall support the growth of grass roots through the material and provide adequate ground cover in times of removed vegetation. The material must have a dense closely woven homogenous matrix not composed of layers or discontinuous material held together by stitched or glued netting. Open weave is unacceptable.
2. Anchored Reinforced Vegetation System HPTRM Properties: (Minimum Average Roll Values (MARV) listed unless otherwise specified. Typical values are not allowed.

HIGH PERFORMANCE TURF REINFORCEMENT MAT			
Property	Test Method	Units	Property Requirement
Thickness	ASTM D-6525	in	0.40
Flexibility/Stiffness	ASTM D-6575	in-lbs	0.534
Resiliency (minimum value)	ASTM D-6524	percent	80
Mass Per Unit Area	ASTM D-6566	oz/sy	13.5
Tensile Strength (Grab) (minimum value)	ASTM D-6818	lbs/ft	(4000 x 3000)
Tensile Elongation (maximum value)	ASTM D-6818	percent	65
Light Penetration (% Passing) (maximum value)	ASTM D-6567	percent	20
Maximum Roll Width	Visual	--	10.5 feet
Color	Visual	-	green
UV Resistance (minimum value)	ASTM D-4355	percent	85 at 10,000 hrs
Estimated Design Life	Calculated	Years	≥50
Maximum Velocity	ASTM D-6460*	m/sec (ft/sec)	7.5 (25)
Maximum Shear Stress - * Manufacturer to provide a recently signed certification from the ASTM D-6460 Testing Facility stating velocity and shear values, the duration of flow for the test, and the time frame for vegetation establishment before beginning testing.	ASTM D-6460*	N/m ² (lb/ft ²)	718 (15)

3. Earth Percussion Anchors

- a) B1 Earth Percussion Anchors – The B1 Earth Percussion Anchors consist of a die cast aluminum bullet nosed anchor head so that the anchor head shall not cut or break yarns. This shall minimize abrasion and installation damage to the HPTRM. Shall consist of a directionally-locking, self setting wedge grip used to lock and hold the loading applied to the anchor. Ball bearing mechanisms for load locking anchors shall not be accepted."The bullet nosed anchor head shall be attached to a zinc-aluminum coated carbon 3- foot long steel 1 x19 cable and a die cast zinc load bearing plate with openings to allow vegetative growth through the plate. The anchors shall be delivered to the jobsite fully assembled and ready for installation. All components of the anchor shall have a 50 year design life. The earth percussion anchor shall be submitted with an HPTRM sample to the Engineer for final approval to ensure they comply with the specified requirements. Depth of 36 inches to provide for permanent tie down of the HPTRM to the levee, channel, or slope in the locations specified in the drawings. The Type B1 earth percussion anchors shall meet the following requirements:

Performance Properties	Value
Anchor and Cable Assembly Ultimate Strength	1.1 kips
Anchor and Cable Assembly Working Load	0.8 kips
Anchor Head Bearing Area	1.5 in ²

Anchor Type	Load Range Cohesive through Non Cohesive Soils	Minimum Drive Depth
B1	Up to 0.5 kips (Ultimate)	3.0 feet

4. Performance Properties shall be demonstrated by all of the following:

- a) Flume testing at an independent facility under conditions similar to this project provided that the manufacturer can demonstrate that the material tested is functionally equivalent to the material being supplied. This may be demonstrated by providing index property test results (listed in 2.2.A.4) from a GAI-LAP accredited laboratory for both the tested and supplied materials.
- b) Documented case histories of successful performance of 500,000 sy or greater on projects in North America.
- c) Manufacturing Quality Control: Testing shall be performed at a laboratory accredited by GAI-LAP for tests required for the geosynthetic, at frequency exceeding ASTM D 4354, with following minimum acceptable testing frequency:

Property	Test Frequency sq m (sq yd)
Mass Per Unit Area ASTM D-6475/6566	1/20,000 (1/24,000)
Tensile Strength ASTM D-6818	1/20,000 (1/24,000)
Tensile Elongation ASTM D-6818	1/20,000 (1/24,000)
Light Penetration (% Passing)	1/20,000 (1/24,000)

B. Erosion Control Blanket (ECB)

1. ECB shall be Landlok ® S2 or approved equal.

1.2 ACCESSORIES

A. ARVS Pins

1. Length: (18 inches); sufficient ground penetration to resist pullout. Use longer anchors for loose soils.
2. Metal pins: Steel, minimum 5 mm (0.20 in) in diameter with 40 mm (1.5 in) steel washer.

B. ECB Staples

1. 6-inch sod staples.

1.3 SUBMITTALS

A. Certification:

1. The Contractor shall provide the Engineer a certificate stating the name of the ARVS manufacturer, product name, style, chemical compositions of filaments or yarns and other pertinent information to fully describe the geotextile.
2. The Manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.
3. The manufacturer's certificate shall state that the furnished ARVS meets MARV requirements of the specification as evaluated under the manufacturer's quality control program. The certificate shall be attested to by a person having legal authority to bind the Manufacturer.
4. The manufacturer shall provide documented design methodology for size, length, and frequency of anchors in specific locations to meet acceptable factors of safety for critical sections of the installation. Design shall be based on designed slope geometry and geotechnical information provided by the engineer, as well as soil-specific anchor pull-out testing performed by the manufacturer.

- B. The ARVS System shall be furnished by a single "pre-approved" manufacturer and/or supplier and not be sourced from multiple manufactures/suppliers.

- C. Manufacturing Quality Control (MQC) test results shall be provided upon request.

- D. Independent Performance Test Results shall be provided upon request.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Rolled Erosion Control Product (RECP) labeling, shipment and storage shall follow ASTM D 4873.
- B. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number.
- C. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

- D. Each RECP roll shall be packaged with a material that shall protect the RECP from damage due to shipment, water, sunlight, and contaminants.
- E. The protective wrapping shall be maintained during periods of shipment and storage.
- F. During storage, ARVS shall be elevated off the ground and adequately covered to protect them from the following: Site construction damage, extended exposure to ultraviolet (UV) radiation, precipitation, chemicals that are strong acids or strong bases, flames, sparks, temperatures in excess of 71 deg C (160 deg F) and any other environmental condition that might damage the ARVS.

1.5 QUALITY ASSURANCE SAMPLING, TESTING, AND ACCEPTANCE

- A. RECP shall be subject to sampling and testing to verify conformance with this specification. Sampling for testing shall be in accordance with ASTM D 4354.
- B. Acceptance shall be in accordance with ASTM D 4759 based on testing of either conformance samples obtained using Procedure A of ASTM D 4354, or based on manufacturer's certifications and testing of quality control samples obtained using Procedure B of ASTM D 4354.
- C. Quality Assurance Sampling and Testing shall be waived for ISO 9002 Certified Manufacturing Facilities. Documentation of ISO 9002 Certification shall be provided upon request.

1.6 PRODUCTS

A. Approved Suppliers

- 1. Propex Operating Company, LLC, Chattanooga, Tennessee 37422 USA, or approved equal. Phone (800) 621-1273 - Fax (423) 899-5005. Joel Eisenman (913) 205-4036, joel.eisenman@propexglobal.com
- 2. Contech Construction Products, Tulsa, Oklahoma 918-504-4236
- 3. For pre-approval for alternate ARVS and ECB suppliers/manufacturers on this project, all products shall be submitted to the Engineer for review and approval no later than 10 days prior to bid date for pre-approval.

B. Alternative Suppliers

If a system other than the ArmorMax® Anchor Reinforced Vegetation System is used for construction, the Contractor shall be responsible for providing an engineered solution for slope reinforcement, considering both sliding shallow plane instabilities, as well as global rotational failure potential. The following documentation shall be provided by the Contractor to support the slope reinforcement design for the alternative engineered solution:

- 1. Overall ARVS Design Methodology
- 2. Input Parameters
- 3. Calculations / Model Output
- 4. Anchor Strength
- 5. Anchor Length
- 6. Anchor Spacing (X-Plane) & (Y-Plane)
- 7. Factor of Safety to support the slope reinforcement design; with a minimum of three (3) different conditions analyzed and documented for both a proposed 1H:1V slope, as well as a 1.5H:1V slope, as follows:
 - a) normal water level

- b) steady state seepage
- c) rapid drawdown

Contractor shall arrange for experienced representatives of the manufacturer to attend the mandatory Pre-Construction Conference and be on site for installation assistance the first day of installation. The Contractor shall arrange for experienced representatives of the alternative manufacturer to be on site for installation assistance and inspection on two additional occasions, one being scheduled mid-way during installation or when installation questions arise and the second being toward the end of installation.

1.7 EXECUTION

A. Preparation

1. Grade and compact area as directed and approved by Engineer. Subgrade shall be uniform and smooth. Remove all rocks, clods, vegetation or other objects so the installed mat shall have direct contact with soil surface.

B. Installation

1. A mandatory pre-construction conference with an Engineer representing the ARVS manufacturer, contractor, and inspector shall be held prior to installation of the mat. Contractor shall schedule the conference providing a minimum of seven (7) days notice to all parties involved.
2. Contractor shall arrange for experienced representatives of the ARVS manufacturer to be on site for installation assistance the first day of ARVS installation. The Contractor shall arrange for experienced representatives of the ARVS manufacturer to be on site for installation assistance and inspection on two additional occasions, one being scheduled mid-way during installation or when installation questions arise and the second being toward the end of installation. Contractor shall provide adequate notice to all parties. Delays caused by manufacturer's representative's late arrival on site shall not be cause for additional contract time.
3. The following installation details are the minimums required. The installation details noted in the drawings shall control the ARVS installation.

All seam overlaps shall be a minimum of 6 inches. All seam overlaps shall be on the upstream or uphill side.

4. Install Initial Trench along the crest of the slope as designated in the drawings.
5. Anchor the HPTRM in the trench and roll the HPTRM down the slope
6. Beginning at the top of the slope and working down to the toe, install pins and earth percussion anchors based on frequency and spacing of tie-down devices shown on the plans.
7. Determine the anchor installation method necessary to achieve the anchor pullout resistance(s) specified herein or on the Plans. The Engineer may add, eliminate, or relocate anchors to accommodate actual field conditions. The cost of any redesign, additional material, or installation modifications resulting from actions of the Contractor shall be borne by the Contractor.

8. The installation of the anchors shall be made at the locations, orientations, and lengths shown on the Plans or as directed by the Engineer. Select installation equipment and methods suitable for the ground conditions described in the geotechnical report and shown in the boring logs. Select anchors required to develop the specified pullout resistance. Where hard drilling conditions such as rock, cobbles, boulders, or obstructions are described elsewhere in the contract documents or project Geotechnical Report, other suitable drilling equipment and anchors capable of drilling through such materials, shall be used.

If a pilot hole is to be drilled for a Gripple Earth Percussion Anchor, adhere to the following guidelines: Use a drill bit no larger than $\frac{3}{4}$ inches (6.35 mm) in diameter. Cut two slits perpendicular to each other to form an "X" in the mat for the drill bit. The length of each slit shall be no longer than 1 inch (2.54 cm).

9. Anchor Installation

- a) Align the drive rod into the anchor head.
 - b) Drive anchor into ground either manually or using ground rod driver. Additional adapter needed for ground rod driver. Remove drive rod once anchor is fully driven. Set anchor by attaching anchor pulling cable or threaded rod until desired load is reached.
 - b) If copper ferrell anchors are being used: load lock anchor using crimpers; if wedge grip anchors are being used: load lock by sliding the wedge grip down the cable while setting anchor according to instructions above.
 - c) Remove excess cable or threaded rod using bolt cutters after Engineer has inspected excess cable or threaded rod for verification and approval of depth of anchors.
10. Anchor head location, deviation from plan design location; if anchors meet refusal when driven into the soil, anchors on seams shall be offset along the seam first while other anchors may be offset 12 inches any direction. If anchors still cannot be driven the full, designed depth drill a pilot hole for the anchor as described in step 8 above. Location tolerances are applicable to only one anchor and not accumulative over large slope areas. Anchors which do not satisfy the specified tolerances due to the Contractor's installation methods shall be replaced at no additional cost. Price bid shall include a contingency of up to 25 percent of required anchors to replace anchors which encounter unanticipated obstructions during drilling and require relocation, as approved by the Engineer. No additional payment shall be made for driving new anchors abandoned due to unanticipated obstructions.
 11. Install Longitudinal Edge trench on the first and the last roll of the project.
 12. Install modified check slots as needed.
 13. Terminate HPTRM in Terminal Trench at the toe of the slope.
 14. The Engineer shall approve alternate installation methods prior to execution.

- C. Turf Establishment

1. Soil filling and sodding the HPTRM:
 - a) Apply two inches of topsoil on the smooth and uniformly graded slopes, below the HPTRM.
 - b) Install the HPTRM.
 - c) Apply 5 inches topsoil on top of the HPTRM.

- d) Apply the solid slab sod.
- e) When using lightweight power equipment to fill HPTRM, avoid sharp turns. The equipment shall be rubber-tired. Do not drive tracked or heavy equipment over HPTRM.
- f) Contractor shall repair any and all damage to HPTRM caused by equipment at no additional cost.

2. Erosion Control Blanket (ECB) covering:

a) Erosion Control Blanket (ECB) Placement

Begin ECB placement at the top of the slope. Extend ECB at least 2 to 3 feet past the crest of the slope. Secure with 6 inch sod staples at 1 foot on center.

Unroll ECB downslope, overlapping adjacent rolls a minimum of 3 inches. Lay material loosely, maintaining direct contact with soil. Overlaps shall be on the upstream and/or uphill side.

Secure ECB to slope with 6 inch sod staples at 2 staples per square yard pattern.

b) Watering

Do not spray water directly at ECB. Doing so may result in washing away of the ECB fibers and movement of the seed below. Instead spray water upwards so that it arcs.

1.8 PROJECT ACCEPTANCE

- A. All areas that erode prior to project acceptance shall be repaired at the expense of the contractor including necessary re-sodding, watering, and repair of the ARVS.

1.9 METHOD OF MEASUREMENT

A. Anchored Reinforced Vegetation System

The area covered by the ARVS, excluding unexposed areas such as the anchor trenches and overlaps between adjacent pieces of mat, installed in place will be measured.

B. Erosion Control Blanket (ECB)

The area covered by the ECB installed in place will be measured, excluding overlaps.

1.10 PAYMENT

- A. Anchored Reinforced Vegetation System (ARVS) shall be measured by the square yard. Such payment shall be full compensation for materials, equipment, labor and incidentals required to perform all operations in connection with installation of ARVS in reasonable accordance with the lines, design and dimensions shown on the plans and as specified herein, including, but not limited to preparation of soil base for mat, anchoring the mat with specified earth percussion anchors, constructing anchor trenches, attending pre-construction conferences and coordination with the manufacturer/supplier.

Price bid shall include a contingency of up to 25 percent of required anchors to replace anchors which encounter unanticipated obstructions during drilling and require relocation, as approved by the Engineer. No additional payment shall be made for driving new anchors abandoned due to unanticipated obstructions.

Accepted ARVS, measured as provided, shall be paid for at the contract unit price as follows:

ANCHORED REINFORCED VEGETATION SYSTEM (ARVS) - SQUARE YARD

- B. Erosion Control Blanket (ECB) shall be measured by the square yard. Such payment shall be full compensation for materials, equipment, labor and incidentals required to perform all operations in connection with installation of ECB in reasonable accordance with the lines, design and dimensions shown on the plans, including, but not limited to preparation of base for ECB, anchoring the ECB with specified 6-inch sod staples and coordination with the manufacturer/supplier.

Accepted ECB, measured as provided, shall be paid for at the contract unit price as follows:

EROSION CONTROL BLANKET (ECB) - SQUARE YARD

END OF SECTION

SPECIAL PROVISIONS SP-02

AESTHETIC TREATMENTS FOR CONCRETE (CONCRETE SPECIAL SURFACE FINISH)

These Special Provisions revise, amend and where in conflict, supersede applicable sections of the 2009 Standard Specifications for Highway Construction, English and Metric, as applicable. Units of measurement are provided in the subsections in both English and Metric equivalents. The units applicable for this project will be those specified in the project plans.

1.0 GENERAL

This work shall consist of the construction and coloring of selected elements of the roadway (including pavement, sidewalk and medians) using coloring agents and concrete stamps in accordance with these specifications and in reasonably close conformance with the lines, grades, and dimensions shown on the Engineer's plans ("Plans"). Field measurements by the Contractor should be taken from supplied stamps for raised relief images. As required by the Engineer, the work shall be in accordance with American Concrete Institute ACI 303R-91, Guide to Cast-In-Place Architectural Concrete, and other appropriate ACI guidelines.

1.1 MATERIALS

A. Specifications and Related Information for Urethane Rubber Concrete Stamps.

- (1) Concrete stamps will be manufactured from urethane rubber.
- (2) The release agent to be used shall be integral coloring compatible with the stamp and the color hardener.
- (3) Absolutely no release agents containing mineral spirits or kerosene should be used.

B. Concrete Stamp Patterns.

- (1) Specified manufacturer is Scofield Systems, 6533 Bandini Blvd., Los Angeles, CA (323) 720-3000 (or approved equal). Concrete is to be stamped as shown on the plans utilizing the following patterns.

Double Stacked Soldier Course Cobble (#3040)
Roman Cobble (#300)
New Brick Running Bond (#2010)
New Brick Herringbone (#2050)
New Brick Double Soldier Border (#2170)

1.2 CONSTRUCTION

A. Color Selection for Concrete Stamped Surfaces.

- (1) Material for Concrete Stamped Surfaces. Specified manufacturer is Brickform / Rafco Products, 11061 Jersey Blvd., Rancho Cucamonga, CA (800) 483-9628 (or approved equal). Specified products are Brickform Integral Color. Colors are to be applied to concrete as shown on the plans using integral coloring. The shake-on method or staining will not be permitted.
 - (a) Sidewalks
 - Integral Color – Tile Red (#500)
 - (b) Medians
 - Integral Color – Cappuccino (#735)

- (c) E. 87th St. S.
 - Integral Color (Border) – Cream Beige (#310)
 - Integral Color – Cappuccino (#735)

B. Concrete Stamping. Concrete stamping work should be done quickly and continuously across the entire placement. Place each stamp on freshly placed concrete surface, align with each other, and block off edges as the pattern requires.

The Contractor shall tamp or step on back of stamp to create full depth imprint in concrete. This should be repeated in rows as the Contractor moves along the area of concern. Residual release agent should be removed from surface once slab has set.

C. Surface Preparation and Finishing.

(1) Penetrating Stain Standards. Penetrating stain shall maintain the following minimum standards:

- (a) Mildew Resistance: In accordance with Fed. Test Method Std. 144, Method 6271.
- (b) Weatherometer: Base material tested in accordance with ASTM G-26, 1000 hours.
- (c) Non Volatile Vehicle: 73.4% of the total NV.
- (d) Viscosity: 58" 2KU
- (e) Solids Content: 40.3%
- (f) Form: viscous, opaque liquid
- (g) Specific gravity: 1.17
- (h) Weight Solids: 40.3%
- (i) Volume Solids: 29.5%
- (j) Lb/gallon: 9.8
- (k) VOC: 170 g/l
- (l) Viscosity (77 deg. F): 58 RU"2
- (m) Hardness: H-2H
- (n) Abrasion resistance (Tabor/CF-10) 500 cycles: 17 gram loss
- (o) Gloss 60 deg.: low luster
- (p) Coverage: 250 sq. ft./gallon
- (q) Scrub Test (1000 revolutions): pass
- (r) Ultraviolet Resistance QUV 1000: no effect
- (s) Alkali Resistance: excellent
- (t) Acid Resistance: good - excellent

(2) Special Surface Preparation for Colored Surfaces. Work under this Section shall include surface cleaning preparation to assure the surface is free of all latency, dirt, dust, grease, efflorescence, paint, and any foreign material prior to the stain application, in accordance with the manufacturer's recommendations. The Contractor shall correct, at his own cost, any surface problems created as a direct result of the surface preparation methods used.

The Contractor is advised that sandblasting will not be allowed for cleaning concrete surfaces. Pressure washing with water (minimum 3,000 psi) is the preferred method of removing latent materials. If cleaned by pressure washing, a pressure of 3000 psi is a rate of three to four gallons per minute using a fan nozzle held perpendicular to the surface at a distance of one to two feet. The completed surface shall be free of blemishes, discolorations, surface voids, and conspicuous form marks to the satisfaction of the Engineer.

(3) Material for Concrete Stamped Surfaces. Specified manufacturer is Brickform / Rafco Products, 11061 Jersey Blvd., Rancho Cucamonga, CA (800) 483-9628 (or approved equal). Specified

products are Brickform Antique Release and Brickform Gemseal. Release agents are to be applied to concrete as shown on the plans. Sealer is to be applied to all stamped and colored surfaces in accordance with the manufacturer's recommendations.

(4) Color Selection for Concrete Stamped Surfaces.

(a) Sidewalks

Antique Release Agent – Brickform Medium Gray (#200)

Sealer – Brickform Gemseal (Clear)

(b) Medians

Antique Release Agent – Desert Tan (#350)

Sealer – Brickform Gemseal (Clear)

(c) E. 87th St. S.

Antique Release Agent – Desert Tan (#350)

Release agent – color sample to be approved by Southern Pointe Homeowner's Association

Sealer – Brickform Gemseal (Clear)

D. Test Panel.

- (1) Prior to staining, stamping, or coloring the entire project, test panels shall be stained, stamped, colored and approved. Color and stamp one (1) complete panel and obtain approval from the engineer before proceeding with the remainder of the project. The contractor is forewarned that multiple stains, colors and/or techniques may be required.

1.3 METHOD OF MEASUREMENT

Aesthetic treatment shall not be measured for payment.

1.4 BASIS OF PAYMENT

Payment for aesthetic treatment shall be included in the price bid for:

4" Stamped Concrete Sidewalk

6" Patterned Concrete Dividing Strip

Decorative Dowel Jointed P.C.C. Pavt. (Placement)

**OKLAHOMA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
FOR
DRILLED SHAFT FOUNDATIONS**

These Special Provisions revise, amend, and where in conflict, supersede applicable sections of the 2009 Standard Specifications for Highway Construction, English and Metric.

(Replace with the following:)

516.01 DESCRIPTION

This work consists of constructing drilled shafts and providing and placing reinforcing steel, concrete, and procedures for integrity testing of drilled shafts including remedial actions.

516.02 MATERIALS

A. General

Use materials in accordance with the following sections:

Material:	Section:
Structural Concrete	509
Reinforcing Steel for Structures	511

B. Concrete

Provide and modify Class AA concrete as follows:

- Limit the maximum aggregate size to $\frac{3}{4}$ in [19 mm],
- Ensure that water/cement ratio is 0.44 or lower,
- Use a high range water reducing admixture to achieve 6 to 8 in [150 mm to 200 mm] of slump at the placement start. Ensure at least 4 in [100 mm] of slump exists at the completion of placement and casing or reinforcement alignment,
- Maintain the concrete temperature below 85 °F [30 °C] during placement.
- For concrete placed under water or slurry, use cementitious material such as slag or fly ash (not cement) to increase the minimum cementitious content 10%, and
- Submit optional anti-washout additives to the Engineer for approval.

C. Casings

For exterior casings, provide smooth, clean, watertight, steel casings that can withstand handling, driving, driving stresses, and pressures from the concrete and surrounding earth. Provide permanent

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casing with the dimensions specified by the American Pipe Institute tolerances for regular steel pipe. If only a single casing is used in a shaft, the casing is considered an exterior casing.

Permanent exterior casings, use steel in accordance with AASHTO M 270 Grade 36 (ASTM A709M Grade 250), unless otherwise specified by the Contract. Weld permanent exterior casings in accordance with Section 506. "Structural Steel." The Department defines permanent exterior casing diameters shown on the Plans as outside diameters.

When the Contract requires permanent exterior casings, or if the electing to provide a permanent exterior casing, ensure that a Registered Professional Engineer in the State of Oklahoma stamps and designs the design and calculations for these casings. Submit permanent casings and design calculations to the Engineer. Provide casing thicknesses not less than shown in Table 516:1.

Table 516:1 Minimum Permanent Casing Wall Thickness	
<48" [<1220 mm]	0.375" [10 mm]
48" - 78" [1220 - 1980 mm]	0.500" [13 mm]
> 78" [1980 mm]	0.625" [16 mm]

For permanent interior casings, use round corrugated galvanized steel pipe with 3 in x 1 in [75 mm x 25 mm] corrugations in accordance with AASHTO M 36. Ensure the pipe gauge stays round and can withstand the concrete pressure.

516.04 CONSTRUCTION METHODS

A. Plan for Drilled Shaft Installation

Use personnel experienced in constructing drilled shafts.

Submit an installation plan or work plan for approval to the Engineer that includes the following details before constructing drilled shafts:

- List of personnel experienced in constructing drilled shafts including resumes of project experiences and documentation that verifies the information;
- Concrete mix design including results of concrete trial mix and tests for slump loss over time. Include procedures for introducing admixtures during mixing operations including set retarders;
- List of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment slurry pumps, core sampling equipment, tremies, and concrete pumps;
- List types of casings to be used by the contractor in accordance with Subsection 516.02C. "Casings." Include diameters and thicknesses for all permanent, temporary, and surface casings;
- Details of shaft excavation methods and procedures for maintaining horizontal and vertical alignment of the excavation;
- When the slurry is used, include details of the methods to mix, circulate, desand, and dispose of the slurry;

- Details of methods to clean the shaft excavation including the method to clean the bottom of the hole;
- Use or disposal of the excavated materials;
- Placement of reinforcing steel including support and centering methods required to minimize lateral movement of the steel cage including bolsters and the type of spacers: plastic rollers, concrete rollers, or sleds (when permitted). Provide any required material documentation for bolsters and spacers;
- Concrete placement, including proposed operational procedures for tremie and pumping methods. Include procedure that will be used to verify the outlet end is at least 10 ft (3 m) into the fluid concrete;
- Type and/or method of shaft inspection device to be used; and
- The format of the video that will be provided to the Engineer, and method of delivery.

Revise and resubmit the installation plan if it does not produce Contract required results. Submit requests for changing the top of shaft elevations with the installation plan.

B. Trial Drilled Shafts

If the Contract requires trial drilled shafts, construct them adjacent to the permanent shafts before constructing the permanent drilled shafts. Demonstrate that the methods and equipment can construct the Contract required drilled shafts. Include reinforcement and CSL tubes for the most heavily reinforced drilled shafts as noted on the Plans.

Construct the trial shaft to the size and tip elevation of the deepest shaft shown on the Plans. To monitor excavation stability and groundwater seepage, leave completed excavation open for at least 4 hr before concreting. Clean the excavation and fill the hole completely with mix design concrete. Remove the concrete 2 ft [0.6 m] below the finished grade. Perform all nondestructive testing including CSL testing as shown on the plans or as directed by the Engineer.

If the Engineer determines that trial drilled shaft is unsatisfactory based on results of CSL other nondestructive testing, and/or coring, modify and resubmit the installation plan and drill a new trial shaft. The Engineer will not allow changes to the installation plan without resubmission.

C. Drilled Shafts

(1) Hole Excavation

Excavate holes in accordance with the installation plan. Before drilling, excavate for structure footings supported on drilled shafts and construct embankments and fills.

Place the drilled shaft horizontally at the top of the shaft elevation within 3 in [75 mm] of the position shown on the Plans. Ensure the vertical shaft alignment does not vary by more than 1 percent of shaft depth.

Use excavation equipment and methods that provide a shaft bottom normal to the axis of the shaft within 5 percent of the shaft diameter. Measurement of the shaft bottom tolerance will be left to the discretion of the Engineer. Use excavation equipment that provides a drilled shaft diameter larger than or equal to the plan diameter minus 1 in [25 mm].

Excavate below the elevation shown on the Plans if the load bearing material does not satisfy Plan requirements. Immediately notify the Engineer of deviations in subsurface conditions that may change the shaft depth or result in a reduced capacity for the bearing area. When excavated material is substantially different than soundings shown on the plans as determined by the Engineer, take soil samples or rock cores consistent with soundings shown in the Plans to determine the character of the material directly below the shaft excavation. Extend cores a minimum of two shaft diameters, or as specified by the Engineer, below the drilled shaft plan elevation logging the type of material and rock quality. Use a geotechnical engineer approved by the Bridge Division.

Check dimensions and alignment of shaft excavations in the presence of the Engineer. The Engineer will measure final shaft depth after final cleaning. If the sidewall of the hole softens due to excavation methods, swells due to delays in concreting, or degrades due to slurry cake buildup, over-ream the sidewall from $\frac{1}{2}$ in to 3 in [12 mm to 75 mm] to sound material. When a shaft constructed using the mineral slurry technique sets more than 4 hours without agitation, ream the shaft to remove the cake build up.

Immediately before placing the reinforcing steel cage or concrete, clean the hole so 50 percent of each hole bottom has less than $\frac{1}{2}$ in [12 mm] of sediment. Ensure the remaining 50 percent of the hole has no greater than $1\frac{1}{2}$ in [38 mm] of sediment or debris. For dry holes, reduce the water depth to 6 in [150 mm] or less before placing concrete.

Verify that the hole bottom has been adequately cleaned using a shaft inspection device. Use a device with a high-resolution camera mounted in a watertight chamber and fitted with a depth gauge(s) to indicate the thickness of the debris on the shaft bottom. Furnish all equipment necessary to conduct the inspection. Use air, gas, or other means to pump the water out of the interior of the chamber such that the bottom of the shaft is visible. Do a minimum of five (5) drops as follows: north, south, east, west, and center (Attachment 516:1). As directed by the Engineer, the number of drops may increase for diameters larger than 8 ft [2.4 m], and the number of drops may decrease for diameters less than 4 ft [1.2 m]. Operate the camera and supporting equipment under the direction of the Engineer in such a manner as to obtain optimum clarity from the equipment. Use television cameras and lighting equipment capable of operating in dry or submerged conditions encountered during the inspection. Record the observations for the shaft bottom on a DVD or flash drive in .mov, .avi or other acceptable electronic format specified by the Engineer to become the property of the Department upon completion of the project. Store DVD's or flash drives in proper containers with dust tight closures. Label DVD's or flash drives as to shaft number, project number, job piece, contract number, and contractor name. Furnish DVD's or flash drives to the Engineer upon completion of the inspection. Continue cleaning until the Engineer is satisfied that the hole bottom is adequately cleaned and the excavation is approved.

Use at least one of the following methods for excavation:

(a) *Dry Method*

Use the dry construction method at sites where the Engineer can visually inspect the shaft before concrete placement. For dry method:

- Drill the shaft,

- Remove accumulated water
- Remove loose material from the excavation,
- Place the reinforcing cage, and
- Concrete the shaft in dry conditions.

If caving, sloughing, or swelling conditions exist or if depth of groundwater seepage exceeds 6 in [150 mm] within one-half hour after pumping is stopped, discontinue the dry construction method and use an alternative method approved by the Engineer.

(b) *Wet Method*

Use the wet construction method or a casing construction method for shafts that do not meet the requirements for dry construction. For the wet method, use water or slurry with the proper hydraulic head to maintain the stability of the hole while advancing the excavation to final depth, placing the reinforcing cage, and concreting the shaft. The wet method involves the following work:

- De-sanding and cleaning the slurry,
- Final cleaning of the excavation,
- Placing the shaft concrete with a watertight tremie or pumping concrete into a watertight tremie beginning at the shaft bottom,
- Providing temporary surface casings to aid shaft alignment and positioning, and
- Providing temporary surface casings to prevent sloughing of the top of the shaft excavation.
- Refer to subsection 516.04C.(2) for slurry requirements

(c) *Casing Methods*

1) *General*

The Department will not allow casing to the bottom of the shaft. Discontinue the casing at the top of the founding stratum as shown on the Plans. Excavate below the casing using the dry or wet method. To provide design frictional load capacity, excavate into the founding stratum to the deepest length or depth shown on the Plans. Install casing in accordance with Subsection 516.04.C.3. "Exterior Casings." Do not use the double casing method when a rock socket is not present.

2) *Temporary Casing Method*

If unable to use the dry or wet methods, use the temporary casing construction method. For temporary casing:

- Use the wet method to advance the excavation through caving material into an impervious formation and set the temporary casing or use a vibratory hammer to drive the casing into the impervious formation prior to excavation,
- Complete excavation and seat the casing into rock by twisting the casing,
- Place the reinforcing cage, and
- Concrete the shaft while removing the casing.

3) *Permanent Casing Method*

Use the permanent casing construction method if shown on the Plans or where drilled shafts are in open water. For the permanent casing method, advance the excavation through casing material by driving or drilling a permanent casing to the Contract required depth or into a nearly impervious formation, whichever is deepest. Excavate to the final depth, or into a nearly impervious formation, whichever is deepest. Excavate to the final depth, place the reinforcing cage, and concrete the shaft. If full penetration cannot be attained during casing installation, excavate within the embedded portion of the casing. Drill a pilot hole if necessary. Ensure continuous casing from the top of the shaft to the elevation shown on the Plans. If the drilled shafts are in open water, extend casings from above the water elevation into the ground to protect the shaft concrete from the water during concrete placement and curing.

4) *Double Casing Method*

Use the double casing construction method if the Contract requires or, as an alternative for the temporary casing method, in the presence of severe groundwater or unstable soil conditions. Make the temporary exterior casing larger than the Contract required shaft diameter and set a permanent interior casing into the top of the founding stratum after excavation completion.

Supply the interior casing with a permanent inner diameter equal to the shaft diameter shown on the Plans. Use a temporary exterior casing with an inner diameter at least 6 in [150 mm] larger than the interior casing, but not more than 12 in [300 mm] larger. After placing the exterior casing, complete the excavation as shown on the Plans. Set the interior casing into the top of the founding stratum and brace it at the top. Remove the temporary casing after filling interior casing with concrete. Add concrete to maintain top of shaft elevation during removal. After the concrete initially sets, do not adjust the interior casing position.

(d) *Obstructions*

The Department defines an obstruction as unexpected manmade materials through which excavation cannot advance. The Department does not consider removal of tools, lost in the excavation, obstructions. Removal of naturally-occurring material, regardless of difficult or removal method, is not considered an obstruction.

Remove obstructions encountered during excavation. Notify the Engineer, in advance, of the proposed obstruction removal method. Include a cost estimate for excess costs in accordance with Subsection 104.03. "Differing Site Conditions," for obstruction removal compensation.

(2) *Slurry*

Before introducing it into the shaft, hydrate the slurry by premixing the material with fresh water in accordance with the slurry manufacturer's instructions. Provide slurry tanks with the capacity for

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slurry circulation, storage and treatment. The Department will not allow the use of excavated slurry pits. Use either mineral (bentonite or attapulgite) or polymer slurry.

Provide de-sanding equipment to limit slurry sand content at any point in the bore hole. Ensure slurry sand content is less than 4 percent by volume for mineral slurry, and less than 1 percent for polymer slurry. The Engineer does not require de-sanding to set temporary casings.

During drilling, maintain a slurry surface in the shaft at least 5 ft [1.5 m] above the highest expected water table elevation or piezometric head and at a level that prevents the hole from caving.

When there is a sudden loss of slurry from the hole, stop drilling and take corrective action to prevent slurry loss. If the slurry construction method fails to produce the Contract required results, stop and use an alternative method approved by the Engineer.

When the excavation reaches the elevation shown on the Plans and clean, allow at least 30 min for polymer slurry to stand undisturbed. Clean the excavation base with a submersible pump or air lift.

Maintain the density, velocity, and pH of the slurry during shaft excavation in accordance with Table 516:2 for mineral slurry, and Table 516:3 for polymer slurry.

Table 516:2 Acceptable Range of Mineral Slurry		
Property, Method	At the time of Slurry Introduction	In Hole at Time of Concreting
Density, ^a Density Balance (lb/ft ³ [kg/m ³])	64.3 - 69.1 [1,030 - 1,107]	64.3 - 75.0 [1,030 - 1,200]
Viscosity, Marsh Cone (s/qt [s/L])	28 - 45 [30 - 48]	28 - 45 [30 - 48]
pH, pH paper or meter	8 - 11	8 - 11
Note: Perform tests when slurry temperatures are above 40° F [4° C]. ^a Density values are for fresh water. Increase density values 2.0 lb/ft ³ [32 kg/m ³] for salt water		

Table 516:3 Acceptable Range of Polymer Slurry		
Property, Method	At the time of Slurry Introduction	In Hole at Time of Concreting
Density, ^a Density Balance (lb/ft ³ [kg/m ³])	62.4 - 63.0 [1,000 - 1,010]	62.4 - 63.5 [1,000 - 1,017]

Table 516:3 Acceptable Range of Polymer Slurry		
Property, Method	At the time of Slurry Introduction	In Hole at Time of Concreting
Viscosity, Marsh Cone (s/qt [s/L])	30 - 40 [32 - 42]	30 - 40 [32 - 42]
pH, pH paper or meter	9 - 11	9 - 11
Note: Perform tests when slurry temperatures are above 40° F [4° C]. ^a Density values are for fresh water. Increase density values 2.0 lb/ft ³ [32 kg/m ³] for salt water		

Take slurry samples using an Engineer approved sampling tool. Extract slurry samples from the base of the shaft and from 10 ft [3 m] above the shaft base. Perform four sets of tests during the first 8 hr of slurry use. When the results are acceptable and consistent, perform one test set for every 4 hr of slurry use.

Make corrections if the test results indicate unacceptable slurry samples. Place concrete when the resampling and retesting indicate acceptable values.

Provide test reports to the Engineer, signed by an authorized technical representative, after completion of each drilled shaft.

Dispose of slurry at approved locations.

(3) Exterior Casings

Ensure casings produce a positive seal that prevents water or other material from piping into or out of the hole. If substituting a casing with a longer or larger diameter casing through caving soils, stabilize the excavation with slurry or backfill before installing the new casing.

Consider subsurface exterior casings as temporary unless designated in the Contract as permanent casing. Remove temporary casing before completing placement of concrete in cased drilled shaft. While removing casing from the hole, maintain at least 5 ft [1.5 m] of fresh concrete in the casing above the surrounding level of water or slurry. Ensure the excess concrete within the casing displaces fluid trapped behind the casing upward and discharges it at the ground surface without contaminating or displacing the shaft concrete.

The Department defines defects in the drilled shaft as temporary casings that are bound or fouled during shaft construction and cannot be practically removed, as determined by the Engineer.

Extend casings above the surface to keep the excavation clean through concrete placement. Cut the casing off of permanent casings at the elevation shown on the Plans and leave in place after concrete placement.

(4) Reinforcing Steel Cages for Drilled Shafts

(a) General

When tying the drilled shaft cage, support the reinforcing steel off the ground. Protect epoxy coated reinforcing steel from exposure to the sun and ensure that the surface of the bars is free of excessive rust, soil, oil, and as specified in subsection 511.04. Place the reinforcing steel cage as a unit only after the shaft excavation is approved by the Engineer and before concrete placement. Tie reinforcing steel lap splices together using wire.

Tie and support the reinforcing steel to keep it within the Contract required tolerances. Tie spacing devices at least at fifth points around the cage perimeter or one per 12 in [300 mm] of shaft diameter. Provide spacers at intervals no greater than 10 ft [3 m] along the length of the cage. Place spacers within 18 in [450 mm] of the top and bottom of the shaft. Use concrete spacers that equal the shaft concrete in quality and durability. Concrete sleds are acceptable in lieu of the rollers but only when casing is used down to the rock line.

Alternate reinforced or non-reinforced virgin plastic spacers may be used provided the plastic spacers meet the following requirements:

- Use spacers of adequate strength to withstand a 300 lb [1,335 N] concentrated load without permanent deformation or breakage
- Limit deformation under a 300 lb [1,335 N] load to a maximum of 5% of the support height.
- Use spacers able to meet the concentrated load requirements within a working temperature range of 20 to 150°F [-7 to 65°C], and have a maximum water absorption rate of 0.5%, as per ASTM D 570.
- Provide reinforced or non-reinforced virgin plastic when tested in accordance with ASTM D695 having a compressive strength greater 4,000 psi at 1% deformation based on a 2"x2"x2" cubic test specimen.

Protect plastic spacers from exposure to sunlight until placed in the reinforcing steel cage. Remove and replace any broken, cracked, or damaged spacers.

Temporarily strengthen the reinforcing steel cage to resist the lifting forces when the cage is lifted from a horizontal position to a vertical position. Use multiple pick-up points, strongbacks, slings or other means to support the reinforcing cage while it is being lifted. If there is evidence of excessive bending of the steel cage and/or if slippage of the spiral or tie bars occurs, repair or replace the reinforcing steel cage as needed, including CSL tubes.

During concrete placement, provide positive support from the top for the reinforcing steel cage. Support the cage concentrically to prevent racking and distortion. Maintain the top of the reinforcing steel cage no greater than 6 in [150 mm] above and no greater than 3 in [75 mm] below the Contract required position. Make corrections if the reinforcing steel cage is not maintained in that position. Do not construct additional shafts until the method of reinforcing steel cage support has been approved by the Engineer. Alternately, support the bottom of the reinforcing steel cage using footing attachments consisting of concrete, mortar, or plastic bolsters as approved by the Engineer. Use bolsters capable of supporting a 1,000 pound [4,450 N] load

without breakage. Do not use bolsters which will extend above the bottom of the reinforcing steel as it may interfere with the CSL testing.

Provide additional reinforcing steel if conditions require shafts longer than shown on the Plans.

(b) Access Tubes for Crosshole Sonic Logging

When the Contract requires Crosshole Sonic Logging (i.e. CSL testing) to be performed, include CSL access tubes in the construction of each drilled shaft. Use access tubes with 2 in [50 mm] inner diameters that are made of schedule 40 steel pipe. Provide tubes, including pipe joints, with a round regular internal diameter that allows a 1.3 in [33 mm] diameter source and receiver probes to pass unobstructed. Make the tubes and joints watertight and corrosion free, with clean surfaces that allow a good bond between the concrete and the tubes.

Install access tubes to the full depth of each shaft for CSL testing equipment. Unless otherwise required by the Contract, install the number of access tubes in each drilled shaft in accordance with Table 516:4.

Table 516:4 Minimum Number of Access Tubes per Drilled Shaft	
<i>Planned Shaft Diameter, ft [m]</i>	<i>Minimum Number of Access Tubes</i>
$D \leq 3.0$ [$D \leq 0.9$]	3
$3.0 < D \leq 4.0$ [$0.9 < D \leq 1.2$]	4
$4.0 < D \leq 5.0$ [$1.2 < D \leq 1.5$]	5
$5.0 < D \leq 6.0$ [$1.5 < D \leq 1.8$]	6
$6.0 < D \leq 8.0$ [$1.8 < D \leq 2.4$]	7
$8.0 < D \leq 10.0$ [$2.4 < D \leq 3.0$]	8
$10.0 < D \leq 12.0$ [$3.0 < D \leq 3.7$]	9

Fit tubes with a watertight shoe on the bottom and a removable cap on the top. Attach the tubes to the interior of the reinforcement cage in a regular, symmetric pattern, equally spaced around the perimeter of the cage. Install the tubes parallel to each other and vertical. Start the tubes from the shaft bottom and end at least 3 ft [0.9 m] above the ground, water surface, or both.

Avoid bending the CSL tubes during lifting of steel cage, and ensure tubes remain parallel during installation operations in the drilled shaft hole. Before concrete placement, fill the access tubes with clean water and cap the tube tops. Ensure that the tubes remain full of water until CSL testing is complete. When temperatures below freezing are anticipated, protect the access tubes against freezing by wrapping the exposed tubes with insulating material, adding antifreeze

to the water in the tubes, or other methods as approved by the Engineer. After concrete placement, avoid breaking the bond between the access tubes and the concrete.

(5) Concrete for Drilled Shafts

In the presence of the Engineer and immediately prior to concrete placement, inspect the hole for caving material falling from the sides or a change in the water elevation. Unless otherwise approved by the Engineer, place drilled shaft concrete within two hours after excavation for the shaft has been approved and the reinforcing cage has been placed. If the concrete placement is delayed or if the hole has become contaminated, remove the cage and verify the integrity of the excavated area, and ensure loose material is removed from the bottom of the hole in accordance with 516.04C.(4) Hole Excavation before resetting the reinforcing steel cage. Complete concreting in a shaft and remove the temporary casing within 2 hr of beginning concrete placement. The Department will not allow retempering concrete that has developed an initial set.

When the wet method is used and prior to placing concrete, ensure that the static water or slurry level is properly maintained in the excavation.

Using a watertight tremie, place concrete in one continuous operation from the bottom to the top of the shaft. Place concrete until acceptable quality concrete reaches the top of the shaft. For a dry shaft, overflow the top with at least 1 ft [300 mm] of concrete. For a wet shaft, overflow the top with at least 5 ft [1.5 m] of concrete. Continue overflow of concrete in shafts until uncontaminated concrete is evident. Before initial concrete sets, consolidate the top 10 ft [3 m] of the shaft using Engineer approved vibratory equipment. Finish the top of the shaft from 3 in [75 mm] lower to 1 in [25 mm] higher than the elevation shown on the Plans. In wet holes, consolidate after removing water above the concrete surface.

Place the discharge end of the watertight tremie at one tremie diameter above the shaft base elevation. Keep the discharge end immersed at least 10 ft [3 m] below the surface of the fluid concrete except when concrete is initially placed. Maintain a positive head of concrete in the tremie during concrete placement. If the discharge end is removed from the fluid concrete column during the concrete placement and concrete is discharged above the rising concrete surface into displaced water, remove the reinforcing cage and concrete, complete sidewall removal as directed by the Engineer, and reconstruct the shaft.

If the top of the shaft is above ground, form the shaft from the top to at least 2 ft [0.6 m] below finished ground. If the top of the shaft is below ground, use a temporary oversize surface casing to control material caving into the freshly placed concrete.

The Engineer will sample concrete for acceptance at the point of discharge into the tremie or concrete pump hopper. Cure exposed concrete surfaces in accordance with Section 509, "Structural Concrete."

During concrete placement and curing, ensure that the concrete temperature does not exceed 150 °F [65 °C]. When drilled shaft diameter exceeds 6 ft [1,830 mm], use recording thermometers, maturity meters, or other means as directed by the Engineer to monitor temperatures inside the drilled shaft. Ensure that the temperature difference between the core of the shaft and the outer edges does not exceed 36 °F [20 °C]. When drilled shaft concrete temperatures exceed 150 °F [65 °C] or when

the temperature difference between the core and the outer edges exceed 36 °F [20 °C], reject the shaft.

Record and document the volume of concrete used in each drilled shaft and provide this information to the Engineer.

(a) Tremies

The Department defines tremies as tubes that discharge concrete at the shaft base. Use watertight tremies to place concrete in wet or dry holes. Ensure the bottom of the tremie can be sealed and charged with concrete in the dry, and then opened in place at the bottom of the shaft. The Department will not allow the use of tremies containing aluminum parts that will come in contact with concrete. Ensure that the tremie can be lowered rapidly to retard or stop the flow of concrete. In order to ensure tremie is lowered to the proper depth, mark tremie prior to lowering.

Provide a watertight tremie with an inner diameter from 10 in to 14 in [254 mm to 350 mm], clean and smooth surfaces, and a wall that prevents crimping or sharp bends. Fit the top with a hopper. Ensure that joints are water tight. Construct the discharge end of the tremie to allow free radial concrete flow during placement.

(b) Concrete Pumps

Pump concrete into a watertight tremie as specified above. Pump concrete in one continuous operation from the bottom to the top of the shaft. For wet holes, use a device at the end of the discharge tremie to seal out water while the tremie fills with concrete. If a plug is used, remove it from the hole. Alternatively, use a plug of Engineer approved material that will prevent a defect in the shaft.

(c) Acceptance

The Department may accept drilled shafts with low concrete strengths in accordance with Subsection 105.03, "Conformity with Plans and Specifications." In such cases the Department will use the strength reduction equation as noted in Subsection 509.06, "Basis of Payment."

(6) Application of Construction Loads

If the Contract requires Integrity Testing, the shaft must pass the Integrity testing before application of any loads or proceeding with the construction of the pier. If the Contract does not require Integrity Testing or the Integrity Testing passes the test, wait a minimum of 24 hours and meet the requirements of 509.04C.(2)(b) before application of construction loads. Determine strengths from test cylinders cured at the work site under similar environmental conditions in accordance with Section 701, "Portland Cement Concrete."

(7) Integrity Testing of Drilled Shafts

The Department shall make the determination to conduct non-destructive testing on drilled shafts based on one or more of the following criteria:

- ADT > 750, ADTT > 100
- Bridge deck area > 10,000 ft²
- Span length > 100 ft
- Drilled shaft depth > 50 ft
- Drilled shaft diameter > 60 in
- Emergency Detour length > 20 miles
- Bridge contains three (3) or more piers
- The pier is located in greater than fifteen feet (15 ft) of water (e.g. a lake).
- Construction of the project involves grade separation.
- The bridge is on either the Interstate, the National Highway System (NHS), or Defense Route.
- The bridge is categorized as an essential or critical structure by either the owner or designer.
- The design of the drilled shaft(s) foundation is based solely on friction.
- The Contract requires the drilled shaft(s) to be constructed using the slurry method, or the Contractor elects to construct the drilled shaft(s) using the slurry method.
- The geological formation is such that voids are present in the rock formation, water is flowing within the soil or rock layers, Artesian water is present, or significant layers of material are suspect to caving and sloughing (e.g. loose sand, loose gravel, etc.).

(a) General

The requirement for non-destructive testing is specified in the Contract documents. When required, perform CSL testing on the first production shaft of each diameter specified in the plans. No additional shafts may be placed until:

- The Contractor demonstrates that the drilled shafts can be constructed in accordance with the Contractor's drilled shaft installation plan, and to the satisfaction of the Engineer, and
- An integrity testing consultant, provided by the Contractor and registered in the State of Oklahoma, has provided the analysis of the tests results, including their recommendation to the Engineer.

If the Engineer concurs with the consultant's recommendation for acceptance, then construction may continue on the remaining shafts using the same construction methods which were used to produce the tested shaft. Construct all subsequent shafts with CSL tubes for the purposes of additional testing.

Provided that all procedures are followed and repeated from the tested shaft, perform additional CSL testing on every sixth drilled shaft. ODOT may require testing, at no additional cost to the Department, on any subsequent shaft not constructed in the same manner as the tested shaft, or where a construction incident occurs which could compromise the shaft's integrity. If defects are discovered, but the Engineer determines that the defects are structurally adequate, the Engineer may accept the shaft in accordance with Subsection 105.03 of the Standard Specifications. Otherwise, repair defective shafts in accordance with Subsection 516.04.C.(8).

Except for the initial shaft, CSL testing is not required on any shaft constructed using the dry method.

(b) PIT (Pile Integrity Testing - Pulse Echo)

Provide Pile Integrity Testing (PIT) only when no other means of testing is readily available and when CSL tubes are not provided. When the Engineer does approve PIT testing, test in accordance with ASTM D5882 and as specified below. After placing concrete in a drilled shaft, wait a minimum of 7 days or ensure the drilled shaft concrete obtains 75% of its design strength prior to the start of the test. Limit PIT to drilled shafts having $L/D \leq 30$, where L is the length of the drilled shaft and D is the diameter of the drilled shaft. The Engineer will reject the shaft when PIT testing shows voids or discontinuities.

(c) Crosshole Sonic Logging (CSL)

1) General

Provide Crosshole Sonic Logging (CSL) in accordance with ASTM D6760 and as specified in the contract or as required by the Engineer. Wait a minimum of three (3) days or four (4) days if retarders are used before starting CSL testing. Provide the Engineer a minimum of three (3) days notice prior to starting the testing.

2) CSL Test Equipment

Use CSL test equipment that can perform the following functions:

- display individual CSL records,
- record CSL data,
- analyze receiver responses,
- print logs,
- test in 2 in [50 mm] inside diameter (ID) access tubes,
- generate an ultrasonic voltage pulse to excite the source with a synchronized triggering system to start the recording system,
- measure and record the depths of probes as the time signals are recorded, and
- filter and amplify signals.

3) CSL Logging Procedures

Inspect CSL tubes to ensure that probes will freely pass through the entire tube length. Replace tubes with cored holes that restrict the passage of the probes at no expense to the Department. To ensure that cored holes do not damage the reinforcing steel cage, locate cored holes approximately 6" inside the cage. Should the cored holes encounter any voids, poor quality concrete, or any other findings; document the finding and elevations and make this information available to the Engineer.

Test all possible combinations of perimeter tube pairs and diagonal tube pairs. Perform CSL tests with the source and receiver probes in the same horizontal plane. Make CSL measurements at depth intervals of 2 in [50 mm]. Pull the probes, starting from the bottom of the tubes, over a depth-measuring device. Remove slack from the cables before pulling to provide accurate depth measurements. Report indicated defects to the Engineer and conduct further tests to evaluate the extent of the defects.

4) *CSL Testing Results*

In the final report, include the CSL logs with analyses of the initial pulse arrival time versus depth and pulse energy (or amplitude) versus depth. Present a CSL log for each tube pair tested with significant anomalies and/or defects indicated on the logs and discussed in the test report. Unless otherwise specified by the Engineer, accept test results in accordance with Table 516:5. Include the following in the report:

- a summary of the test results that covers drilled shaft identification,
- test date,
- shaft age at time of CSL testing,
- drilled shaft diameter,
- number of CSL tubes tested,
- test length,
- average compression velocity, and
- “waterfall” diagram plotted as a function of time versus depth

In the report include the following items for any significant anomalies and/or defect descriptions:

- the CSL tube number or tube combinations,
- depth below concrete top,
- percent concrete wave velocity reduction, and
- description of anomalies and/or defects.

The Engineer will evaluate the CSL test results and determine the acceptability of the drilled shaft construction in accordance with Table 516:5, “Acceptance of Drilled Shafts.”

Table 516:5 Acceptance of Drilled Shafts			
Concrete Condition Rating	Rating Symbol	Velocity Reduction	Results
Good	G	0 to 10%	Acceptable Concrete
Questionable	Q	10 to \leq 20%	Minor concrete contamination
Poor	P/D	> 20%	Unacceptable
Water	W	V= 4760 to 5005 ft/sec [1,450 to 1,525 m/sec]	Water or water with gravel, Unacceptable
No Signal	NS	No signal received	* Soil intrusion or tube debonding

- * Additional testing is required to determine cause for no signal, soil intrusion into the drilled shaft is unacceptable, debonding leads to false readings.

The percent velocity reduction (VR) based on measured tube spacing is determined using the following equation:

$$VR = (1 - V / V_b) \times 100\%$$

where,

- V = theoretical compressional wave velocity in concrete
- V_b = baseline velocity (running average of velocity over a 10 ft depth, generally 5 ft above and 5 ft below excluding anomalous zones in the running average; V_b ≥ 13,000 ft/s)

(Reference: Publication No. FHWA-NHI-10-016, equation 20-4)

5) *Abandoning CSL Access Tubes*

After completing CSL testing and obtaining the Engineer's approval to continue construction above the shafts, dewater the tubes and use portland cement grout to fill the access tubes in the drilled shafts. Submit the grout mix design and grouting method for the Engineer's approval. Saw cut the top of the CSL tubes even with the top of the drilled shaft.

(d) **Core Drilling of Drilled Shaft Concrete**

If nondestructive testing indicates voids or discontinuities, or if there are other concerns about a drilled shaft, the Engineer may require full depth coring to determine the soundness of a drilled shaft using continuous coring with a 3" interior diameter core barrel in accordance with ASTM D2113. The Engineer will specify the number, depth, and location of cores.

Submit the methods and equipment for coring and grouting to the Engineer for approval before coring. Place the cores in a commercially available core box and mark the shaft depth at each core recovery interval. Submit the cores and a log for recovered cores.

When the Engineer determines that the quality of the concrete in the shaft, represented by the core samples, is acceptable, construction may proceed. The drilled shaft will be considered defective if the Engineer determines that the quality of the concrete in the core is unacceptable.

(8) **Defective Shafts**

If the Engineer determines a drilled shaft to be potentially defective based on CSL test results, construction inspection records, and/or structural evaluation, the Contractor may do additional testing and/or investigations. The additional testing may include, but is not limited to crosshole tomography imaging using vertically offset crosshole sonic measurements and recordings to evaluate the extent of anomalous zones, gamma-gamma testing to evaluate differences in relative density surrounding suspected tube debonding, secondary CSL testing 7 to 10 days after the initial test to investigate for

improved concrete condition due to delayed curing, or continuous coring of the drilled shaft. All test procedures must be accepted and approved by the Engineer. Regardless of the test results, all additional integrity testing will be done at the Contractor's expense and in accordance with the procedure noted above. No allowance for an increase in contract time or extension of the contract completion date will be made.

Submit a plan for further investigation or remedial action to the Engineer for approval. Provide written procedures or drawings as appropriate to the Engineer for approval showing any modifications to shaft dimensions, plans for remedial actions of the shafts, or proposed testing. When the anomalous zone is near the surface, repair plan may show the mechanical removal and replacement of the concrete. Straddle shafts must be designed by a Professional Engineer registered in Oklahoma and reviewed by the Bridge Engineer. Provide qualifications for subcontractors doing mitigation procedures such as pressure grouting, micro piles, perimeter grouting, or other procedures. At a minimum, provide the following for grouting mitigation: any proposed cutting of high pressure inspection tubes, high pressure washing, water flow testing, flushing (high volume, low pressure washing), down-hole camera observations, grouting procedures, conformance testing, and required documentation. Once the plan has been reviewed and approved by the Engineer, proceed with the remedial action or testing as directed by the Engineer.

The Engineer will make the determination of final shaft acceptance or rejection based on initial and supplemental integrity testing results or repairs done by the Contractor. The Engineer will provide a determination of acceptance of any remedial action proposed by the Contractor. The Engineer may require the complete replacement of the shaft, addition of straddle shafts to compensate for capacity loss, or additional integrity testing including coring. Any remedial action necessary will be done at the Contractor's expense.

516.05 METHOD OF MEASUREMENT

The Engineer will measure the length of *Drilled Shafts* and *Trial Drilled Shafts* from the shaft base to the top of the shaft. The Engineer will base measurements on elevations shown on the plans or approved by the Engineer. The Engineer will not measure corrective work or miscellaneous items, such as, soil samples and rock cores required by the Contract, rebar splices, permanent casings, lost tools and equipment, overreamed excavation, surface excavation and backfill, overflow concrete and concrete placed outside the neat lines of the shaft. If required by the Contract, the Engineer will measure CSL testing per drilled shaft tested. The Engineer will not measure tests for determining the extent of defects. The Engineer will not make reductions in drilled shaft measurements due to obstructions.

516.06 BASIS OF PAYMENT

The Department will pay for each pay item at the contract unit price per the specified pay units as follows:

Pay Item:	Pay Unit:
(A) DRILLED SHAFTS	Linear Foot [Meter]
(B) TRIAL DRILLED SHAFTS	Linear Foot [Meter]

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<i>(C) CROSSHOLE SONIC LOGGING</i>	Each
<i>(E) OBSTRUCTIONS</i>	Lump Sum
<i>(F) CORE DRILLING</i>	Linear Foot [Meter]

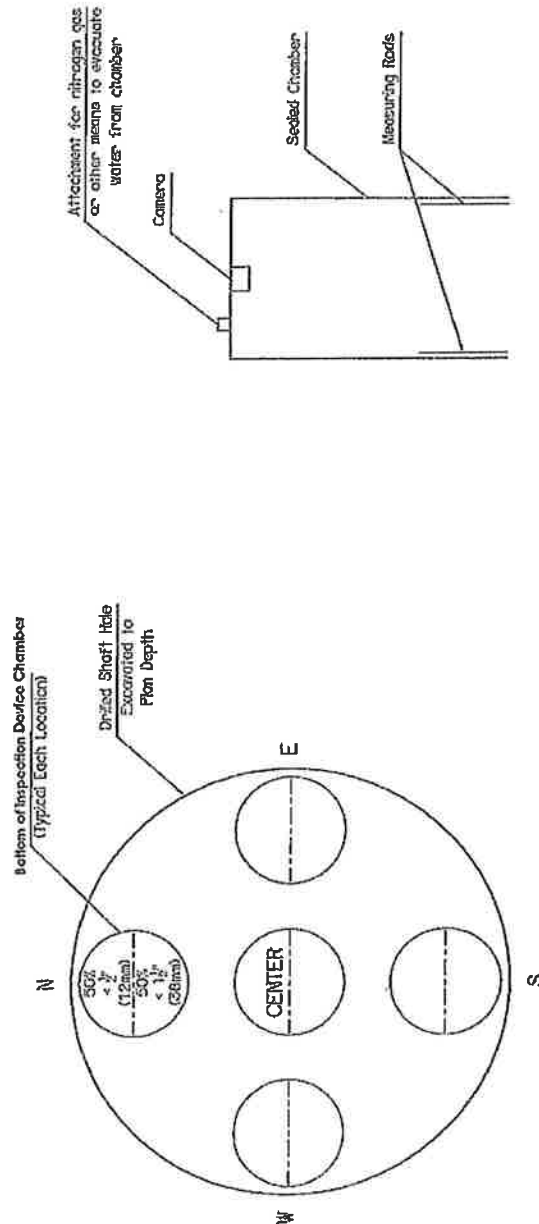
The Department will pay for the following under a Supplemental Agreement:

- Approved obstructions,
- Additional nondestructive testing or core drilling required by the Engineer that reveals no structural defects, and
- Contractor soil sampling or rock coring directed by the Engineer.

The Department will not pay for the following:

- Nondestructive testing or core drilling directed by the Engineer that reveals structural defects.
- Additional NDT testing or core drilling requested by the Contractor done after a shaft has been rejected regardless of the results,
- CSL tubes (all costs for CSL tubes will be included in price bid for drilled shafts), and
- Shaft inspection devices used to inspect the shaft bottom

ATTACHMENT 516:1



SHAFT INSPECTION DEVICE

NOTE:
 Use five (5) drop locations, as noted, to verify bottom of hole has been properly cleaned. Additional drops may be required as directed by the Engineer to verify proper cleaning and acceptance.

SHAFT INSPECTION DEVICE INSPECTION LOCATIONS

SECTION 32 8400 – LANDSCAPE IRRIGATION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this Section.
- B. Coordinate work of this Section with other underground utilities and with trades responsible for their installation. Refer to respective Drawings pertaining to other work.
- C. All references in this Section to "Contractor" and/or "Irrigation Contractor" shall mean "Landscape Contractor or Irrigation Contractor".
- D. Carefully examine all of the Contract Documents for requirements that affect the Work of this Section.

1.2 WORK DESCRIPTION

- A. The work under this Section consists of furnishing adequate numbers of skilled workmen who are thoroughly trained and experienced and installing all materials, equipment and services required to complete and provide a fully operational, automatic landscape irrigation system for the turf and landscape areas depicted on the final approved landscape plans.
- B. The system shall automatically irrigate, using spray or rotary sprinklers as needed, on all turf areas as indicated on the landscape plan and as directed by the Owner. The system shall automatically irrigate, using spray sprinklers and/or drip irrigation, all landscape areas as indicated on the landscape plan and as directed by the Owner.
 - 1) The primary source of irrigation water is a domestic water supply from one (1) 1-1/2" water meter.
 - 2) The control system at a location determined by the Owner. Training, programming and start-up of control system shall be by a trained professional.
 - 3) Trench excavation, back filling and bedding materials, together with the testing and proper scheduling of the completed installation shall be included as part of this scope of work.
 - 4) The work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the Specifications. All parts necessary for the proper and complete execution of the work, whether the same may have been specifically mentioned or not, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.

- 5) Record Drawing (As-built) as well as generation of the Operating & Maintenance Manual in accordance to these specifications shall also be included in this work.
- C. At the completion of work, contractor shall perform and successfully complete the tests as outlined in Section 3.13 "SYSTEM TESTING, START-UP AND ADJUSTMENT"

1.3 PERMITS AND INSPECTIONS

- A. The work under this Section shall comply with all ordinances and regulations of authorities having jurisdiction.
- B. Obtain and pay for all permits to any agency having jurisdiction over the work required for the execution of this Section.
- C. Furnish copies of Permits and Approval Notices to the Owner's Representative before requesting final payment.
- D. The Contractor shall include in their bid any charges by the Water Department, Utility Company, or other authorities for work done by them and charged to the Contractor.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division Specification Sections.
- B. The Contractor shall provide copies of product specification sheets on all proposed equipment to be installed to the Owner's Representative for approval prior to the start of work, in accordance with the parameters of Division-1. Work on the irrigation system may not commence until product sheets are submitted and approved. Submittals shall be highlighted to show proper model, nozzles, sizes, flows, etc. Submittals not properly highlighted or marked up will be rejected. As a minimum, the following equipment shall be included in the submittal:
 - 1) Backflow Preventers and Enclosures
 - 2) Pressure Regulator
 - 3) Flow Sensor
 - 4) Normally Open Master Valve
 - 5) Main Line Pipe
 - 6) Lateral Line Pipe
 - 7) Schedule 40 and Schedule 80 Fittings and Nipples

- 8) Swing Joints Assemblies including Swing Pipe and Fittings
- 9) Manual Valves: Main Line Isolation and Control Valve Isolation and Manual Control Valves
- 10) Automatic Electric Control Valves with Pressure Regulators
- 11) Automatic Drain Valves (Lateral Lines)
- 12) PVC Check Valves (Low Head Drainage)
- 13) Quick Coupling Valves, Keys and Hose Swivels
- 14) Valve Boxes and Enclosures
- 15) Control Wire and Waterproof Connectors
- 16) Sprinkler Heads and Nozzles
- 17) Controller and Remote Operator
- 18) Sensor Decoder
- 19) Valve Decoder
- 20) Environmental Sensors
- 21) Ground Rods, Plates and Wire
- 22) Solvent Cements and Cleaner/Primers
- 23) Miscellaneous Materials

1.5 QUALITY ASSURANCE

- A. Irrigation Contractor: A firm which has at least five (5) years of experience in work of the type and size required by this Section and which is acceptable to the Owner's Representative.
- B. References: The Installation Contractor must supply three references for work of this type and size with their bid including names, phone numbers and email addresses of contact person(s).
- C. Applicable requirements of accepted Standards and Codes shall apply to the Work of this Section and shall be so labeled or listed:
 - 1) American Society for Testing & Materials (ASTM)
 - 2) National Plumbing Code (NPC)
 - 3) National Electric Code (NEC)

- 4) National Sanitary Foundation (NSF)
- 5) American Society of Agricultural Engineers (ASAE)
- 6) Underwriters Laboratories, Inc. (UL)
- 7) Occupational Safety and Health Regulations (OSHA)
- 8) American Society of Irrigation Consultants (ASIC)

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store and handle all materials in compliance with manufacturer instructions and recommendations. Protect from all possible damage. Minimize on-site storage. Contractor is responsible for the security of all stored materials on site.

1.7 GUARANTEE

- A. The Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities that the Contractor may have by law.
- B. In addition to the manufacturers guarantees the Contractor shall warrant the entire irrigation system, both parts and labor for a period of one (1) year from the date of acceptance by the Owner.
- C. As part of the one-year warranty the Contractor shall perform the first year-end winterization and spring start-up for the irrigation system.
- D. Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Owner's Representative at no additional expense to the Owner.
- E. A written warranty showing date of completion and period of warranty shall be supplied upon completion of each segment of the project.

1.8 COORDINATION

- A. The Contractor shall at all times coordinate his work closely with the Owner's Representative to avoid misunderstandings and to efficiently bring the project to completion. The Irrigation Contractor shall also coordinate their work with that of the electrical contractor, general contractor, plumbing contractor and landscape contractor. The Owner's Representative shall be notified as to the start of work, progression and completion, as well as any changes to the drawings before the change is made. The Contractor shall also coordinate his work with that of his sub-contractors.

- B. The Contractor shall be held responsible for and shall pay for all damage to other work caused by his work, workmen or sub-contractors. Repairing of such damage shall be done by the Contractor who installed the work as directed by the Owner's Representative.

1.9 MAINTENANCE AND OPERATING INSTRUCTIONS

- A. Contractor shall include in their Bid an allowance for two (2) hours of instruction of Owner and/or Owner's personnel upon completion of check/test/start-up/adjust operations by a competent operator (The Owner's Representative office shall be notified at least one (1) week in advance of system testing, start-up and adjustment.
- B. Upon completion of work and prior to application for acceptance and final payment, a three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE SOUTH YALE AVENUE WIDENING PROJECT- 81ST TO 91ST IRRIGATION SYSTEM, shall be submitted to the Owner's Representative office. After review and approval, the copies will be forwarded to the Owner. Included in the Maintenance and Operating binder shall be:
 - 1) Table of Contents
 - 2) Written description of Irrigation System.
 - 3) System drawings:
 - a) One (1) copy of the approved irrigation plan;
 - b) One (1) reproducible copy of the Record Drawing (As-Built); Measurements on record drawings shall be surveyed or triangulated from permanent objects and recorded on Autocad compatible digital format;
 - c) An Autocad compatible digital file (USB Flash Drive) of the record drawing;
 - 4) A complete set of "APPROVED" submittals of all irrigation equipment;
 - 5) A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.
 - 6) One (1) copy of the controller/valve/rain/moisture/flow sensor system wiring diagram.

1.10 EXAMINATION OF CONDITIONS

- A. The Contractor shall fully inform himself of existing conditions on the site before submitting his bid, and shall be fully responsible for carrying out all work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.

1.11 PROCEDURE

- A. Notify all city departments and/or public utility owners concerned, of the time and location of any work that may affect them. Cooperate and coordinate with them in the protection and/or repairs of any utilities.
- B. Provide and install temporary support, adequate protection and maintenance of all structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Architect.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material overages at the completion of the installation are the property of the Contractor and shall be removed from the site.
- B. No material substitutions from the irrigation products described in these specifications and shown on the drawings shall be made without prior approval and written acceptance from the Owner's Representative.

2.2 PVC IRRIGATION PIPE AND FITTINGS

- A. All pipe shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.
- B. All main line pipe, two and one-half inches (2-1/2") and smaller shall be PVC Type 1120-1220 Schedule 40, belled end solvent weld and conforming to ASTM D1784, cell class 12454 and ASTM 1785.
- C. All lateral pipe 3/4" and larger shall be PVC, Class 200 Type 1120, SDR 21, solvent-weld PVC. Lateral pipe shall conform to ASTM No. D2241 as manufactured by PipeLife Jet Stream or approved equal. All 1/2" lateral pipe shall be PVC Class 315 Type 1120, SDR 13.5, solvent-weld PVC joints as manufactured by PipeLife Jet Stream or approved equal.
- D. Fittings for solvent weld PVC pipe shall be Schedule 40 solvent weld PVC fittings as manufactured by Spears or approved equal.

- E. Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.
- F. PVC Schedule 80 fittings and nipples shall be used on all fittings required between the main line tap (service tee) 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 teflon tape or other sealing method according to valve, sprinkler and fitting manufacturer's recommended practice for the specific application. All Schedule 80 PVC nipples shall be supplied with machined threads.
- G. PVC solvent shall be NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Medium Cement or equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC and CPVC pipe applications. Primer is to meet ASTM F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68 Clear, Oatey Purple Primer for PVC and CPVC, or equal.

2.3 PIPE SLEEVES

- A. All pipe sleeves beneath non-soil areas (except under City of Tulsa streets) shall be PVC, Schedule 40 water pipe as manufactured by PipeLife Jet Stream or equal. Sleeves shall be the larger of the minimum size stated in these specifications, shown on the contract drawings or two (2) times larger than the total outside diameter of all the piping contained within the sleeve. All irrigation control wire shall be routed in a separate 2" minimum diameter sleeve.
- B. All sleeving to protect pipe or control wires under city streets and roads or below grade crossings shall be ductile iron, steel or PVC Schedule 40 and shall meet the standards and specifications of the City of Tulsa Water and Sewer Department. Sleeves shall be a minimum of 4" and shall be two (2) times larger than the total outside diameter of all the piping contained within the sleeve. All irrigation control wires shall be routed in a separate 2" minimum diameter sleeve.
- C. Minimum pipe sleeve size shall be 4" diameter.

2.4 WIRE CONDUIT

- A. Conduit for wiring beneath non-soil areas shall be PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Certainteed, Cresline or equal.
- B. Sweep ells shall be standard electrical type PVC schedule 40 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.
- C. Conduit for above ground wiring to environmental sensors, weather stations or controllers shall be galvanized, rigid metallic conduit.

2.5 SPRAY SPRINKLERS

- A. Full and part circle pop up spray sprinklers shall have:
- 1) Operating pressures of 15 to 100 psi, pressure regulating at 30 psi.
 - 2) Plastic construction with ratcheting riser, removable nozzle and check valve with capability to hold up to 14 feet of water.
 - 3) Technology built into the stem to restrict water loss by up to 90% if the nozzle is removed and shall have a visual stream indicator of nozzle removal which is easily detected.
 - 4) Nozzle sizes indicated on the drawing and in the legend. Nozzle size shall be as required to provide adequate coverage and avoid over spray onto walkways, roads, buildings and other permanent structures.
 - 5) Nozzles with matched precipitation between nozzle arc patterns and radii. All 8', 10' 12' and 15' variable arc nozzles shall be high efficiency equal to Rain Bird HE-VAN series.
 - 6) Pop-up height equal to 6 inches for trees and 12" for landscape planting areas. The sprinkler shall have one-half inch (1/2") IPS water connection on the bottom of the sprinkler.
- B. Sprinkler shall carry a minimum 5-year exchange warranty against defects.
- C. Sprinklers shall be manufactured by Rain Bird, model RD-06-S-P30-F (6" Pop-up and RD-12-S-P30-F (12" Pop-up).

2.6 BACKFLOW PREVENTER

- A. Provide backflow preventer meeting the requirements of the City of Tulsa, OK for irrigation systems equal to Wilkins Model 975XLSE – 1-1/2". The 1-1/2" backflow preventer shall be installed using Type L copper pipe and shall incorporate two (2) unions for ease of installation and maintenance.
- B. The backflow preventer shall be protected from freeze damage by covering it with an insulated cover and using thermostatically controlled "heat tape" or heaters. The insulated box shall be constructed of fiberglass, hinged to provide full access to the preventer. The enclosure shall be designed to accommodate the heat tape, for the recommended drain size and for the size of the backflow preventer to be installed. Enclosure shall be Hubbell Model HB1.5 or approved equal.
- C. The backflow preventer protective enclosure shall be installed on a concrete footing constructed of a minimum 3500 psi concrete and shall meet the requirements of the backflow preventer cover manufacturer's recommendation for size and mounting requirements including hardware. Contractor shall reference installation detail drawings for details of the base. The ground shall be hand excavated to provide a solid surface for the concrete foundation. The surface of the concrete base must be finished level to insure proper installation of the cover.

2.7 PRESSURE REDUCING VALVE

- A. Pressure reducing valve shall be certified to NSF/ANSI 372, consisting of a low lead bronze body and bronze bell housing, a separate access cover for the plunger and a bolt to adjust the downstream pressure. The bronze bell housing and access cap shall be threaded to the body and not require the use of ferrous screws. The inlet shall be FNPT with a single union and a FNPT outlet. The assembly shall be of the balanced piston design and shall reduce pressure in both flow and no-flow conditions. The assembly shall be accessible for maintenance without having to remove the body from the line. The Pressure Reducing Valve shall be a Zurn Wilkins Model 600XLHLP with the 10 to 125 psi pressure range option and tapped and plugged for a pressure gauge. Pressure gauges shall be liquid filled and provided with each regulator.

2.8 ELECTRIC CONTROL VALVES

- A. Electric control valves shall be remote control diaphragm type glass-filled nylon body valves with flow control and 200-psi pressure rating. Valve shall have globe configuration, 24 volt electric.
- B. Valves shall be manufactured by Rain Bird model PEB or approved equal.
- C. Valves shall be installed with a pressure regulating module capable of regulating between 15 and 100 psi. The module shall be manufactured by Rain Bird model PRS-Dial or approved equal.

2.9 MASTER VALVE

- A. A normally open master valve shall be installed downstream of the pressure regulator and in front of the flow sensor.
- B. Master valve shall be cast iron with a polyester coating, globe style with threaded ends. Valve shall be normally open unless actuated by the 24 volt AC solenoid. Cover shall be mounted to the body with 4 stainless steel bolts to permit easy access and maintenance. Diaphragm shall be nylon-fabric, reinforced natural rubber. Internal spring shall be stainless steel. Master valve shall be Bermad model IR-410-KX 1-1/2" or approved equal.

2.10 AUTOMATIC DRAIN VALVES

- A. Automatic drain valves shall be model 22163 (1/2") or 22167 (3/4") as manufactured by King Innovation, Inc. At least four (4) drains per piping zone shall be installed at the points of lowest elevation to permit proper drainage in areas susceptible to freezing.

2.11 QUICK COUPLING VALVES

- A. Quick Coupling Valves shall be Rain Bird model 5LRC with spring loaded locking rubber cover. Quick coupling valve shall be prevented from rotation with Leemco Model LS-120 valve stabilizer. Provide three (3) Rain Bird model 2049 locking

cover keys to owner at project completion.

- B. Keys shall be 1 inch male thread and 3/4-inch female thread at the top equal to Rain Bird model 55-K-1. Provide three (3) quick coupler keys to Owner at project completion.
- C. Hose swivels shall be 1 inch FPT x 3/4 inch MHT, Rain Bird model SH-1 or approved equal. Provide three (3) hose swivels to Owner at project completion.

2.12 ISOLATION VALVES

- A. Main line isolation valves 2-1/2 inches and smaller in size shall be gate type, of bronze construction, US Manufacture with a 200 WOG. The valve shall meet Federal Specifications MSS SP-80 equal to Hammond Model IB645 or approved equal.
- B. Electric Control Valve Isolation Valves: 2" and smaller shall be of the ball type, plastic construction, tru-union threaded ends and have a maximum pressure rating of 235 psi at 73 degrees F. The valves shall be equal to Spears Model 3629-XX size the same as the control valve.

2.13 INLINE CHECK VALVES

- A. Inline check valves to prevent low head drainage shall be the same size as the line they are installed in. They shall be PVC, 150 PSI pressure rating at 73 degrees F. true union utility swing check style. All valves shall be maintenance free seal unit construction with EPDM seat and weighted disc. Check valves shall be equal to Spears model S1720-05 (1/2"), S1720-07 (3/4") or S1720-10 (1") socket with true unions.

2.14 VALVE BOXES

- A. All valve boxes and covers shall be injection molded of structural foam polyethylene with a melt index between 10 and 12 and shall be UV stabilized. All covers shall be green in color.
- B. Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer.
- C. Valve boxes for isolation valves, quick coupling valves, and isolation valves and in-line check valve locations shall be 10-inch round valve boxes with bolt down covers equal to Carson Industries, Inc. model 910-12, NDS Pro Series model 212-BC or Rain Bird model VB10RNDH. Provide manufacturer's stainless steel locking bolts and associated clips for each valve box supplied. Valve box extensions shall be constructed with 8" I.D. corrugated polyethylene pipe, as manufactured by Advanced Drainage Systems, Inc. (ADS), cut to length as required to achieve proper coverage over pipe and valves.

- D. Valve boxes for automatic electric control valves, flow sensors and master control valves shall be 13"x20" ("jumbo") valve boxes with bolt down covers equal to Carson Industries Inc. model 1220-12 with model 1220E-1 6" extensions, NDS Pro Series model 218-BC with model 218-6 6" extensions or Rain Bird VBJMB with model VBJMB6EXTB 6" extensions. Provide manufacturer's stainless steel locking bolts and associated clips for each valve box supplied.
- E. Valve boxes for wire splices shall be 10-inch round valve boxes with bolt down covers equal to Carson Industries, Inc. model 910-10, NDS Pro Series model 212-BC or Rain Bird model VB10RNDH. Provide manufacturer's stainless steel locking bolts and associated clips for each valve box supplied. Valve box extensions shall be constructed with 8" I.D. corrugated polyethylene pipe, as manufactured by Advanced Drainage Systems, Inc. (ADS), cut to length as required to achieve proper coverage over pipe and valves. All splices shall be in separate valve boxes and not included with isolation valves.

2.15 CONTROL SYSTEM

- A. The controller shall be of a hybrid type that combines electro-mechanical and micro-electronic circuitry capable of fully automatic or manual operation. The controller shall be housed in a wall-mountable, weather-resistant stainless steel cabinet with a key-locking cabinet door suitable for either indoor or outdoor installation.

The controller shall have a base station capacity of 50 stations with two additional expansion slots capable of receiving ESPLXD-SM75 station modules to create a controller capacity of up to 200 stations. All stations shall have the capability of independently obeying or ignoring any weather sensor as well as using or not using the master valves. Station timing shall be from 0 minutes to 12 hours. The controller shall have a Seasonal Adjustment by program which adjusts the station run time from 0 to 300% in 1% increments. The controller shall also have a Monthly Seasonal Adjustment of 0 to 300% by month. Station timing with Seasonal Adjustment shall be from 1 second to 16 hours.

The controller shall have 4 separate and independent programs which can have different start times, start day cycles, and station run times. Each program shall have up to 8 start times per day for a total of 32 possible start times per day. The 4 programs shall be allowed to overlap operation based on user-defined settings which control the number of simultaneous stations per program and total for the controller. The controller shall allow up to 8 valves to operate simultaneously per program and total for the controller including the master valves.

The controller shall have a 365-day calendar with Permanent Day Off feature that allows a day(s) of the week to be turned off on any user selected program day cycle. (Custom, Even, Odd, Odd31, & Cyclical). Days set to Permanent Day Off shall override the normal repeating schedule and not water on the specified day(s) of the week. The controller shall also have a Calendar Day Off feature allowing the user to select up to 5 dates up to 365-days in the future when the controller shall not start programs. The controller shall incorporate a Rain Delay feature allowing the user to set the number of days the controller should remain off before automatically returning to the auto mode.

The controller shall have Cycle+Soak water management software which is capable of operating each station for a maximum cycle time and a minimum soak time to reduce water run-off. The maximum cycle time shall not be extended by Seasonal Adjustment.

The controller shall incorporate a FloManager feature providing real-time flow, power, and station management. FloManager shall manage the number of stations operating at any point in time based on water source capacity, station flow rate, number of valves per station; user-defined simultaneous stations per program and for the controller. The controller shall provide station priorities to determine the order in which stations shall operate. The controller shall ignore the station number and instead operate the highest priority stations first and the lower priority stations last.

The controller shall offer Water Windows for each program. This function sets the allowed start and stop time where watering is allowed. If the watering cannot be completed by the time the Water Window closes, the stations with remaining run time are paused and watering automatically resumes when the Water Window opens the next time.

The controller shall include an integrated Flow Smart Module with flow sensing functionality. The Flow Smart Module shall accept sensor decoder input from 1 - 5 flow sensors with no flow scaling device required.

A FloWatch Learn Flow Utility which learns the normal flow rate of each station shall be included. Each time a station runs FloWatch compares the current real-time flow rate to the learned rate and takes user-defined actions if high flow, low flow, or no flow is detected. FloWatch shall automatically determine the location of the flow problem and isolate the problem by turning off the affected station(s) or master valve(s). FloWatch shall be compatible with both normally closed and open master valves. A Manual Master Valve Water Window shall be provided to coordinate daytime manual watering with the flow sensing. This Water Window shall offer programmable days of the week and manual watering additional flow rate.

The wall mount controller shall be as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California Model ESPLD Modular or approved equal with size as shown on contract drawings. Stainless steel cabinet to house controller shall be Rain Bird model LXMMSS or approved equal.

- B. Provide One (1) Rain Bird Model LIMRKIT Landscape Irrigation and Maintenance Remote 3.0. Kit includes the model LIMRTX transmitter, model LIMRRX receiver, LIMRQC603 and LIMRQC503 connectors, batteries and plastic carrying case.
- C. Flow Sensors
 - 1) Flow sensor downstream of the normally open master valves on each sub-main connection shall be an in-line type with a non-magnetic, spinning impeller as the only moving part. The solid state electronics housing shall

be glass-filled PPS and shall have two (2) o'rings for easy removal from the meter body. The sensor electronics shall be potted in an epoxy compound designed for prolonged immersion. The sensor shall be capable of operating in flows of 1/2 feet per second up to 30 feet per second with linearity and repeatability of +/- 1 percent and in line pressures up to 400 psi and liquid temperatures up to 220 degrees F. Meter body shall be pre-installed in a brass tee. Flow sensor shall be Rain Bird model FS150B or approved equal.

- 2) A two-wire sensor decoder shall be installed with each flow sensor according to manufacturer's recommendations. Two-wire sensor decoder shall be Rain Bird model SD210TURF or approved equal.

D. Field decoders shall be compatible and be of the same manufacturer as the central control system and shall have the address and solenoid capacities as shown on the drawings. The field decoders shall be as manufactured by Rain Bird, models as follows:

- 1) FD101TURF: 1 address, 1 solenoid per address
- 2) FD102TURF: 1 address, 2 solenoids per address
- 3) FD102TURF: 2 address, 2 solenoids per address
- 4) FD102TURF: 4 address, 1 solenoids per address
- 5) FD102TURF: 6 address, 1 solenoids per address

The decoders shall be fully waterproof, precoded address from the manufacturer, nominal voltage of 24 volts AC with a minimum voltage of 15 volts AC.

- E. Line surge protectors shall be installed every 500 feet along the 2-wire path or for every 8 decoders along the two-wire path. Line surge protectors shall be Rain Bird model LSP-1 or approved equal.

2.16 RAIN-FREEZE SENSOR

The rain sensor shall shut off the irrigation system when the measured rainfall equals or exceeds the shutoff setting of the sensor device. The freeze sensor shall be adjustable between 33 degrees F. and 41 degrees F. and shall shut off the irrigation system when the temperature reaches at or below the set point. The device shall be adjustable with positive stops from 1/8th inch to 1/2 inch. Sensor shall have quick shut-off capability to suspend Irrigation during a rain event. The device shall be U.L. rated, maintenance free and shall absorb water and shall dry out at rates similar to turf. The device shall have a self-leveling bracket which can be mounted to flat surfaces or rain gutters. Sensor shall be installed within 700 feet line-of-sight between sensor and irrigation controller. The wireless device shall be manufactured by Rain Bird Mfg, Model WR2RFC or approved equal.

2.17 WIRE AND COMMUNICATION CABLE

- A. Wire for the 2-Wire decoder system shall consist of two (2) tin coated, soft drawn bare copper, solid 14 AWG conductors. The two conductors shall be insulated with a high quality polyvinylchloride (PVC) for system applications up to 600 volts. One conductor shall be insulated red and one conductor insulated yellow. The two conductors shall be laid parallel and pressure extruded with a solid color, linear low density, sunlight resistant polyethylene (PE) outer jacket. Standard colors for the jacket shall be red, green, blue, yellow, black, purple and orange. The wire shall be rated as direct burial and shall be as manufactured by Regency Wire and Cable, model "Rain Bird" Maxi Cable or approved equivalent.
- B. In ground wire connections shall be UL listed, rated for 600 Volts manufactured by Rain Bird model WC20 or approved equal. All wire connections shall be made in specified valve boxes.
- C. All wire connections shall be made in specified valve boxes.
- D. Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-volt A.C. or less.

2.18 SWING PIPE AND JOINTS

- A. 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-FLEX100) and appropriate insert fittings (Rain Bird Models SBE-050, SBE-075, SBA-050, SBA-075). 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.
- B. Swing Joints: All 1" inlet quick coupling valves shall be installed on prefabricated, manufactured swing joint assembly rated for 315 psi with prelubricated buttress threads and O'ring seals equal to Spears Manufacturing Co. Series 5807-01012.

2.19 GROUNDING EQUIPMENT

- A. Each electronic component of the control system shall be grounded to the manufacturer's recommended resistance to ground.
- B. Proper grounding practices shall include both the installation of ground rods and grounding plates. Ground rods shall be copper clad, 5/8-inch diameter x 10 foot long grounding rods and connected to the electrical equipment and grounding plate with minimum #6 AWG, solid, bare copper wire. Grounding plates shall be 4-inch x 96-inch x 0.0625 inch copper as outlined below. Minimum 20-foot separation between rod and plate. Minimum 12-foot separation between controller and ground rod. All connections to rods shall be with Cadweld connectors as specified. All connections to plates shall be performed by the plate manufacturer with 25-feet of bare copper wire already attached. Each grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover and six inches of 4-inch SDR35 PVC. Plates shall be installed in ground enhancement material. Plates shall be covered with 4-inch plastic grated cover with detection and minimum 36 inches of 4 inch

ADS drainage pipe. Ground rods and plates shall be UL listed.

2.20 SAND

- A. Sand used for backfilling of trenches; under, around and over PVC lines shall be as specified in SECTION: EARTHWORK.

2.21 CONCRETE BASES AND THRUST BLOCKS

- A. Standard concrete mix shall be in accordance with ASTM C150, ASTM C-33, and ASTM C-94 with a compressive strength (28 days) of 3,500 psi.
- B. All bell and gasket mainline pipe and fittings shall have thrust blocks sized and placed in accordance with pipe manufacturer's recommendations for standard concrete mix. Thrust blocks shall be installed at all tees, elbows, crosses, reducers, plugs, caps and valves. Contractor shall be responsible to insure the stability of all thrust blocks. A minimum 4 mil "visqueen" plastic poly sheeting shall be used to protect fitting and pipe from concrete during thrust block installation.
- C. All concrete bases shall be standard concrete mix. Sizes shall be as indicated on the Drawings and sited in the Specifications.

2.22 SPARE PARTS

- A. Contractor shall supply the following tools and equipment to the Owner's Representative before final observation:
 - 1. Two (2) tools for disassembling and adjusting each type of sprinkler head provided.
 - 2. Three (3) quick coupler keys, hose swivels and locking cover keys
 - 3. Two (2) of each type sprinkler head and pattern (PC & FC) used in the project.
 - 4. Two (2) of each type nozzle used in the project.
 - 5. Two (2) diaphragms and solenoids for each type and size of control valve used in the project.
- B. Before final observation can occur, written evidence that the Owner's Representative has received the tools and equipment must be shown to the Owner.

PART 3 – EXECUTION

3.1 GENERAL

- A. Before work is commenced, hold a conference with the Owner's Representative to discuss general details of the work.
- B. Examine all contract documents applying to this Section noting any discrepancies and bringing the same to the attention of the Owner's Representative for timely resolution.
- C. Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the landscape irrigation system when it is apparent that obstructions or grade differences exist or if conflicts in construction details, irrigation equipment legend or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of the Owner's Representative.
- D. Make all field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades). Project shall be laid out essentially as indicated on the Irrigation Plans, making minor adjustments for variations in the planting arrangement. Major changes shall be reviewed with the Owner's Representative prior to proceeding.
- E. Coordinate installation of all sprinkler materials, including pipe, to avoid conflict with the trees, shrubs, or other plantings. Special attention shall be made to avoid damage to the root system of existing trees. Contractor shall contact Owner's Representative for guidance on trenching in this area.
- F. During progress of work, a competent superintendent and all assistants necessary shall be on site. All shall be satisfactory to the Owner's Representative. The superintendent shall not be changed, except with the consent of the Owner's Representative, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent the Contractor in his absence and all directions given to the superintendent shall be as binding as if given to the Contractor.
- G. At all times, protect existing irrigation, landscaping, paving, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.
- H. Replace, or repair to the satisfaction of the Owner, all existing paving disturbed during course of work. New paving shall be the same type, strength, texture, finish, and be equal in every way to removed paving.

3.2 PIPE AND FITTINGS INSTALLATION

- A. Using proper width trencher chain, excavate trenches to a depth of minimum pipe coverage plus six inches. Trenches shall have sides as nearly vertical as possible. Remove all lumber, rubbish and rocks larger than 1 inch from the trenches. Provide a uniform bearing for the entire length of each pipe line to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Make the width of the trench a minimum of 1 1/2 times the diameter of the piping but not less than 4 inches.
- B. Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths as shown on the Drawings and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and no additional compensation will be allowed therefore.
- C. Back filling shall be accomplished as follows: the first 10-inch of backfill material shall contain no foreign matter and no rock larger than 1-inch in diameter. Carefully place material around pipe and wire and tamp in place. Remainder of backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compaction in paved areas shall be to 98% standard proctor. Compact backfill in trenches to dry density equal to the adjacent undisturbed soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.
- D. Do backfilling when pipe is cool. During hot weather keep pipe cool by backfilling in the early part of the morning before the heat of the day.
- E. Do not, under any circumstances, use truck wheels or flooding for compacting soil.
- F. Restore grades and repair damage where settling occurs.
- G. All solvent-weld joints shall be made in strict accordance with manufacturer's recommendations and ASTM D2855 Standard Practice. Make solvent welds with a nonsynthetic bristle brush in the following sequence: Apply an even coat of solvent to the outside of the pipe. Then apply solvent to the inside of the fittings and then re-apply a light coat of solvent to the outside of the pipe, making sure that coated area on the pipe is equal to the depth of the fitting socket. Insert pipe quickly into the fitting and turn the pipe approximately 1/4 turn to distribute the solvent and remove air bubbles. Check all tees and ells for correct position, then hold joint for approximately 15 seconds so that pipe does not push out from the fitting. Wipe off any excess of primer or solvent from each connection. Allow at least 15 minute drying time for each weld joint before moving. When the temperature is above 80° F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80° F, follow manufacturer's recommendations. Provide and install for expansion and contraction as recommended. Wire shall be laid in same trench as mainline and at pipe invert (see WIRING INSTALLATION).

- H. The minimum cover over the pipe shall be as follows:
1. Main line pipe - 20 inches of cover over pipe
 2. Lateral pipe - 15 inches of cover over pipe
- I. Cut plastic pipe with handsaw or pipe-cutting tool, removing all burrs at cut ends. All pipe cuts are to be square and true. Bevel cut end as required to conform to Manufacturer's Specifications.
- J. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the piping is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. All piping, which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the piping, no additional piping may be installed or back filled until all water is removed from the trench. Pipe shall not be installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40° F or below. Pipe installed at temperatures below 40° F shall be removed and replaced at no cost to the Owner. PVC pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.
- K. Carefully install system in areas of existing vegetation designated to remain to provide minimal disturbance feasible. When trenching under the drip-line of existing trees, extreme care must be given to avoid root damage. If at all possible avoid trenching inside the drip-line by going around the tree rather than under it. If trenching must occur under the drip-line, use either tunneling or hand-digging methods rather than a mechanical trencher. Minimize the impact of root severing by avoiding construction during hot, dry weather, keeping trees well watered before and after digging and covering roots with soil or mulch as soon as possible. Contractor shall contact Owner's Representative for guidance on trenching in this area. Where excavation must occur near trees, the Contractor shall provide proper root pruning and sealing methods shown in the landscape plans and specifications and approved by Owner's Representative.
- L. Maintain 6-inch minimum clearance between sprinkler lines and lines of other trades. Do not install sprinkler lines directly above another line of any kind.
- M. Maintain 1-inch minimum clearance between lines which cross at angles of 45 to 90 degrees.
- N. Exercise care when excavating, trenching and working near existing utilities.
- O. Throughout the guarantee period it will be the responsibility of the Contractor to refill any trenches that have settled due to incomplete compaction.
- P. Pulling of pipe will be allowed provided soil is suitable and specified depth of bury can be maintained.

3.3 THRUST BLOCKING

- A. All gasket joint bell-end fittings shall be blocked with an adequately sized thrust block as per ASAE Standard S376.1 and as depicted in the details. Blocking shall be in accordance with pipe and fitting manufacturer's recommendations. Thrust blocks shall be required at all changes in size and direction of bends, reducers, plugs and tees. Thrust blocks shall be installed against undisturbed soil in all cases. Concrete thrust blocks shall utilize 3,500-psi standard concrete mixture. Bricks, stones, boulders, etc. will not be accepted as thrust blocks or thrust block material. Premixed cement, sand and gravel packages "Sackcrete" will not be permitted as a thrust blocking material. Contractor to supply all material needed for thrust blocking.
- B. Size of thrust block shall be determined by working pressure, size and type of fitting, and soil conditions. Calculate area required for concrete thrust block in contact with soil. Refer to ASAE 376.2 for thrust block sizing information to determine size of thrust block for each condition.
- C. A minimum 4 mil "visqueen" plastic poly sheeting shall be used to protect fitting and pipe from concrete during thrust block installation.
- D. Under no circumstances will concrete block be approved for thrust blocks.

3.4 ELECTRICAL WIRE CONDUIT INSTALLATION

- A. Electrical conduit shall be installed in all non-soil areas, as well as for all above ground wiring where wire passes under or through walls, walks and paving to controllers and other sensors.
- B. Conduit shall extend 18 inches beyond edges of walls and pavement.

3.5 PIPE SLEEVING INSTALLATION

- A. Contractor is responsible for the supply and installation of 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.
- B. Sleeving shall be installed wherever piping is going under a non-soil area, generally where indicated on the Drawings. Cover over all sleeving pipe shall be appropriate for the specified depth of the pipe passing through the sleeve. Minimum coverage shall be 20 inches.
- C. Sleeving shall extend 24 inches beyond edges of walls and pavement.
- D. If finished pavement is in place, the Contractor shall bore under the pavement for sleeving installation using personnel experienced in the procedure. Contractor shall be responsible for all damage to finished paving due to improper boring.

3.6 ISOLATION VALVE INSTALLATION

- A. Install isolation valves in 10-inch round valve boxes with extensions at locations shown on the irrigation plan drawings.
- B. Install all isolation valves on a level crushed stone base so that they can be easily opened or closed with the appropriate valve wrench.
- C. Check and tighten valve bonnet packing before valve box and backfill installation.
- D. Provide and install thrust blocks for ring-tite valves as per detail.

3.7 VALVE AND VALVE BOX INSTALLATION

- A. Furnish and install a valve access box for each electric valve, quick coupling valve, isolation valve, wire splice, flushing valve, air/vacuum relief valve, in-line check valves, etc.
- B. 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. Earth fill shall be carefully tamped around each valve box. Valve boxes should be supported by concrete blocks to ensure that any surface loads on the valve boxes will not be transmitted below to the pipe or valves and to minimize box settlement. All boxes shall have at least 6" depth of clean washed round river rock under the valve boxes for drainage.
- C. Electric control valves shall be connected to the main line in a plumb position with adjusting handle and all bolts, screws and wiring accessible through the valve box opening. Sufficient clearance shall be provided for service and operation.. Valve manifolds shall be installed in such a manner that it will not be necessary to remove more the one valve when a valve is removed or replaced. The valves shall be adjusted for proper operation as required by the manufacturer for the specified performance. Adjust zone valve operation after installation using flow control device on valve.

3.8 WIRING INSTALLATION

- A. Wiring shall be installed along with the main distribution line. Multiple wire bundles shall be cinched together at maximum 12-foot centers using plastic cable cinches and shall be laid beside, and at the same invert as, the irrigation lines. Sufficient slack for expansion and contraction shall be maintained and wiring shall at no point be installed tightly. Provide and install an additional 8 inches to 12 inches slack at all changes of direction. Wiring in valve boxes shall be a sufficient length to allow the decoder, valve solenoid, splice, and all connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box.
- B. All wire shall be laid in trenches and shall be carefully back-filled to avoid any damage to the wire insulation or wire conductors themselves. In areas of unsuitable material, the trench shall have a 3 inch layer of sand or stone dust on the bottom before the wires are laid into the trench and back-filled. The wires shall

have a minimum of 15 inches of cover. Wire not to be installed that day shall not be laid out.

- C. An expansion curl shall be provided and installed within 6 inches of each wire connection to a solenoid. Expansion curls can be formed by wrapping five (5) turns of wire around a 1-inch diameter or larger pipe and then withdrawing the pipe.
- D. Service wiring in connection with Drawings and local codes for 24-volt service. All in-ground wire connections shall be waterproofed with materials specified in PART 2 - PRODUCTS. All splices shall be made in valve boxes (wire runs requiring splices between valve locations shall be provided and installed in splice box-valve box shall be used). Splice locations shall be shown on the Record Drawings.
- E. Contractor shall provide a complete wiring diagram showing wire routing for the connections between the controller, sensors, valve decoders, sensor decoders and valves. See PART 1 - GENERAL for the inclusion of wiring diagram in operation and maintenance manuals.

3.9 CONTROLLER INSTALLATION

- A. Contractor to install all controller components, including required surge protection and grounding at the owner approved location. Contractor shall program the controller with initial irrigation program and verify data transmission and proper valve operation.
- B. All 120 volt electrical supply requirements shall be provided and installed using a licensed electrician.

3.10 SPRINKLER INSTALLATION

- A. Spray sprinklers and rotary sprinklers shall be installed on flexible connections or swing joints as specified in PART 2 - PRODUCTS and shall be set plumb and level with the final grade and in accordance with manufacturer's recommendations. Locate part circle sprinklers to maintain a minimum of 4 Inches from walls and 2 Inches from other boundaries and borders.
- B. In turf areas where grass has not yet been established, sprinklers shall be initially installed on risers above grade level. When grass is established, the contractor shall lower sprinkler heads to their permanent position flush with the finish grade. This elevation is critical and care shall be taken to set them exactly at or slightly above finished grade, never below grade except as recommended by the manufacture.

3.11 QUICK COUPLING VALVE INSTALLATION

- A. Provide quick coupling valves at locations shown on the drawings.
- B. Quick coupling valves to be mounted on 1" inch PVC unitized swing joint with stabilizer.

- C. Quick couplers shall be installed in 10" round valve boxes and prevented from rotation utilizing the specified stabilizer bar.

3.12 GROUNDING INSTALLATION

- A. Contractor shall ground all electrical equipment according to the irrigation manufacturer's requirements and specifications. Each grounding rod shall be driven into the ground its full length within 8-feet of the controller and connected via a Cadweld connection to #6 solid, bare copper wire. The copper wire is to be installed in as straight a line as possible, and if it is necessary to make a turn or bend, it shall be done in a sweeping curve with a minimum radius of 8 inches and a minimum included angle of 90 degrees. There shall be no splices in the bare copper wire. The top of the ground rod shall be driven below the ground surface. A 4-inch grated cover as specified, set a minimum of 1-inch below grade, shall be placed over the ground rod and Cadweld connection for periodic maintenance. Cover shall be installed on a minimum of 6 inches of 4-inch SDR35 PVC drainage pipe. Plates shall be installed 36 inches below grade with 50 lbs of ground enhancement material spread evenly below the plate in accordance with the manufacturer's requirements.
- B. Grounding rods shall be separated a minimum of 20 feet between grids. Grids shall be installed in an irrigated area.
- C. When tested, grounding grid shall have an earth resistance no greater than 5 ohms. If earth resistance is greater than 5 ohms, additional grounding plates and enhancement material shall be added to system until desired test results have been met.

3.13 SYSTEM TESTING, START-UP AND ADJUSTMENT

- A. Flushing:
 - 1. After all piping, valves, sprinkler bodies, pipe lines and risers are in place and connected, but prior to installation of sprinkler internals, open the control valves and flush out the system under a full head of water.
 - 2. INITIAL FLUSHING OF LINES SHALL NEVER BE THROUGH SPRINKLER HEADS OR DRIP ZONES. Sprinkler internals, flush caps and riser nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Owner's Representative.
 - 3. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged nozzles during the warranty period.
- B. Testing:
 - 1. Leakage test: With zone valves closed, pressure test mainlines by supplying and maintaining full static pressure continuously for one full hour. Observe for evidence of leakage by monitoring flow meter and by visual inspection of the exposed lines. Repair all leaks and retest until no water

flow is observed. Owner's Representative must be contacted to inspect and witness the leak testing procedures.

2. Coverage test: perform a coverage test in the presence of the Owner's Representative (notify Landscape Architect at least three (3) days in advance of scheduled coverage test). Owner's representative will determine if the water coverage and dispersion is complete and adequate. Readjust heads and/or head locations as necessary or directed to achieve proper coverage. After landscape finish grading is accomplished, install heads to finished grade in lawn and shrub areas and backfill with clean topsoil so head is stabilized and no lateral motion is exhibited during operation. Heads shall be set so the tip of the heads are 1/2" above the top of the mulch in planting beds. Heads in the turf areas shall be set flush with the finished grade and not a hazard to pedestrians and/or maintenance machinery. Set sprinkler heads to plumb within 1/16" and a minimum of 4 inches and a maximum of 6 inches from walls, walks and curbs.
3. Sprinkler heads to be spaced so as not to throw water on the buildings, walks or driveways. Heads shall be adjusted as required so that foliage of plants will not obstruct the spray and that the system has 100% coverage.
4. Contractor shall conduct a performance test of the complete system to ensure that all components are functioning properly. Performance test shall consist of operating the system through a complete irrigation cycle per day for two (2) consecutive days. Contractor shall be at the site to monitor the performance test and make any adjustments and corrections as needed during the testing period.
5. All testing shall be at the expense of the Contractor.

3.14 CLEANING AND ADJUSTING

- A. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.
- B. Adjust sprinkler heads, valve boxes, and quick coupling valves to grade as required, so that they will not be damaged by mowing operations.
- C. Continue sprinkler coverage adjustment as required by settlement, etc., throughout the guarantee period.
- D. Each control zone shall be operated for a minimum of 5 minutes and all heads checked for consistency of delivering water. Adjustments shall be made to sprinklers that are not consistent to the point that they match the manufacturer's standards. All sprinklers, valves, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.

3.15 ACCEPTANCE AND OPERATION BY OWNER

- A. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's Representative in the operation of the system (provide minimum 72 hours written notice in advance of test). The Contractor shall furnish, in addition to the Record Drawings and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. The Contractor shall guarantee all parts and labor for a minimum period of one (1) year from date of acceptance.
- B. Conditions for acceptability of work for start of maintenance by Owner issued by Owner or Owner's Representative shall include but not be limited to:
 - 1. Punch list items complete and approved by Owner or Owner's Representative.
 - 2. Landscape irrigation system complete and in place.
 - 3. Record drawings complete.
 - 4. Maintain installation and watering schedules until all conditions noted above have been completed.

3.16 CLEAN UP

- A. Upon completion of all installation work, Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.
- B. Contractor shall remove all debris resulting from work of this section.
- C. Contractor shall regrade, lightly compact, and replant around sprinkler heads where necessary to maintain proper vertical positioning in relation to established grade.
- D. Contractor shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with Owner's Representative's requirements.

END OF SECTION

SECTION 02950

LANDSCAPING AND TREE PROTECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES:

- A. Section includes:
 - 1. Perform all work required to complete the landscape installation including all labor, materials, taxes, insurance, overhead, profit, services, and equipment necessary as described herein and shown on the accompanying drawings. Provide coordination of landscape work with all other construction trades as required.
 - 2. Work to include:
 - a. Trees and other plantings shown on Drawings.
 - b. Topsoil backfill, soil amendments, planting soil preparation, and mulching.
 - c. Maintenance service through landscape acceptance.
- B. Related documents:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.2 DEFINITIONS AND ABBREVIATIONS:

The following terms will apply to these specifications:

- A. "B&B" indicates balled and burlap wrapped root system.
- B. "1 gal." indicates the standard one-gallon nursery container.
- C. "2 gal." indicates the standard two-gallon nursery container.
- D. "3 gal." indicates the standard three-gallon nursery container.
- E. "5 gal." indicates the standard five-gallon nursery container.
- F. "M.T." or "multi-trunk" indicates a tree with a specified number of trunks as called out on the plant list.
- G. "cal." refers to the caliper of the trunk at six (6) inches above the ground level for trunks of four (4) inches in caliper size or less.
- H. "o.c." means "on center" and refers to the spacing used between the center of one plant and the center of another.

1.3 QUALITY ASSURANCE:

- A. Plant names indicated comply with the latest edition of the American Standard for Nursery Stock published by the American Association of Nurserymen and the latest edition of Standardized Plant Names prepared by the American Joint Committee on Horticultural Nomenclature. Names of varieties not listed in these publications conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

- B. Comply with sizing and grading standards of the latest edition of American Standard for Nursery Stock. Any plant with irregular growth, weakness in structure of material, infestations or irregular coloration when planted will not be accepted.
- C. All plants shall be grown under the supervision of standardized nursery conditions.
- D. Stock furnished shall be at least the minimum size indicated. The use of stock larger than specified is acceptable at no additional cost to the City of Tulsa. If the use of the larger stock is approved, the spread of roots or root ball of earth shall be increased in proportion to the size of and extend on all sides to the inside face of the container. The root structure shall provide evidence that the plant has been grown in the container size specified.
- E. All plants and other products and materials to be supplied by the Contractor shall be subject to inspection and approval by the City of Tulsa / Owner's Representative prior to their installation. Such inspections may be made at the site.

1.4 DELIVERY, STORAGE AND HANDLING

- A. The Landscape Contractor shall coordinate all delivery and installation activities with the General Contractor and shall inform the General Contractor at least 24 hours prior to commencement of work at the project premises.
- B. Deliver fertilizer materials in original, unopened and undamaged containers showing weight, analysis and name of manufacturer. Store in manner to prevent wetting and deterioration. Store materials in areas of site as directed by General Contractor.
- C. Take all precautions customary in good trade practice in preparing plants for moving. Dig, pack, wrap, transport and handle plants with care to ensure protection against injury. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with tarps, or in a manner acceptable to the City of Tulsa. No plant shall be bound with rope or wire in a manner that could damage or break the branches.
- D. Cover plants transported in open vehicles with a protective covering to prevent windburn.
- E. Provide dry, loose topsoil for planting mixes. Muddy topsoil is not acceptable.
- F. Erosion Control blanket shall be furnished in rolls and wrapped with suitable material to protect against moisture intrusion and extended ultraviolet exposure prior to placement. Each roll shall be labeled with a date code identification, which allows for sufficient tracking of the product back to date of manufacturing and for quality control purposes. Erosion control blanket shall be of consistent thickness with fibers distributed evenly over the entire area of the blanket. Erosion control blanket shall be free of defects and voids that would interfere with proper installation or impair performance. Erosion control blanket shall be stored by the Contractor in a manner that protects them from damage by construction activities. Blankets shall not be damaged or defective. Damaged or defective materials shall be replaced at no additional cost to the City.

1.5 SUBMITTALS

- A. Compost: Provide one pound sample, with identification of source (if different than drawings).
- B. Roots Transplant 1-Step Fertilizer: Provide product literature.

1.6 MAINTENANCE

- A. During planting operations, the Contractor shall perform all maintenance required of the installed plantings. Maintenance is to continue until completion and Final Acceptance.

1.7 WATERING

- A. Water used during the initial planting installation, and until Final Acceptance, is to be provided by the Contractor. All water used (during initial construction and until Final Acceptance) shall be at the expense of the contractor. Hose and other watering equipment required for the work shall be furnished by the Contractor installing the plant materials.

1.8 CLEAN-UP

- A. During the work progression, the premises are to be kept neat and orderly at all times. Storage areas for plants and other materials shall be so organized that they, too, are neat and orderly. All trash, including debris resulting from removing weeds or rock from planting areas, preparing beds, or planting plants shall be removed from the site daily as the work progresses.

1.9 INSPECTION FOR ACCEPTANCE

- A. Inspection of the plantings to determine completion of the specified work shall be made by the City of Tulsa upon written receipt of notice from Contractor, at least 3 days prior to requested inspection date. Inspection shall be requested only after all plant materials are in place in accordance with construction documents.
- B. After inspection, the contractor will be notified in writing by the City of Tulsa of any work that is not in accordance with plans and specifications. Reinspections will be held as required until all work is satisfactory. In all cases, the opinion of the City of Tulsa shall be final.

1.10 COMPLETION OF WORK

- A. Work shall be considered complete and eligible for acceptance only after fulfillment of the contract requirements as per drawings and specifications. The City of Tulsa will provide written approval of Final Acceptance.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. Provide plants typical of their species or variety with normal, densely developed branches and vigorous fibrous root systems complying with the recommendations and requirements of ANSI Z60.1 "Standard Nursery Stock" as specified. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sun scald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers, and all other forms of infestation. All plants shall have a fully developed form without voids and open spaces.
 - 1. Balled and burlapped plants shall have firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of American Standard for Nursery Stock.
 - 2. If there is no specification listed, the following guide shall be used: Tree root balls shall be a minimum of 12" in diameter for each 1" of trunk diameter as measured 6" above ball.
 - 3. Plants larger than those specified in the plant list may be used if acceptable to the City of Tulsa at no additional cost to the City of Tulsa. If the use of larger plants is acceptable, increase the specified spread of roots or root ball in proportion to the size of the plant.

4. The height of all trees shall be measured from the crown of the roots to the top of the highest branch and shall not be less than the minimum size designated in the plant list.

2.2 SOIL PREPARATION MATERIALS

- A. Topsoil to be used shall have the following characteristics: fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained site, reasonably free from clay, lumps, coarse sands, stones, plants, grass, weeds, roots, sticks, and other foreign materials. Provide topsoil free of substances harmful to the plants which will be grown in the soil.
- B. Compost:
 1. High Quality Compost (Back to Earth Cottonseed Compost) or approved equal.
- C. Tree Planting Fertilizer:
 1. ROOTS Transplant 1-Step Fertilizer.
- D. Herbicides:
 1. Roundup, as manufactured by Monsanto, or approved equal.
 2. Treflan 5G, as manufactured by ElanCo Products, or approved equal.

2.3 STAKING AND GUYING

- A. Refer to details on Drawings for staking methods. Staking material shall consist of eight (8) foot metal T-fence posts painted green.
- B. Guying material shall be No. 11 gauge wire attached to green commercial grade garden hose or approved equal.

2.4 WOOD MULCH

- A. Wood Cellulose Fiber Mulch shall meet ODOT Specification 233(D) or be approved by the Landscape Architect.

2.5 TREE PROTECTION FENCING

- A. Stakes to be 6 ft. long steel 'T'-posts. Safety fence to be orange polypropylene; 4 ft. height; 2.8 ounces / square yard in weight.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

- A. Examine proposed planting areas and conditions of installation prior to construction. Do not start planting work until unsatisfactory conditions are corrected.
- B. Verify the location of all utilities prior to landscape operations.
- C. Closely coordinate with General Contractor for grading and placement of topsoil.
- D. Receive approval that grades / elevations meet plans (Civil) and are acceptable prior to installing plant materials.

3.2 TREE PROTECTION

- A. Refer to removal plan for identification of trees to remain. City of Tulsa will inspect and approve tree protection before work begins.
- B. All trees to be preserved on the property shall be protected against damage during construction operations by placing tree protection fencing around the drip line of all each tree. The tree protection shall be placed before any excavating or grading is begun and is to be maintained in good condition for the duration of the construction work. No material

shall be stored, and no construction operation shall be carried on within the tree protection fencing. Tree protection shall remain until all work is completed. All trees designated to remain shall be protected as described herein. It shall be the Contractor's responsibility to comply with these requirements as stated.

- C. Where new utilities are planned inside fenced areas, remove fencing temporarily to perform work. Immediately replace fence once work is complete.
- D. At Contractor's expense, damage done to existing tree canopy or root systems (within the fenced limits) shall be repaired immediately by an approved tree surgeon at the City of Tulsa's direction. Roots exposed and / or damaged during grading operations shall be cut off cleanly inside the exposed or damaged area. The cut surface shall be painted with approved tree paint and have topsoil placed over the exposed root area immediately. The City of Tulsa shall have its representative present on the site to observe these operations.

3.3 EXCAVATION

- A. The Contractor shall adhere to the following during excavation:
Protect existing utilities, paving, and curbing from damage caused by landscaping operations. Damage to items to remain in place shall be repaired to the satisfaction of the engineer at no cost to the City.
- B. The Contractor shall be familiar with the location and alignment of all existing or new utility lines, ducts, and buried cables. The Contractor shall field check the location of utilities before installation of materials or plants. The Contractor shall be responsible for all damage resulting from neglect or failure to comply with this requirement. Hand excavate if required due to utilities.

3.4 PREPARATION FOR PLANTING

- A. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.
- B. Planting times and procedures shall be according to accepted practices. Planting shall be suspended when temperature is below 32 degrees F., the wind velocity over 30 miles per hour, the natural ground is frozen or too wet, or the continuation of prevailing weather would cause unsatisfactory results.
- C. Locate trees as indicated on the Drawings. If obstructions are encountered that are not shown on the drawings, do not proceed with planting operations until obstructions are corrected or alternate plant locations have been selected by the City of Tulsa. Adjust tree locations as required for areas where site elements are not built per plans (walks, lights, fencing, railing, retaining walls, etc.). Adjustments to be staked and approved by the Landscape Architect prior to planting.

3.5 PLANT INSTALLATION

- A. Excavate for plant materials. Tree pits shall be as shown on details on Drawings. Topsoil from excavation may be retained for backfill. Remove all excavated clay, subsoil, rock and debris from site.
- B. Each tree shall receive three (3) cubic feet of high quality compost (Back to Earth or approved equal). Mix evenly with the existing soil. Apply roots transplant 1-step at a rate of four (4) ounces per caliper inch. Incorporate ROOTS Transplant 1-step (or approved equal) into the top 3"-4" of soil backfill.

- C. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other. No filling will be permitted around trunks or stems. Backfill the pit with planting mixture. Do not use wet, muddy mixtures for backfilling.
- D. In lawn areas, set trees 2" above surrounding grade, to allow for settlement. Form watering ring for all trees per tree planting detail. On slopes of 15% or greater, see detail on Drawings for slope planting technique.
- E. Thoroughly water all plants by hose immediately after installation.

3.6 MULCHING

- A. Mulch tree wells in lawn areas with hardwood mulch to a three-inch depth immediately after planting. Remove all twine / rope from base of tree trunks prior to mulching. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finish surface.

3.7 STAKING AND GUYING

- A. Trees shall be staked within 24 hours of planting, per details on Drawings.
- B. Drive 3"T" – Post stakes vertically into the ground to a depth of 2 to 2 ½ ft. Avoid damaging root ball. Place 2 stakes uphill of tree parallel to slope and 1 downhill of tree. All 3 equidistant to tree in a triangular placement.
- C. Hose shall be placed around the wire at the trunk to prevent damage to the plant, per details.
- D. For all trees, place an NDS pipe "tree boot" at base of trunk.

3.8 PRUNING

- A. Pruning shall be limited to the minimum necessary to remove injured twigs and branches, and to compensate for the loss of roots during transplanting, but shall not exceed one-fifth (1/5) of the branching structure. All pruning shall be done only after the plants have been transplanted at the site.

3.9 RESTORATION AND CLEAN-UP

- A. Excess and waste material shall be removed daily.
- B. When planting in an area has been completed, the area shall be cleaned of all debris, spoil piles, and containers.

3.10 MAINTENANCE DURING INSTALLATION

- A. Maintenance operations shall begin immediately after each plant is planted and shall continue as required until acceptance.
- B. Plants shall be kept in a healthy, growing condition by watering, pruning, spraying, weeding, and any other necessary operations of maintenance.
- C. Plants shall be inspected at least once per week by Contractor, and needed maintenance performed promptly.
- D. Plants shall be hand watered by watering truck to provide 1 ½" per week when there has been insufficient rain to sustain the plants. This shall be done until final acceptance.

PART 4 – EXTENDED WARRANTY CONDITIONS

4.1 BEGINNING OF THE WARRANTY PERIOD

- A. The Warranty Period shall begin on the date than an inspection by the Landscape Architect shows that all plants are acceptable, in place, and have been installed in accordance with the specifications and plans.

4.2 DURING THE WARRANTY PERIOD

- A. All plants shall be guaranteed for a period of **three years** from the date of the beginning of the Warranty Period and shall be maintained as living, healthy specimens during this period.
- B. During the Warranty Period, the Contractor shall be responsible for the following work:
 - 1. Immediately remove dead plants and plants not in a vigorous condition and replace as soon as weather conditions permit. Match with adjacent plants of the same species in size and form. Each replacement shall be covered with two years warranty commencing at time of planting.
 - 2. Weeding of plant beds and tree pits.
 - a. Area around all trees within saucer rim should be freed of all grass and weed growth. Saucer rim shall be maintained around the cultivated area to hold water.
 - b. All planting beds and decomposed granite areas to be maintained substantially weed free and are to be monitored monthly or as-needed to maintain weed free areas..
 - c. Weeds may be manually or chemically removed and/or controlled. Submit type and frequency of chemical control to City for approval prior to application.
 - 3. Operation and maintenance of the installed irrigation system to maintain optimum moisture level.
 - a. Includes utility fees necessary to operate the system per plan specifications.
 - 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. Deadhead all perennials after bloom period each year.
 - c. Cut back grasses down to near crown in early spring for two years.
 - d. Cleanup: Remove all debris created by pruning as work proceeds.
 - 5. Disease and insect control.
 - a. If insect outbreak occurs chemically remove and/or control. Submit type and frequency of chemical control to City for approval prior to application.
 - 6. Maintaining plants in an upright, plumb position, and repair of settling.
 - 7. Maintenance of wrappings, guys, turnbuckles and stakes.
 - a. Adjust turnbuckles or otherwise keep guy wires tight.
 - b. Repair or replace accessories when required.
 - c. Remove all tree guys after one year and turn over to City

8. Fertilization
 - a. Apply evenly within saucer rim or planting bed
 - b. Time of application to be April or May.
 - c. Trees 2 1/2" caliper and greater: 1 pound of 14/14/14 Osmocote slow release.
 - d. Shrubs: 3 pound/1000 SF of bed area of 14/14/14 Osmocote slow release.
9. Trash Removal
 - a. All litter and trash in shrub and grass beds and tree planting areas shall be removed.
10. Remulching
 - a. Tree saucers shall be mulched as necessary to maintain a 3" mulch depth. This item shall be performed at least every six (6) months if replenishment is necessary.
 - b. Shrub beds shall be mulched as necessary to maintain a 3" mulch depth. This item shall be performed at least every six (6) months if replenishment is necessary.

4.3 TERMINATION OF THE EXTENDED WARRANTY PERIOD

- A. A preliminary inspection by the Contractor and the City representative will be held thirty-four (34) month from the date of the beginning of the Warranty Period to determine plant acceptability and the number of replacements, if required. Any replacements required shall be made within two (2) weeks of the preliminary inspection, unless other arrangements are made at said inspection. Alternate or substituted varieties will not be allowed.
- B. A final inspection of all plants will be held after the replacement planting has been completed. No additional warranty period will be required for replacement plants.
- C. The Warranty Period will end on the date of this inspection and said inspection will be considered final acceptance provided the Contractor has complied with the following requirements:
 1. Dead, missing, and defective plant material shall have been replaced as directed by the Owner. Otherwise, final acceptance will be delayed until such replacements have been satisfactorily accomplished.
 2. All requirements were met above in section 4.3.
- D. Ownership, operation, and maintenance of the installed irrigation system will revert to either the City or a designated Home Owners Association upon termination of the extended warranty period:

END OF SECTION

SPECIAL PROVISION FOR STRUCTURAL SHOTCRETE

1.0 GENERAL DESCRIPTION AND REQUIREMENTS

1.1 SCOPE

This specification is for the construction of structural shotcrete walls using the wet-mix shotcrete construction process.

1.2 QUALIFICATIONS

The shotcrete Contractor's crew foreman and nozzlemen shall meet the following requirements:

1. Furnish proof that the Contractor and shotcrete crew foreman have at least 5 years of experience in reinforced shotcrete construction work on projects of similar size and character along with three references from persons who were responsible for supervision of these projects. Include name, address, and telephone number of references who will testify to a successful completion of these projects by the Contractor and shotcrete crew foreman;
2. Furnish proof that the nozzlemen are certified by the American Concrete Institute (ACI) for application of shotcrete to vertical surfaces, using the wet-mix shotcrete process, as prescribed in ACI publication CP-60 (Current Edition); and
3. Furnish proof that the nozzlemen have successfully completed three projects of similar size and character. The nozzlemen shall also pass a preconstruction mock-up test, described in Section 8.3, demonstrating their ability to satisfactorily construct the reinforced shotcrete structural elements required for this project. (Note: the requirement for construction of a mock-up may be waived if the nozzleman can provide evidence of having previously successfully shot structurally reinforced walls of similar configuration with the same equipment and shotcrete mixture).

1.3 REQUIREMENTS

1.3.1 Furnish all labor, materials, and equipment for the following:

- a) Demonstrate in preconstruction testing that the submitted shotcrete mixture design(s) satisfies the performance requirements of this specification;
- b) Shoot a preconstruction mock-up of the reinforced shotcrete walls to demonstrate that the shotcrete materials, mixture(s), equipment, crew, and construction sequence and methods used are capable of producing a product conforming to these specifications and acceptable to the Engineer;
- c) Provide quality control services as necessary to ensure compliance of the completed work with the requirements of this specification. Shoot test panels at the frequency specified for independent quality assurance testing by the Engineer;
- d) Verify that the reinforcing steel bars in the walls are installed in a manner that is acceptable to the design Engineer and conducive to the shotcrete construction process;
- e) Provide all hoarding, covers, or other protection devices necessary to protect all fixtures and installations in the shotcrete construction area from contamination or damage from the shotcrete construction process. In particular, protect such fixtures and installations from impact from the shotcrete nozzle stream, rebound, overspray, and shotcrete mist or dust;
- f) Provide all scaffolding, platforms, lift equipment, or other devices necessary to provide the shotcrete nozzlemen and other crew and inspectors with safe and proper access to the shotcrete work;
- g) Provide suitable ventilation, lighting, fans, curtains, or other devices necessary to provide the shotcrete nozzlemen and crew with good visibility and control of shotcrete mist, dust, overspray, and rebound;
- h) Provide all forming, bracing, guide wires, and finishing tools necessary to enable construction of the reinforced shotcrete elements to the specified profiles, tolerance, and finish;
- i) Apply shotcrete to the walls using prequalified nozzlemen and crew and approved shotcrete mixture(s);
- j) Finish shotcrete to specified finish, dimensions, tolerance, and line and grade. Provide moist curing and protection as specified;

- k) Provide assistance to the Engineer for quality assurance testing including access for any coring required by the Engineer. Remove and replace, at no cost to the Owner, any defective shotcrete or work that is nonconforming to the project specifications; and
 - l) Leave completed shotcrete work in a clean condition, free of any deposits of excess shotcrete, overspray, rebound, or other contaminants. Remove all such materials from the work area and dispose of at an approved disposal site.
- 1.3.2** Implement a health, safety, and environmental protection program that conforms to the requirements of the Engineer and any other authorities having jurisdiction. Such programs shall include, but not be limited to the following:
- a) Ensure that all equipment, scaffolding, shoring, bracing, and other devices used on the project meet the requirements of the authorities having jurisdiction;
 - b) Put in place a mandatory health and safety training program for all workers, inspectors, and other persons entering the workplace; and
 - c) Protect all workers and other personnel from applied shotcrete and rebound during the shotcrete application process. As a minimum, all workers and personnel in active shotcreting areas shall wear appropriate respiratory protection devices as well as appropriate clothing and other personal protection equipment (hard hats, eye protection, safety boots, and reflective vests). Provide eye wash equipment at shotcrete site.

2.0 SUBMITTALS

2.1 Submit to the Engineer at least 10 working days before commencement of production of shotcrete work written documentation that provides the following:

- 2.1.1** The qualifications of the Contractor and work crew, including the supervisor, shotcrete nozzleman, pump operator, and shotcrete blowpipe operators, and the references for the Contractor and shotcrete crew foreman required in 1.2 (a).
- 2.1.2** Test records, showing source and proof of conformance to project specifications for all shotcrete materials, including:
- a) Portland cement;
 - b) Supplementary cementing materials (silica fume and fly ash);
 - c) Aggregates;
 - d) Mixture water;
 - e) Chemical admixtures; and
 - f) Reinforcement.
- 2.1.3** Details of proposed shotcrete mixture(s), proportions, and means of shotcrete supply.
- 2.1.4** A list of the proposed shotcreting equipment, including brand name, model, and capacity of proposed pump and air compressor.
- 2.1.5** Results of the preconstruction testing program and a description of the proposed construction quality control testing program, including the frequency of specific tests.
- 2.1.6** Details of proposed scaffolding, man lifts, or other temporary support system for workers and inspectors.
- 2.1.7** Details of proposed forming, bracing, or temporary support systems for construction of reinforced shotcrete elements.
- 2.1.8** Details of proposed means of preparing surface to receive shotcrete.
- 2.1.9** A description of proposed curing procedures and protection to be provided to shotcrete.
- 2.1.10** Details of proposed methods for control and disposal of waste materials, including waste shotcrete, rebound, and overspray.

3.0 REFERENCE DOCUMENTS

3.1 The documents referenced in the following form a part of this document only to the extent referenced. In the case of conflicts between the referenced portions of these documents and this specification, the requirements of this specification take precedence.

- 3.1.1 American Concrete Institute (ACI)**
 - ACI 506R Guide to Shotcrete
 - ACI CP-60 (Current Edition) Shotcrete Nozzlemen Certification
 - ACI 506.2 Specifications for Shotcrete
- 3.1.2 American Society for Testing and Materials (ASTM)**
 - ASTM C33 Specification for Concrete Aggregates
 - ASTM C94 Specification for Ready-Mixed Concrete
 - ASTM C143 Test Method for Slump of Hydraulic-Cement Concrete
 - ASTM C150 Specification for Portland Cement
 - ASTM C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
 - ASTM C260 Standard Specification for Air Entraining Admixtures for Concrete
 - ASTM C618 Specification for Coal Fly Ash
 - ASTM C1140 Practice for Preparing and Testing Specimens from Shotcrete Test Panels
 - ASTM C1141 Specification for Admixtures for Shotcrete
 - ASTM C1240 Specification for Silica Fume used in Concrete Mixtures
 - ASTM C1436 Specification for Materials for Shotcrete
 - ASTM C1604 Test Method for Obtaining and Testing Drilled Cores of Shotcrete
- 3.1.3 Canadian Standards Association (CSA) CSA A5 Portland Cement**
 - CSA A23.5 Supplementary Cementing Materials
 - CSA A23.1-04 Concrete Materials and Methods of Concrete Construction
 - CSA A23.2-04 Methods of Test for Concrete

4.0 DEFINITIONS

4.1 The following definitions refer to words and terms used in this specification. For definitions not covered in this document, refer to ACI 506R and ACI 506.2.

- Acceptable, Approved or Permitted:** Acceptable to approved or permitted by the Engineer.
- Bench gunning:** The practice of shooting thick members of full section by building from the bottom up.
- Blowpipe:** Air jet operated by nozzleman's helper in shotcrete application to assist in keeping rebound and overspray out of the work.
- Contractor:** The person, firm, or corporation with whom the Owner enters into agreement for construction of the work.
- Engineer:** The accepting authority responsible for issuing the project specifications and administering work under the contract documents on behalf of the Owner.
- Guide wire (also called screed wire or shooting wire):** Small gauge, high strength wire used to establish line and grade to guide work.
- Nozzleman:** Worker on the shotcrete crew who manipulates the nozzle, controls air addition at the nozzle, and controls final deposition of the material.
- Overspray:** Shotcrete material deposited away from the intended receiving surface.
- Rebound:** Shotcrete material leaner than the original mixture that ricochets off the receiving surface and falls to accumulate on the ground or other surfaces.
- Rod:** Sharp-edged cutting screed used to trim shotcrete to forms or ground wires.
- Shadow:** Area of porous, improperly consolidated shotcrete behind reinforcing steel or other embedments.
- Shotcrete:** Concrete pneumatically projected at high velocity onto a receiving surface.
- Sloughing (also called sagging):** Subsidence of shotcrete due generally to excessive water in the mixture or placing too great a thickness or height in a single pass.

Wet-Mix Shotcrete: Shotcrete in which all the shotcrete ingredients, including mixture water, are mixed before introduction into the shotcrete delivery system, and compressed air is introduced to the material flow at the nozzle.

5.0 MATERIALS

5.1 CEMENT

5.1.1 Cement shall conform to the requirements of ASTM C150 portland cement Type I, or CSA A5 portland cement Type GU.

5.2 SUPPLEMENTARY CEMENTING MATERIALS

5.2.1 Fly ash shall conform to the requirements of ASTM C618, Type F, or CAN/CSA-A3000-03 Type F or CI.

5.2.2 Silica fume shall conform to the requirements of ASTM C1240, or CAN/CSA-A3000-03 Type SF.

5.3 WATER

5.3.1 All water used in shotcrete production shall be of drinking water standard and free of oil and chemical or organic impurities.

5.3.2 Similarly, all water used in pressure sprayers for removal of rebound and overspray or green-cutting and for shotcrete curing shall be of drinking water standards and free of oil and chemical or organic impurities.

5.4 AGGREGATES

5.4.1 Use normalweight aggregates conforming to the requirements of ASTM C33 or CSA A23.1. Aggregates shall be hard, dense, and durable and conform to limits for allowable quantities of deleterious substances as given in ASTM C33 Tables 1 and 3 or CSA-A23.1-04 Table 12.

5.4.2 Aggregates used shall not react with alkalis in the cement to an extent that results in excessive expansion of the shotcrete. The requirements of CSA A23.1-04 and CSA A23.2-27A shall be met.

5.4.3 Use nominal 3/8 in. (10 mm) maximum size coarse aggregate combined with a concrete sand to provide a blend that conforms to the following composite gradation envelope:

U.S. sieve size	Metric sieve size	Total passing each sieve % by mass
1/2 in.	14 mm	100
3/8 in.	10 mm	90-100
No. 4	5 mm	70-85
No. 8	2.5 mm	50-70
No. 16	1.25 mm	35-55
No. 30	630 µm	20-35
No. 50	315 µm	8-20
No. 100	160 µm	2-10

5.4.4 The 3/8 in. to No. 8 (10 to 2.5 mm) coarse aggregate fraction shall be stockpiled and added separately from the fine aggregate (nominal No. 4 [5 mm] maximum size) during batching operations. (Note: in some jurisdictions 1/2 in. (12.7 mm) maximum size aggregate is now being used in thicker bench-gunned walls.)

5.5 ADMIXTURES

5.5.1 Do not use any admixtures containing chlorides. Do not use any shotcrete accelerators without written authorization by the Engineer.

5.5.2 Air-entraining admixtures shall conform to the requirements of ASTM C260.

5.5.3 Chemical admixtures, such as water reducers, high-range water reducers (superplasticizers), and retarders, shall conform to the requirements of ASTM C1141.

5.6 REINFORCEMENT

5.6.1 Use reinforcing steel of the type, size, and dimensions shown in the drawings.

6.0 SHOTCRETE PROPORTIONING

6.1 MIXTURE DESIGN

6.1.1 The Contractor shall be responsible for shotcrete mixture proportioning. Submit the proposed shotcrete mixture proportions to the Engineer for review and approval at least 10 working days before preconstruction trials; see Section 8.3. As a minimum, for each shotcrete mixture design, submit the following information:

- An easily identifiable mixture designation, number, or code; and
- Proof that the proposed mixture design is capable of meeting the specified performance requirements.

6.1.2 Performance Requirements

Proportion shotcrete to meet the following performance requirements:

Test description	Test method	Age (days)	Specified requirement
Maximum water/cementitious materials ratio		—	0.45
Air content — as shot ^{1,2}	ASTM C231, or CSA A23.2-4C	—	4 ± 1%
Slump at discharge into pump	ASTM C143, or CSA A23.2-5C	—	2 1/2 ± 1 in. (60 ± 20 mm)
Minimum compressive strength, psi (MPa)	ASTM C1604, or CSA A23.2-14C	7 28	2900 psi (20MPa) ³ 4350 psi (30 MPa) ³

Note 1: To obtain an as-shot air content of 4 ± 1% will require an air content at the point of discharge into the shotcrete pump in the 7 to 10% range

Note 2: The use of air entrainment is beneficial even in shotcrete not exposed to freezing and thawing because, as air content is lost on shooting, there is a corresponding loss of slump on impact that helps prevent sagging and sloughing.

Note 3: The shotcrete mixture shall meet the minimum specified compressive strengths listed in the table.

Note 4: The Engineer may specify higher compressive strengths if structurally required.

7.0 SUPPLY AND EQUIPMENT

7.1 BATCHING, MIXING, AND SUPPLY

7.1.1 Batch, mix, and supply wet-mix shotcrete by one of the following methods:

- Central mixing with transit mixture delivery; or
- Transit mixing and delivery.

7.1.2 Central Mixing and Supply

- Aggregate, cement, and silica fume shall be mass batched in a central mixer in accordance with the requirements of ASTM C94 or CSA A23.1-04. Water and chemical admixtures shall be batched to the accuracy specified in ASTM C94 or CSA A23.1-04;
- Transit mixers shall be free of excessive accumulations of hardened shotcrete or concrete in the drum or on the blades. Blades shall be free of excessive wear. Transit mixture delivery shall conform to the requirements of ASTM C94 or CSA A23.1-04; and
- All shotcrete shall be shot within 90 minutes after addition of mixture water to the batch. Shotcrete loads shall be of such batch size that this requirement is met. This time limit may be extended, subject to approval by the Engineer, if proper use is made of set retarding or hydration controlling admixtures to maintain workability without retempering with water.

7.1.3 Transit Mixing and Supply

The same requirements in Section 7.1.2 apply for central mixing except that all ingredients shall be added directly to the transit mixer instead of the central mixer. Transit mixers shall be charged to not more than 70% of their rated capacity, to enable efficient mixing action.

7.2 SHOTCRETE PLACING EQUIPMENT

7.2.1 The shotcrete delivery equipment shall be capable of delivering a steady stream of uniformly mixed material to the discharge nozzle at the proper velocity and rate of discharge.

7.2.2 The use of positive displacement pumps equipped with hydraulic or mechanically powered pistons (for example, similar to conventional concrete piston pumps), with compressed air added at the discharge nozzle, is the preferred type of wet-mix shotcrete delivery system. Pneumatic feed guns, rotary type feed guns (similar to dry-mix guns) and peristaltic squeeze-type pumps shall only be used if the Contractor can demonstrate that they produce shotcrete meeting all the specified performance requirements.

7.2.3 The air ring at the nozzle shall be carefully monitored for any signs of blockage of individual air holes. If non-uniform discharge of shotcrete becomes apparent, shooting shall be stopped and the air ring cleaned or other appropriate corrective actions taken.

7.2.4 The delivery of equipment shall be thoroughly cleaned at the end of each shift. Any build-up of coatings in the delivery hose and nozzle shall be removed. The air ring and nozzle shall be regularly inspected and cleaned, and replaced if required.

7.3 AUXILIARY SHOTCRETE EQUIPMENT

7.3.1 Supply clean, dry, compressed air, capable of maintaining sufficient nozzle velocity for all parts of the work and simultaneous operation of a blowpipe.

7.3.2 The air supply system shall contain a moisture and oil trap to prevent contamination of the shotcrete.

7.3.3 Provide auxiliary shotcrete equipment such as material delivery hoses, blowpipes, and couplings as required to complete the work.

7.4 REINFORCING STEEL

7.4.1 Reinforcing steel to be of the type, size, and dimensions detailed in the drawings.

7.4.2 Securely tie reinforcing steel bars at locations of intersecting bars with 0.06 in. (1.6 mm) or heavier gauge tie wire to minimize vibration and prevent movement of steel during shotcrete application. Avoid formation of knots of tie wire that could interfere with proper shotcrete encasement of reinforcing steel.

7.4.3 Tie reinforcing steel to avoid multiple laps or other congestion that could compromise ability of shotcrete nozzleman to properly encase reinforcing steel and embedments.

7.4.4 Submit proposed splice details to the Engineer for review and approval before installation of reinforcing steel.

7.4.5 Clearance between reinforcing bars and formwork or substrate to be as detailed in drawings, but not less than 0.79 in. (20 mm).

7.5 ALIGNMENT CONTROL AND COVER

7.4.6 Implement alignment control to establish control over line and grade and ensure that the minimum specified shotcrete thickness and cover to reinforcing steel are maintained. Verify that reinforcing bars are fixed to provide specified cover before application of any shotcrete.

7.4.7 Provide alignment control by means of devices such as shooting wires, guide strips, depth gauges, or forms. The proposed means of alignment control shall be submitted to the Engineer for review and approval before any shotcrete application.

7.4.8 When ground wires (also called guide wires or shooting wires) are used, they shall consist of a high-strength steel wire kept taut during shotcreting. Remove ground wires after completion of shotcreting and screeding operations.

7.4.9 Guide strips and forms shall be of such dimensions and installation configuration that they do not impede the

ability of the nozzle men to produce uniform, dense, properly consolidated shotcrete. In particular, installations that are conducive to the entrapment of rebound or formation of shadows and voids shall not be used.

8.0 QUALITY ASSURANCE AND QUALITY CONTROL

8.1 QUALITY ASSURANCE

The Engineer will implement a quality assurance program, paid for by the Owner, which will include:

- a) Review of Contractor Submittals;
- b) Review and approval of Contractor's proposed materials, supplies, equipment, and crew. In particular, all shotcrete nozzle men proposed for use on the project shall be evaluated in the preconstruction mock-up testing program. Only nozzle men approved by the Engineer shall be used on the project;
- c) Examination and approval of areas prepared for shotcreting at start-up of the project, including installation of anchors, reinforcement, and devices to control line and grade before application of any shotcrete;
- d) Provision of intermittent inspections to monitor shotcrete installation at a frequency selected by the Engineer;
- e) Regular monitoring of the results of the compressive strength tests conducted by a testing agency appointed and paid for by the Owner on cores extracted from standard shotcrete test panels shot by the Contractor at a frequency specified by the Engineer;
- f) Implementation of a program for in-place evaluation and acceptance, or rejection, where testing indicates shotcrete is nonconforming to the project specifications;
- g) Where defective shotcrete is indicated, carrying out appropriate tests that may include core evaluation and compressive strength testing of extracted cores from the in-place shotcrete; and
- h) Monitoring of a program of remedial works by the Contractor, where indicated as being necessary from the results of the quality assurance program.

8.2 QUALITY CONTROL

The Contractor shall establish and maintain a quality control program for the shotcrete work to ensure compliance with the contract requirements. Such program shall include maintenance of test records for all quality control operations. Such records shall be provided to the Engineer for review on request.

8.3 PRECONSTRUCTION TRIALS

8.3.1 Implement a preconstruction trial to enable the Engineer to evaluate the ability of the proposed materials, shotcrete mixture, equipment, and crew to produce shotcrete conforming to the project specifications. Acceptance of the preconstruction trial results by the Engineer is required before application of any shotcrete on the project.

8.3.2 The preconstruction trial shall be used to prequalify the nozzle men proposed for use on the project. Nozzle men who have not been prequalified shall not be permitted to apply shotcrete on the project.

8.3.3 The preconstruction trial shall use the same materials, shotcrete mixture, and equipment proposed for use on the project and approximate actual working conditions, configuration, reinforcement, and shooting positions as near as possible.

8.3.4 Nozzle men shall prequalify by shooting mock-ups of the reinforced structural wall element. Five cores shall be taken from each mock-up for core grading from locations directed by the Engineer.

8.3.5 Cores shall be evaluated by the Engineer to check the quality of shotcrete placement. Cores shall show adequate consolidation and be free of excessive voids around reinforcing steel, shadows, sags, sloughing, or delaminations.

8.3.6 Prequalify the shotcrete mixture by shooting a plain (nonreinforced) test panel with dimensions of 18 x 18 x 4.5 in. (450 x 450 x 110 mm) deep. The test panel shall be made from wood and sealed plywood and have 45-degree sloped edges to permit rebound to escape and facilitate demoulding.

8.3.7 Cure the test panels in the field, close to the location where shot, for two (2) days before being transported in the form to the testing laboratory. Cure the test panel under wet burlap covered with plastic sheet under temperatures conditions similar to that experienced by the wall. Protect the panels from disturbance or damage.

8.3.8 Assist testing laboratory by loading test panels, in their forms, onto their trucks. Test panels and cores extracted from the test panels shall be moist cured in the laboratory at 73.4 ± 2 °F (23 ± 2 °C) until the time of compressive strength testing.

8.3.9 If the preconstruction test specimens fail to meet the project performance requirements, then make the necessary

adjustments in shotcrete materials, mixture design, or application, and reshoot test panels. No work shall commence on the project until the preconstruction performance testing requirements have been met.

8.4 CONSTRUCTION TESTING

8.4.1 Shoot one construction test panel for each 65 yd³ (50 m³) of shotcrete production, or for each day of shotcrete production, whichever is more frequent. Shoot the panel in the same orientation as the work being done.

8.4.2 Produce, store, handle, and cure construction test panels in the same manner prescribed for preconstruction test panels. Similarly, prepare, handle, cure, and test shotcrete in the same manner prescribed for the preconstruction test panels.

9.0 SHOTCRETE APPLICATION AND FINISHING

9.1.1 Provide suitable scaffolding, man lifts, or other devices to provide the nozzlemen, helpers, and inspectors with free unhindered access to the work area. Provide safety measures to protect the workers on such devices that comply with the requirements of the authorities having jurisdiction.

9.1.2 Install sufficient lighting and ventilation to provide the nozzlemen and helpers with a clear, unhindered view of the shooting area. Work shall be terminated and corrective measures adopted if, in the opinion of the Engineer, visibility is unsuitable for the safe application of quality shotcrete.

9.1.3 Use good shotcrete nozzling technique as detailed in ACI 506R-05. In particular:

- a) Use the bench-gunning technique. Orient the nozzle at right angles to the receiving surface, except as required to fill corners, cove edges, and encase reinforcing steel;
- b) Optimize the combination of air volume at the nozzle and distance of the nozzle from the receiving surface to achieve maximum consolidation of the shotcrete and full encapsulation of the reinforcing steel;
- c) Adjust air volume and distance of the nozzle from the work while encasing reinforcing steel to keep the front face of the reinforcement clean during shooting operations, so that shotcrete builds up from behind to encase the reinforcement without the formation of shadows or voids;
- d) Nozzlemans helper to continuously remove accumulations of rebound and overspray using blowpipe, or other suitable devices in advance of deposition of new shotcrete; and
- e) Do not include rebound, hardened overspray, or stiffened shotcrete trimmings in the shotcrete work.

9.2 When applying more than one layer of shotcrete trim with a cutting rod, or brush with a stiff bristle broom to remove all loose material, overspray, laitance, or other material detrimental to bonding of the next layer of shotcrete.

9.3 Allow shotcrete layer to stiffen sufficiently before applying next layer of shotcrete. If shotcrete has set and hardened, high-pressure water blast (minimum 5000 psi [34.4 MPa]) with clean water and bring to a saturated surface-dry (SSD) condition at time of application of the next layer of shotcrete. Use air blow pipe to accelerate drying if necessary.

9.4 Use a shooting technique that provides full encapsulation of all reinforcing steel and embedments. Cut out any voids, shadows, sags, or other defects from the applied shotcrete while still plastic and reshoot. Otherwise make good any defects in the hardened shotcrete using light-duty chipping hammers (15 lb [7 kg] maximum) followed by high pressure water blasting (minimum 5000 psi [34.4 MPa]) to remove bruised shotcrete surface.

9.5 Trim shotcrete with a cutting rod or other suitable device to the specified line and grade. Finish shotcrete to a sandy texture as approved by the Engineer using suitable finishing tools. Tolerance of finished surface shall be as specified by the Engineer.

9.6 Protect all fixtures and adjacent concrete surfaces from build-up of rebound, overspray, and shotcrete trimmings. Remove all such materials from the work area on a daily basis.

9.7 Remove any excess shotcrete applied outside of the specified areas to be shot. Leave the work area in a clean condition on completion of the work, free from contamination by excess shotcrete trimmings, rebound, overspray, or slurry from shotcrete operations.

9.8 Construct construction joints to a 45-degree tapered edge. Cut plastic shotcrete with a trowel or other suitable tool to form a construction joint. Green cut with a 5000 psi (34.4 MPa) water pressure jet the next day, if necessary to remove loose material. Do not feather-edge (produce long tapered) construction joints. Square (90 degrees) joints permitted on horizontal surfaces over which concrete slabs will be placed.

10.0 CURING AND PROTECTION

10.1 CURING

10.1.1 On completion of finishing, prevent shotcrete from drying out by moist curing using fogging or wetting or maintenance of a minimum 95% relative humidity in the area surrounding the shotcrete.

10.1.2 Moist-cure shotcrete for a minimum of 7 days. Moist curing shall be accomplished using one or more of the following procedures:

- a) Wrap the elements in wet burlap covered with a plastic sheet or a presaturated plastic coated nonwoven synthetic fabric; or
- b) Install sprinklers, soaker hoses, or other devices that keep the shotcrete continuously wet for the specified period. Avoid the use of intermittent wetting procedures that allow shotcrete to undergo cycles of wetting and drying during the curing process.

10.2 HOT AND COLD WEATHER PROTECTION

10.2.1 The general requirements for hot and cold weather concreting detailed in ACI 506.2 or CSA A23.1-04 apply to the shotcrete work.

10.2.2 If the prevailing ambient conditions (relative humidity, wind speed, and air temperature) are such that the shotcrete develops plastic shrinkage and/or early drying shrinkage-cracking, terminate shotcrete application. Adopt corrective measures such as installation of wind barriers or fogging devices to protect the work before restarting shotcrete application. Do not proceed with shotcrete application if the rate of evaporation at the shotcrete surface exceeds 0.20 lb/ft².hr (1.0 kg/m².hr) as detailed in CSA A23.1-04, Appendix D.

10.2.3 Terminate shotcrete application if the ambient temperature rises above 86 °F (30 °C), unless the Contractor adopts special hot-weather shotcreting procedures that are approved by the Engineer.

10.2.4 During periods of cold weather, shotcreting may only proceed if the substrate to which the shotcrete is applied is above 41 °F (5 °C).

10.2.5 After application of the shotcrete, maintain the air temperature at the shotcrete surfaces at 50 °F (10 °C) or greater for at least four days after application of shotcrete. The means of maintaining the air temperature shall be approved by the Engineer. The use of unvented heaters that give rise to carbonation is prohibited.

11.0 SHOTCRETE ACCEPTANCE AND REPAIR

11.1 SHOTCRETE ACCEPTANCE

11.1.1 The Engineer has the authority to accept or reject the shotcrete work. Shotcrete that does not conform to the project specifications may be rejected either during the shotcrete application process, or on the basis of tests on cores from test panels or the completed work.

11.1.2 Deficiencies observed during the shotcrete application process, such as but not limited to the following, constitute a cause for shotcrete rejection:

- a) Failure to properly control and remove build-up of overspray and rebound;
- b) Incomplete consolidation of shotcrete around reinforcing steel and embedments;
- c) Incorporation of shadows, excessive voids, delaminations, sags or sloughing; and
- d) Failure to apply shotcrete to the required line and grade and tolerance.

11.1.3 Whenever possible, perform remedial work to correct deficiencies while shotcrete is still plastic.

11.1.4 The hardened shotcrete will be examined by the Engineer for any evidence of excessive plastic or drying shrinkage cracking, tears, feather-edging, sloughs, or other deficiencies. Sounding or suitable nondestructive testing shall be used to check for voids and delaminations. If the shotcrete does not meet the specified criteria, the work will be rejected and the Contractor shall implement a remediation program to correct the deficiency.

11.1.5 If the results of compliance tests from shotcrete test panels or assessment of the plastic or hardened shotcrete

indicate nonconformance of the shotcrete to the project specifications, the Engineer will implement a program of evaluation of the in-place shotcrete. Such evaluation shall include, but not be limited to:

- a) Extraction of cores from the in-place shotcrete at locations selected by the Engineer and evaluation of such cores for compliance to the project specifications;
- b) Checking for delaminations using sounding or other appropriate nondestructive testing procedures; and
- c) Diamond saw cutting or coring to check the adequacy of encasement of reinforcing steel and embedments.

11.1.6 Shotcrete that is proven to be nonconforming to the project specifications shall be removed and replaced by the Contractor at no cost to the Owner.

11.2 SHOTCRETE REPAIR

11.2.1 Shotcrete that is identified as being defective while still plastic shall be removed using trowels, scrapers, or other suitable mechanical devices.

11.2.2 Hardened shotcrete that is identified as being deficient shall be removed. Care shall be taken to prevent damage to reinforcing steel bars or embedments and adjacent sound shotcrete. Any embedments and adjacent sound shotcrete damaged during the shotcrete removal process shall be removed and replaced at no cost to the Owner.

11.2.3 All prepared repair areas shall be inspected and approved by the Engineer before the placement of any repair shotcrete. Repair shotcrete shall be placed, finished, cured, and protected in the same manner specified for shotcrete work.

11.2.4 The Contractor shall bear the costs for all repair and tests for nonconforming shotcrete.

END OF SECTION



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